FINAL LICENSE APPLICATION

Volume II of V

Part 4 - Consultation Appendix
Book 1 of 3

Byllesby-Buck Hydroelectric Project (FERC No. 2514)

February 28, 2022

Prepared by:

HDR

Prepared for:

Appalachian Power Company

APPALACHIAN POWER

An AEP Company

BOUNDLESS ENERGY

This page intentionally left blank.

Appendix I

Consultation Summary
Book 1 of of 3

This page intentionally left blank.

Byllesby-Buck Relicensing (P-2514)
Correspondence Log

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
August 2017	Letter	Bureau of Indian Affairs (BIA)	HDR	Response to Pre-Application Document (PAD) Questionnaire
August 2017	Letter	New River Conservancy (NRC)	HDR	Response to PAD Questionnaire
August 2017	Letter	Virginia Department of Environmental Quality (VDEQ)	HDR	Response to PAD Questionnaire
August 2017	Letter	Virginia Tech (VA Tech)	HDR	Response to PAD Questionnaire
August 15, 2017	Letter	HDR	Project Stakeholders[1]	PAD Questionnaire
August 15, 2017	Letter	HDR	U.S. Fish and Wildlife Service (USFWS)	Request for Threatened and Endangered Species Information
August 15, 2017	Letter	HDR	Virginia Department of Conservation and Recreation (VDCR)	Request for Threatened and Endangered Species Information
August 15, 2017	Letter	HDR	Virginia Department of Environmental Quality (VDEQ)	Coastal Zone Consistency Determination
August 23, 2017	E-mail	VDCR	HDR	Contacts and Website for Natural Heritage Program
September 1, 2017	Letter	VDEQ	HDR	Response to Coastal Zone Consistency Determination

[1] Project Stakeholders is used to represent communication to the majority of the relicensing stakeholders and may include representatives from the Federal Energy Regulatory Commission (FERC) U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), U.S. National Park Service (NPS), Virginia Department of Environmental Quality (VDEQ), Virginia Department of Game and Inland Fisheries (VDGIF), Advisory Council on Historic Preservation, NOAA Fisheries Service, U.S. Department of Interior, U.S. House of Representatives, Freshwater Mollusk Conservation, Natural Resource Conservation Service, FEMA, U.S. Environmental Protection Agency, U.S. Geological Survey, Virginia Department of Forestry, Virginia Department of Conservation and Recreation (VDCR), Archeological Society of Virginia, Monacan Indian Nation, and/or state, local, or non-governmental organizations.

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
September 13, 2017	Letter	VDCR	HDR	Response to PAD Questionnaire
September 23, 2017	Letter	VDCR	HDR	Review of Biotics Data System for occurrences of natural heritage resources
October 24, 2017	Conference Call	Appalachian Power (Appalachian) and HDR	Virginia Department of Game and Inland Fisheries (VDGIF)	PAD Information Request
November 1, 2017	E-mail	VDGIF	HDR	PAD Response
November 1, 2017	E-mail	VDGIF	HDR	Potential recreational access (old Appalachian Trail)
November 6, 2017	E-mail	HDR	VDGIF	Byllesby/Buck PAD Information Call Summary
April 25, 2018	Letter (20180425-3030)	Federal Energy Regulatory Commission (FERC)	Tribal Stakeholders	Invitation to participation in the relicensing process
May 10, 2018	Letter (20180510-3019)	FERC	Cherokee Nation	Invitation to participation in the relicensing process
August 1, 2018	Letter (20180815-0016)	Cherokee Nation	FERC	Confirmation the Cherokee Nation would like to participate in the relicensing process as a consulting party
September 21, 2018	Telephone Memo (20180921-3016)	FERC	Project Stakeholders	Update on initiating consultation with Tribes
January 7, 2019	Letter (20190107-5203)	Appalachian	FERC	Notice of Intent (NOI) and PAD
January 8, 2019	E-mail and Mail	HDR	Project Stakeholders	Notice of Filing of NOI and PAD
January 29, 2019	Letter (20190129-0008)	Cherokee Nation	FERC	Response to PAD and NOI
February 11, 2019	Letter	VDCR	HDR	Response to PAD and NOI

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
March 1, 2019	Letter	Delaware Nation	Appalachian	Project NOI and PAD
March 6, 2019	Letter (20190306-3030)	FERC	Delaware Tribe of Indians	Request for Tribal Consultation
March 8, 2019	Letter (20190308-3017)	FERC	Appalachian	Notice of Intent to File License Application for a New License and Commencing Pre-filing Process
March 8, 2019	Letter (20190308-3014)	FERC	Appalachian	Scoping Document 1 (SD1)
March 14, 2019	Letter (20190314-5067)	VDEQ	FERC	SD1 Comments
March 15, 2019	Letter (20190315-5181)	VA Tech	FERC	Comments and Study Requests
April 9, 2019	Letter (20190409-0015)	BIA	FERC	Monacan Indian Nation Consultation
April 30, 2019	Letter (20190430-5410)	Virginia Department of Health	FERC	Proximity to Public Drinking Water Sources
May 2, 2019	E-mail	Appalachian Power	VDGIF and FERC	Recreation Management Plan and Report
May 7, 2019	Letter (20190507-5155)	National Park Service (NPS)	FERC	Comments on PAD and SD1
May 7, 2019	Letter (20190507-5104)	USFWS	FERC	Comments on PAD, SD1, and Study Requests
May 7, 2019	Letter (20190507-5055)	VDEQ	FERC	Comments on SD1
May 7, 2019	Letter (20190507-5063)	VDGIF	FERC	Comments on PAD, SD1, and Study Requests

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
May 7, 2019	Letter (20190507-5031)	VDGIF	FERC	Supporting Information: Dynamic of Lotic Ecosystems
May 8, 2019	Letter (20190508-5025)	NRC	FERC	Comments on PAD, SD1, and Study Requests
May 8, 2019	Letter (20190508-5029)	VA Tech	FERC	Comments on the PAD and Study Requests
May 8, 2019	Letter (20190508-5015)	VDCR	FERC	Biotics Data System Results
May 20, 2019	Letter (20190520-4003)	FERC	Project Stakeholders	Evening Scoping Meeting Transcript
May 20, 2019	Letter (20190520-4005)	FERC	Project Stakeholders	Errata Sheet from Evening Scoping Meeting
May 20, 2019	Letter (20190520-4002)	FERC	Project Stakeholders	Morning Scoping Meeting Transcript
May 20, 2019	Letter (20190520-4004)	FERC	Project Stakeholders	Errata Sheet from Morning Scoping Meeting
June 12, 2019	Letter (20190612-3041)	FERC	Delaware Tribe of Indians	Consultation with the Delaware Tribe of Indians
June 21, 2019	Letter (20190621-3046)	FERC	Project Stakeholders	Scoping Document 2
June 21, 2019	Letter (20190621-5199)/E-mail	Appalachian/HDR	Project Stakeholders	Filing of Proposed Study Plan (PSP) for Relicensing Studies
September 3, 2019	E-mail	Appalachian	FERC	Mussel Study
September 3, 2019	E-mail	Appalachian	USFWS	1991 Fishery Survey
September 3, 2019	E-mail	Appalachian	USFWS	Mussel Study
September 4, 2019	E-mail	Appalachian	USFWS	Ramping Rate Assessment

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
September 18, 2019	Letter (20190918-5152)	VDGIF	FERC	Comments on PSP
September 19, 2019	Letter (20190919-3078)	FERC	Appalachian	Comments on PSP and Request for Additional Information
September 19, 2019	Letter (20190919-5051)	USFWS	FERC	Comments on PSP
October 9, 2019	E-mail	Appalachian	VDGIF	Fisheries Study
October 18, 2019	Letter (20191018-5274)	Appalachian	FERC	Revised Study Plan (RSP)
October 21, 2019	E-mail	HDR	Project Stakeholders	RSP
October 22, 2019	E-mail	VDGIF	Appalachian	Response to Fishery Study Question
October 30, 2019	Letter (20191030-3016)	FERC	Appalachian	Extension of Time to Respond to Additional Information Request
November 4, 2019	Letter (20191104-5009)	VDGIF	FERC	Comments on RSP
November 4, 2019	Letter (20191104-5165)	USFWS	FERC	Comments on RSP
November 18, 2019	Letter (20191118-3010)	FERC	Appalachian	Study Plan Determination (SPD)
December 12, 2019	Letter (20191212-5197)	Appalachian	FERC	SPD Clarification
December 12, 2019	E-mail	Appalachian	VDGIF, USFWS, and VDEQ	SPD Clarification
December 16, 2019	Letter (20191216-5148)	Appalachian	FERC	Additional Information Request Response

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
December 18, 2019	Letter (20191218-5213)	Appalachian	FERC	Request for Rehearing of SPD
January 16, 2020	Letter (20200116-3048)	FERC	Appalachian	Order Granting Rehearing for Further Consideration
February 20, 2020	Letter (20200220-3030)	FERC	Appalachian	Order on Rehearing
February 25, 2020	E-mail	Appalachian	VDGIF and VDCR	Proposed Project Site Visit
March 6, 2020	E-mail	HDR	VDEQ, NRC, VDGIF, VDCR, USFWS, and Carroll County	Proposed Recreation Site Visit Availability
March 31, 2020	E-mail	VDGIF	HDR	Walleye Gill Net Methods
April 3, 2020	E-mail	Environmental Science I (ESI)	VDGIF	Tentative Field Sampling Locations
April 13, 2020	E-mail	HDR	Project Stakeholders	Recreation Site Visit Cancelled due to COVID-19
April 15, 2020	E-mail	Appalachian	VDGIF	Fish Community Study Postponed
April 16, 2020	E-mail	VDGIF	Appalachian	Acknowledgement of Postponed Studies
April 17, 2020	E-mail	Appalachian	USFWS	Postponement of Schedule due to COVID-19
April 29, 2020	E-mail	Appalachian	Project Stakeholders	Recreation Online Survey
June 30, 2020	Online Meeting	Appalachian	VDGIF, USFWS, and VDEQ	Study Schedule Update Conference Call
July 1, 2020	E-mail	Appalachian	USFWS	Byllesby-Buck Virginia Spiraea Follow-Up
July 17, 2020	E-mail	Appalachian	VDGIF, USFWS and VDEQ	Updated Study Schedule Meeting Notes Review
July 20, 2020	E-mail	VDGIF	Appalachian	Agreement with Meeting Notes

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
July 27, 2020	Letter (20200727-5156)	Appalachian	FERC	First Quarterly Study Progress Report, Updated ILP Study Schedule, and Request for Extension of Time to File Initial Study Report (ISR)
July 28, 2020	E-mail	Appalachian	FERC	Notice of Filing for Extension of Time and Filing of ISR
July 28, 2020	E-mail	HDR	Project Stakeholders	Filing of ILP Study Progress Report
August 10, 2020	Letter (20200810-3001)	FERC	Appalachian	Order Granting Request for Extension of Time and Filing of ISR
August 18, 2020	E-mail	Appalachian	USFWS, VDGIF and VDEQ	Flow and Bypass Reach Aquatic Habitat Study – Flow Test Scenarios
August 25, 2020	E-mail	Virginia Department of Wildlife Resources (VDWR) (formally VDGIF)	Appalachian	Flow Test Scenarios
September 1, 2020	Letter	Appalachian	Section 106 Consultation Distribution List	Area of Potential Effects (APE)
September 10, 2020	E-mail	Appalachian	Project Stakeholders	Flow and Bypass Reach Meeting Notes
September 11, 2020	Letter (20200911-0007)	Appalachian	FERC	APE Letter
September 18, 2020	E-mail	USFWS, VDWR and VDEQ	Appalachian	Flow Test Scenario Meeting Notes
September 25, 2020	E-mail	Appalachian	VDHR	APE Consultation and Relicensing Documents
September 28, 2020	Letter	Catawba Indian Nation	Appalachian	APE Consultation Response
October 2, 2020	Letter	VDHR	Appalachian	APE Consultation Response

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
October 2, 2020	E-mail	Appalachian	Project Stakeholders	Recreation Study Update and Planning for Facilities Site Visit
October 5, 2020	Letter	Pamunkey Indian Tribe	Appalachian	APE Consultation Response
October 8, 2020	E-mail	VDWR	Stantec	Mussel Survey Update
October 8, 2020	E-mail	EDGE	VDWR and USFWS	Collection of State Threatened Pistolgrip Mussel
October 16, 2020	E-mail	EDGE	USFWS	Response to Pistolgrip Collection Questions
October 20, 2020	E-mail	HDR	VDWR	Contact List Update
October 23, 2020	E-mail	HDR	Project Stakeholders	Recreation Virtual Meeting Summary and Presentation
October 27, 2020	Letter (20201027-5179)	Appalachian	FERC	Second Quarterly Progress Report
October 27, 2020	E-mail	Appalachian	Project Stakeholders	Second Quarterly Progress Report
November 9, 2020	E-mail	VDWR	HDR	Fish Community Study Update
November 9, 2020	Letter	The Delaware Nation	Appalachian	APE Consultation Response
November 18, 2020	E-mail	HDR	Project Stakeholders	Recreation Site Visit Meeting Summary
December 4, 2020	E-mail	HDR	Project Stakeholders	Proposed Date for ISR Meeting
December 23, 2020	Letter (20201223-3004)	FERC	Appalachian	Scoping Document 3
January 18, 2021	Letter (20210119-5057)	Appalachian	FERC	Filing of Initial Study Report and Schedule for Virtual ISR Meeting
January 19, 2021	E-mail	HDR	Project Stakeholders	ISR Transmittal and Notice of Filing
January 21, 2021	E-mail	Terracon Consultants (Terracon)	Tribal Stakeholders	ISR Transmittal and Privileged Cultural Resources Report

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
February 12, 2021	Letter (20210212-5176	Appalachian	FERC	ISR Meeting Summary and Presentation
February 15, 2021	E-mail	HDR	Project Stakeholders	ISR Meeting Summary and Notice of Filing
March 15, 2021	Letter (20210315-5152)	VDWR	FERC	Comments on the ISR Meeting Summary
March 15, 2021	Letter (20210315-3039)	FERC	Appalachian	Comments on the ISR Meeting Summary
March 15, 2021	Letter (20210315-5265)	USFWS	Appalachian	Comments on the ISR Meeting Summary
April 13, 2021	Letter (20210413-5292)	Appalachian	FERC	Response to Comments on the ISR
April 13, 2021	E-mail	HDR	Project Stakeholders	Response to Comments on the ISR
April 30, 2021	Letter (20210430-5604)	Appalachian	FERC	Third Quarterly Progress Report
May 3, 2021	E-mail	HDR	Project Stakeholders	Third Quarterly Progress Report
July 20, 2021	E-mail	HDR	VDWR	Loafer’s Rest Recreation Meeting Summary
July 22, 2021	Letter (20210722-5139)	Appalachian	FERC	Fourth Quarterly Progress Report
July 27, 2021	E-mail	VDCR	HDR	Email Address Update from DGIF to DWR
July 27, 2021	E-mail	HDR	Project Stakeholders	Fourth Quarterly Study Progress Report
September 8, 2021	Letter	Appalachian	Project Stakeholders	Cultural Resource Study Report (PRIVLEDGED)
September 13, 2021	Letter (20210913-0009)	Appalachian	FERC	Cultural Resource Study Report (PRIVLEDGED)
September 22, 2021	Letter	Appalachian	USFWS, VDWR, VDEQ, and VDGIF	Notification Regarding Turbidity Study

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
October 1, 2021	Letter (20211001-5258)	Appalachian	FERC	Filing of Draft License Application (DLA)
October 4, 2021	E-mail	HDR	Project Stakeholders	Notice of Filing DLA
November 3, 2021	E-mail/Letter	HDR	Project Stakeholders	Fifth Quarterly Study Progress Report
November 18, 2021	E-mail/Letter	HDR	Project Stakeholders	Filing of Updated Study Report (USR)
November 30, 2021	Letter (20211130-5272)	Appalachian	FERC	General Fish Community Raw Data
December 9, 2021	E-mail	HDR	VDCR	Project Boundary File
December 16, 2021	Letter (20211216-5123)	Appalachian	FERC	Filing of USR Meeting Summary
December 17, 2021	E-mail	HDR	Project Stakeholders	Notification of Filing of USR Meeting Summary
December 17, 2021	E-mail	HDR	USFWS	Response to USR Action Items
December 20, 2021	Letter (20211220-3001)	FERC	Appalachian	Comments on the DLA
December 22, 2021	Letter (20211222-5116)	VDWR	FERC	Comments on the DLA
December 30, 2021	Letter (20211230-5017)	USFWS	FERC	Comments on the DLA
January 18, 2022	Letter (20220118-3014)	FERC	Appalachian	Comments on the USR
January 18, 2022	Letter (20220118-5153)	VDWR	FERC	Comments on the USR

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
January 18, 2022	Letter (20220118-5231)	USFWS	FERC	Comments on the USR
January 26, 2022	E-mail	Appalachian	Project Stakeholders	Draft Recreation Management Plan
January 27, 2022	E-mail	Appalachian	VDWR	Walleye Body Depth Data Request
January 28, 2022	E-mail	VDWR	Appalachian	Walleye Body Depth Data Response
February 2, 2022	Virtual Meeting	Appalachian	USFWS and VDWR	Buck Bypass Flow and Aquatic Habitat Follow-Up Meeting
February 3, 2022	E-mail	J.D. Kleopfer (VDWR)	John Copeland (VDWR)	Hellbender Follow-Up Discussion
February 14, 2022	Letter (20220214-5208)	Appalachian	FERC	Response to Comments on the Updated Study Report and Request for Extension of Time to File Revised Study Reports
February 15, 2022	E-mail	HDR	Project Stakeholders	Notice of Filing Response to Comments on the Updated Study Report
February 16, 2022	Virtual Meeting	Appalachian	VDWR	Eastern Hellbender Habitat at Byllesby-Buck
February 16, 2022	Virtual Meeting	Appalachian	USFWS and VDWR	Byllesby Bypass Flow and Aquatic Habitat Follow-up Meeting
February 17, 2022	Letter (20220217-3069)	FERC	Appalachian	Approval of Schedule for Filing Outstanding Information

This page intentionally left blank.

Byllesby-Buck Hydroelectric Project (FERC Project No. 2514) Relicensing Pre-Application Document Information Questionnaire

Appalachian Power Company (Appalachian) is the Licensee and operator of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project), located along the New River in Carroll County, Virginia (see attached map). Appalachian, with assistance from HDR, Inc. (HDR), is beginning the Federal Energy Regulatory Commission (FERC) relicensing process for the Project. Accordingly, Appalachian is preparing a Pre-Application Document (PAD). The PAD provides FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project.

This information is intended to help identify items of interest and related information needs, develop study requests and study plans, and prepare documents related to analyzing the relicensing application to be prepared by Appalachian. To prepare the PAD, Appalachian will use information in its possession and information obtained from others. This PAD Questionnaire will be used by Appalachian to help identify sources of existing, relevant, and reasonably available information that is not currently in Appalachian's possession. Comments and/or questions regarding this request may be sent to Sarah Kulpa with HDR via email at sarah.kulpa@hdrinc.com or via phone at (704) 248-3620, or to Elizabeth Parcell who represents Appalachian at ebparcell@aep.com or via phonc at (540) 985-2441.

Please return this questionnaire in the enclosed, self-addressed, stamped envelope within 30 days of receipt to allow for any follow-up contact by Appalachian's or HDR's representative that may be needed. Not responding within 30 days indicates that you are not aware of any existing, relevant, and reasonably available information that describes the existing Project environment or known potential impacts of the Project.

Appalachian and HDR respectfully request the following information:

1. Information about person completing the questionnaire:

Name & Title	Harold Peterson, Natural Resources Officer
Organization	Bureau of Indian Affairs Eastern Region Office
Address	545 Marriott Dr Ste 700 Nashville, TN 37214
Phone	615-564-6838
Email Address	harold.peterson@bia.gov

2. Do you or your organization know of existing, relevant and reasonably available information that describes the existing Byllesby-Buck Hydroelectric Projeet's environment (i.e., information regarding the New River in or close to the Byllesby-Buck Hydroelectric Project)?

   √ Yes (*If yes, please complete 2a through 2e*) __ No (*If no, go to 3*)

   a. If yes, please circle the specific resource area(s) that the information relates to:

- Geology and soils
- Water resources
- Fish and aquatic resources
- Wildlife and botanical resources
- Wetlands, riparian, and littoral habitat
- Rare, threatened & endangered species
- Recreation and land use
- Aesthetie resources
- Cultural resources
- Socio-economic resources
- Tribal resources
- Other resource information

   b. Please briefly describe the information referenced above or list available documents *(additional information may be provided on page 4 of this questionnaire).*

In addition to the Pamunkey Tribe this location is also of historic interest to the Eastern Band of Cherokee Indians, Cherokee Nation, and United Keetoowah Band of Cherokee Indians.

   c. Where can Appalachian obtain this information?

www.bia.gov has a Tribal Leaders Directory

d. Please indicate whether there is a speeific representative you wish to designate for a potential follow-up contact by Appalachian's or HDR's representative for the resource area(s) checked above *(additional information may be provided on page 4 of this questionnaire).*

Representative Contact Information

Name	
Address	
Phone	
Email Address	

Name	
Address	
Phone	
Email Address	

e. Based on the specific resources listed in 2a, are you aware of any specific issues or improvements pertaining to the identified resource area(s)? *(Additional information may be provided on page 4 of this questionnaire.)*

___ Yes *(please list specific issues below)* X No

Resource Area	Specific Issue

3. Do you or your organization plan to participate in the Byllesby-Buck Hydroelectric Project relicensing proceeding? X Yes ___ No

4. We are interested in your comments. If you have comments and/or questions regarding the Byllesby-Buck Hydroelectric Project or the relicensing process, please provide below. In addition, this questionnaire has been sent to the people/organizations shown on the attached distribution list; please let us know if there is anyone else you believe should receive this questionnaire that is not included on the attached distribution list.

(Comments and/or questions may be sent via email to: sarah.kulpa@hdrinc.com or ebparcell@aep.com)

As noted above, please return this questionnaire in the enclosed, self-addressed, stamped envelope within 30 days of receipt to allow for any follow-up contact by Appalachian's or HDR's representative that may be needed. Not responding within 30 days indicates that you are not aware of any existing, relevant, and reasonably available information that describes the existing Project environment or known potential impacts of the Project.

Byllesby-Buck Hydroelectric Project (FERC Project No. 2514) Relicensing Pre-Application Document Information Questionnaire

Appalachian Power Company (Appalachian) is the Licensee and operator of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project), located along the New River in Carroll County, Virginia (see attached map). Appalachian, with assistance from HDR, Inc. (HDR), is beginning the Federal Energy Regulatory Commission (FERC) relicensing process for the Project. Accordingly, Appalachian is preparing a Pre-Application Document (PAD). The PAD provides FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project.

This information is intended to help identify items of interest and related information needs, develop study requests and study plans, and prepare documents related to analyzing the relicensing application to be prepared by Appalachian. To prepare the PAD, Appalachian will use information in its possession and information obtained from others. This PAD Questionnaire will be used by Appalachian to help identify sources of existing, relevant, and reasonably available information that is not currently in Appalachian's possession. Comments and/or questions regarding this request may be sent to Sarah Kulpa with HDR via email at sarah.kulpa@hdrinc.com or via phone at (704) 248-3620, or to Elizabeth Parcell who represents Appalachian at ebparcell@aep.com or via phone at (540) 985-2441.

Please return this questionnaire in the enclosed, self-addressed, stamped envelope within 30 days of receipt to allow for any follow-up contact by Appalachian's or HDR's representative that may be needed. Not responding within 30 days indicates that you are not aware of any existing, relevant, and reasonably available information that describes the existing Project environment or known potential impacts of the Project.

Appalachian and HDR respectfully request the following information:

1. Information about person completing the questionnaire:

Name & Title	George Santucci President
Organization	New River Conservancy
Address	PO Box 1480, West Jefferson, NC 1 N Jefferson Ave Suite D 28694
Phone	336 846 6267
Email Address	george@newriverconservancy.org

2. Do you or your organization know of existing, relevant and reasonably available information that describes the existing Byllesby-Buck Hydroelectric Project's environment (i.e., information regarding the New River in or close to the Byllesby-Buck Hydroelectric Project)?

   ___ Yes (*If yes, please complete 2a through 2e*) __ No (*If no, go to 3*)

   a. If yes, please circle the specific resource area(s) that the information relates to:

- Geology and soils
- Water resources
- Fish and aquatic resources
- Wildlife and botanical resources
- Wetlands, riparian, and littoral habitat
- Rare, threatened & endangered species
- Recreation and land use
- Aesthetic resources
- Cultural resources
- Socio-economic resources
- Tribal resources
- Other resource information

   b. Please briefly describe the information refereneed above or list available documents *(additional information may be provided on page 4 of this questionnaire).*

   c. Where can Appalachian obtain this information?

d. Please indicate whether there is a specific representative you wish to designate for a potential follow-up contact by Appalachian's or HDR's representative for the resource area(s) checked above *(additional information may be provided on page 4 of this questionnaire).*

Representative Contact Information

Name	Laura Walters, NRC Board Chair
Address	6218 Dunkard Rd Dublin VA 24084
Phone	540 230 6272
Email Address	claytorlakegirl@gmail.com

Name	
Address	
Phone	
Email Address	

e. Based on the specific resources listed in 2a, are you aware of any specific issues or improvements pertaining to the identified resource area(s)? *(Additional information may be provided on page 4 of this questionnaire.)*

___ Yes *(please list specific issues below)* ___ No

Resource Area	Specific Issue

3. Do you or your organization plan to participate in the Byllesby-Buck Hydroelectric Project relicensing proceeding? _X_ Yes ___ No

4. We are interested in your comments. If you have comments and/or questions regarding the Byllesby-Buck Hydroelectric Project or the relicensing process, please provide below. In addition, this questionnaire has been sent to the people/organizations shown on the attached distribution list; please let us know if there is anyone else you believe should receive this questionnaire that is not included on the attached distribution list.

(Comments and/or questions may be sent via email to: sarah.kulpa@hdrinc.com or ebparcell@aep.com)

As noted above, please return this questionnaire in the enclosed, self-addressed, stamped envelope within 30 days of receipt to allow for any follow-up contact by Appalachian's or HDR's representative that may be needed. Not responding within 30 days indicates that you are not aware of any existing, relevant, and reasonably available information that describes the existing Project environment or known potential impacts of the Project.

Byllesby-Buck Hydroelectric Project (FERC Project No. 2514)
Relicensing Pre-Application Document Information Questionnaire

Appalachian Power Company (Appalachian) is the Licensee and operator of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project), located along the New River in Carroll County, Virginia (see attached map). Appalachian, with assistance from HDR, Inc. (HDR), is beginning the Federal Energy Regulatory Commission (FERC) relicensing process for the Project. Accordingly, Appalachian is preparing a Pre-Application Document (PAD). The PAD provides FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project.

This information is intended to help identify items of interest and related information needs, develop study requests and study plans, and prepare documents related to analyzing the relicensing application to be prepared by Appalachian. To prepare the PAD, Appalachian will use information in its possession and information obtained from others. This PAD Questionnaire will be used by Appalachian to help identify sources of existing, relevant, and reasonably available information that is not currently in Appalachian's possession. Comments and/or questions regarding this request may be sent to Sarah Kulpa with HDR via email at sarah.kulpa@hdrinc.com or via phone at (704) 248-3620, or to Elizabeth Parcell who represents Appalachian at ebparcell@aep.com or via phone at (540) 985-2441.

Please return this questionnaire in the enclosed, self-addressed, stamped envelope within 30 days of receipt to allow for any follow-up contact by Appalachian's or HDR's representative that may be needed. Not responding within 30 days indicates that you are not aware of any existing, relevant, and reasonably available information that describes the existing Project environment or known potential impacts of the Project.

Appalachian and HDR respectfully request the following information:

1. Information about person completing the questionnaire:

Name & Title	Drew Hammond, Water Withdrawal Permitting & Compliance Manager
Organization	Virginia Department of Environmental Quality, Office of Water Supply
Address	629 East Main St, Richmond VA 23218
Phone	804-698-4101
Email	Andrew.Hammond@deq.virginia.gov

Address	

2. Do you or your organization know of existing, relevant and reasonably available information that describes the existing Byllesby-Buck Hydroelectric Project's environment (i.e., information regarding the New River in or close to the Byllesby-Buck Hydroelectric Project)?

   ✓ Yes (*If yes, please complete 2a through 2e)* __ No (*If no, go to 3*)

   a. If yes, please circle the specific resource area(s) that the information relates to:

✓ Geology and soils
✓ Water resources
✓ Fish and aquatic resources
■ Wildlife and botanical resources
■ Wetlands, riparian, and littoral habitat
■ Rare, threatened & endangered species
■ Recreation and land use
■ Aesthetic resources
■ Cultural resources
■ Socio-economic resources
■ Tribal resources
✓ Other resource information (WQ)

   b. Please briefly describe the information referenced above or list available documents *(additional information may be provided on page 4 of this questionnaire).*

- New River flow data
- Upstream and downstream water users and associated water withdrawals in the New River and its watershed
- New River water quality data

   c. Where can Appalachian obtain this information?

DEQ Office of Water Supply has information on flow data and upstream and downstream water uses. Flow data can also be obtained through the USGS website. Water quality data for the Roanoke River can be obtained from the DEQ website or from the DEQ Water Quality Monitoring Program.

   d. Please indicate whether there is a specific representative you wish to designate for a potential follow-up contact by Appalachian's or HDR's representative for the resource area(s) checked above *(additional information may be provided on page 4 of this questionnaire).*

Representative Contact Information

Name	Matthew Link Water Withdrawal Permit Writer Virginia Department of Environmental Quality Office of Water Supply
Address	P.O. Box 1105, Richmond VA 23218
Phone	804-698-4078
Email Address	Matthew.link@deq.virginia.gov

Name	Scott Kudlas Director Virginia Department of Environmental Quality Office of Water Supply
Address	P.O. Box 1105, Richmond VA 23218
Phone	(804) 698-4456
Email Address	Scott.Kudlas@deq.virginia.gov

e. Based on the specific resources listed in 2a, are you aware of any specific issues or improvements pertaining to the identified resource area(s)? *(Additional information may be provided on page 4 of this questionnaire.)*

✓ Yes *(please list specific issues below)* ___ No

Resource Area	Specific Issue
Water quality	May be affected by the alteration of flow affecting water temperature, dissolved oxygen levels or other water quality aspects in the New River.
Downstream water uses	Downstream water withdrawals for public water supplies or other beneficial uses may be affected by the alterations of flow from a hydroelectric facility and would need to be assessed in any permit review.

3. Do you or your organization plan to participate in the Byllesby-Buck Hydroelectric Project relicensing proceeding? ✓ Yes ___ No

4. We are interested in your comments. If you have comments and/or questions regarding the Byllesby-Buck Hydroelectric Project or the relicensing process, please provide below. In addition, this questionnaire has been sent to the people/organizations shown on the attached distribution list; please let us know if there is anyone else you believe should receive this questionnaire that is not included on the attached distribution list.

A Virginia Water Protection Permit (VWP permit) issued by the DEQ Office of Water Supply will be required for any construction activities in the New River as well as for the alterations of flow related to the operation of a hydroelectric plant on the river. The VWP permit serves as the Clean Water Act § 401 state certification for the FERC license. Please contact the DEQ Office of Water Supply about the VWP Permitting process.

The following links provide information about the VWP permitting process and flow in the New River that would be useful to permitting a hydroelectric facility.

http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity.aspx

http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity/WaterWithdrawalPermittingandCompliance/SurfaceWaterWithdrawalPermittingandFees.aspx

https://va.water.usgs.gov/

(Comments and/or questions may be sent via email to: sarah.kulpa@hdrinc.com or ebparcell@aep.com)

As noted above, please return this questionnaire in the enclosed, self-addressed, stamped envelope within 30 days of receipt to allow for any follow-up contact by Appalachian's or HDR's representative that may be needed. Not responding within 30 days indicates that you are not aware of any existing, relevant, and reasonably available information that describes the existing Project environment or known potential impacts of the Project.

Byllesby-Buck Hydroelectric Project (FERC Project No. 2514)
Relicensing Pre-Application Document Information Questionnaire

Appalachian Power Company (Appalachian) is the Licensee and operator of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project), located along the New River in Carroll County, Virginia (see attached map). Appalachian, with assistance from HDR, Inc. (HDR), is beginning the Federal Energy Regulatory Commission (FERC) relicensing process for the Project. Accordingly, Appalachian is preparing a Pre-Application Document (PAD). The PAD provides FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project.

This information is intended to help identify items of interest and related information needs, develop study requests and study plans, and prepare documents related to analyzing the relicensing application to be prepared by Appalachian. To prepare the PAD, Appalachian will use information in its possession and information obtained from others. This PAD Questionnaire will be used by Appalachian to help identify sources of existing, relevant, and reasonably available information that is not currently in Appalachian's possession. Comments and/or questions regarding this request may be sent to Sarah Kulpa with HDR via email at sarah.kulpa@hdrinc.com or via phone at (704) 248-3620, or to Elizabeth Parcell who represents Appalachian at ebparcell@aep.com or via phone at (540) 985-2441.

Please return this questionnaire in the enclosed, self-addressed, stamped envelope within 30 days of receipt to allow for any follow-up contact by Appalachian's or HDR's representative that may be needed. Not responding within 30 days indicates that you are not aware of any existing, relevant, and reasonably available information that describes the existing Project environment or known potential impacts of the Project.

Appalachian and HDR respectfully request the following information:

1. Information about person completing the questionnaire:

Name & Title	DONALD J. ORTH DONALD J. ORTH
Organization	VirginiaTech College of Natural Resources and Environment
Address	Department of Fish and Wildlife Conservation Virginia Polytechnic Institute and State University 106 Cheatham Hall (0321) Blacksburg, VA 24061 Fax: 540/231-7580
Phone	Donald J. Orth Thomas H. Jones Professor 540/231-5919 Cell: 540/230-4738
Email Address	E-mail: Don_Orth@vt.edu www.fishwild.vt.edu/faculty/orth

2. Do you or your organization know of existing, relevant and reasonably available information that describes the existing Byllesby-Buck Hydroelectric Project's environment (i.e., information regarding the New River in or close to the Byllesby-Buck Hydroelectric Project)?

   √ Yes (*If yes, please complete 2a through 2e*) __ No (*If no, go to 3*)

   a. If yes, please circle the specific resource area(s) that the information relates to:

- Geology and soils
- Water resources
- Fish and aquatic resources
- Wildlife and botanical resources
- Wetlands, riparian, and littoral habitat
- Rare, threatened & endangered species
- Recreation and land use
- Aesthetic resources
- Cultural resources
- Socio-economic resources
- Tribal resources
- Other resource information

   b. Please briefly describe the information referenced above or list available documents *(additional information may be provided on page 4 of this questionnaire).*

Survey of fish + mussels
in vicinity of Fries Dam

   c. Where can Appalachian obtain this information?

Wendy Bly

WBley@TRCsolutions.com

d. Please indicate whether there is a specific representative you wish to designate for a potential follow-up contact by Appalachian's or HDR's representative for the resource area(s) checked above *(additional information may be provided on page 4 of this questionnaire).*

Representative Contact Information

Name	
Address	
Phone	
Email Address	

Name	
Address	
Phone	
Email Address	

e. Based on the specific resources listed in 2a, are you aware of any specific issues or improvements pertaining to the identified resource area(s)? *(Additional information may be provided on page 4 of this questionnaire.)*

__✓__ Yes *(please list specific issues below)* ___ No

Resource Area	Specific Issue
Geology + Soils	Sediment deposition.
Fish + aquatic	Sediment and Temperature

3. Do you or your organization plan to participate in the Byllesby-Buck Hydroelectric Project relicensing proceeding? __✓__ Yes ___ No

4. We are interested in your comments. If you have comments and/or questions regarding the Byllesby-Buck Hydroelectric Project or the relicensing process, please provide below. In addition, this questionnaire has been sent to the people/organizations shown on the attached distribution list; please let us know if there is anyone else you believe should receive this questionnaire that is not included on the attached distribution list.

(Comments and/or questions may be sent via email to: sarah.kulpa@hdrinc.com or ebparcell@aep.com)

As noted above, please return this questionnaire in the enclosed, self-addressed, stamped envelope within 30 days of receipt to allow for any follow-up contact by Appalachian's or HDR's representative that may be needed. Not responding within 30 days indicates that you are not aware of any existing, relevant, and reasonably available information that describes the existing Project environment or known potential impacts of the Project.

August 15, 2017

Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514)
Relicensing Pre-Application Document Questionnaire

To the Attached Distribution List:

Appalachian Power Company (Appalachian) is the Licensee and operator of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project) located on the New River in Carroll County, Virginia. The Project is licensed by the Federal Energy Regulatory Commission (FERC).

The existing FERC license for the Project expires on February 29, 2024. Appalachian intends to pursue a new license for the Project and is preparing the Pre-Application Document (PAD) required by FERC's relicensing process. Appalachian has retained HDR, Inc. (HDR) for assistance with the relicensing process, including development of the PAD.

The PAD provides FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project. This information is intended to help identify items of interest and related information needs, develop study requests and study plans, and prepare documents related to analyzing the relicensing application to be prepared by Appalachian. To prepare the PAD, Appalachian will use information in its possession and information obtained from others. On behalf of Appalachian, HDR is currently gathering information to support preparation of the PAD. Consistent with this effort, the purpose of this letter is to:

1) Notify interested governmental agencies, local governments, non-governmental organizations, Indian tribes, and individuals of the upcoming relicensing proceeding, and

2) Request your help in identifying existing, relevant, and reasonably available information related to the existing Project environment or known impacts or benefits of the Project.

Appalachian's goal is to produce a final comprehensive PAD by the end of 2017 and to file the PAD with the FERC in 2018. We are asking for your help to identify additional information of which you may be aware. To facilitate the information search, we have prepared the attached Pre-Application Document Information Questionnaire (PAD Questionnaire).

440 S Church Street, Suites 900 & 1000, Charlotte, NC 28202-2075
(704) 338-6700

Appalachian is requesting that you provide any relevant information for the PAD. Relevant information would include site-or-region specific studies, data, reports, or management plans on any of the following resource areas:

- Geology and soils
- Recreation and land use
- Water resources
- Aesthetic resources
- Fish and aquatic resources
- Cultural resources
- Wildlife and botanical resources
- Socioeconomic resources
- Wetlands, riparian, and littoral habitat
- Tribal resources
- Rare, threatened, and endangered species

To help ensure that your relevant information and resources are available for inclusion in the PAD, please fill out the attached PAD Questionnaire and return to Sarah Kulpa (of HDR) via email at sarah.kulpa@hdrinc.com or in the enclosed self-addressed, stamped envelope.

HDR intends to include relevant information in the PAD. Therefore, we respectfully request a response within 30 days of receipt of this letter. This will allow time for follow-up contacts that may be necessary. If we do not receive a response from you within 30 days, this will indicate you are not aware of any existing, relevant, and reasonably available information that describes the Project environment or known potential impacts of the Project, and that, unless you are representative of an Indian tribe or federal or state agency, you do not wish to remain on the distribution list for this relicensing process.

We want to thank you in advance for helping identify information that meets the criteria for inclusion in the PAD. We appreciate your assistance and look forward to working with you during the relicensing process. If you have any questions regarding this request or would like additional information, please contact me at sarah.kulpa@hdrinc.com or via phone at (704) 248-3620 or Elizabeth Parcell who represents Appalachian at ebparcell@aep.com or via phone at (540) 985-2441.

Sincerely,
HDR, Inc.

Sarah E Kulpa

Sarah Kulpa
Project Manager

Attachment

cc: Elizabeth Parcell, on behalf of Appalachian

DISTRIBUTION LIST

Byllesby-Buck Hydroelectric Project (FERC No. 2514)

Charlene Dwin Vaughn
Advisory Council on Historic Preservation
401 F Street NW, Suite 308
Washington, DC 20001-2637

Kimberly Bose
Federal Energy Regulatory Commission
888 1st St NE
Washington, DC 20426

FEMA Region 3
615 Chestnut Street
One Independence Mall, Sixth Floor
Philadelphia , PA 19106-4404

John Bullard
NOAA Fisheries Service
Greater Atlantic Reg. Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930-2276

John A. Bricker
US Department of Agriculture
Natural Resources Conservation Service
1606 Santa Rosa Road, Suite 209
Richmond, VA 23229-5014

Harold Peterson
US Department of the Interior
545 Marriott Dr, Suite 700
Nashville, TN 37214

US Department of the Interior
1849 C Street, NW
Washington, DC 20240

Lindy Nelson, US Dept of the Interior
Philadelphia Region
Custom House, Room 244
200 Chestnut Street
Philadelphia , PA 19106

Barbara Rudnick
US Environmental Protection Agency
1650 Arch Street
Philadelphia , PA 19103-2029

Martin Miller
US Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 1035

Cindy Schulz
US Fish and Wildlife Service
6669 Short Lane
Gloucester, VA 23061

Elizabeth Merz
US Forest Service
3714 Highway 16
Marion, VA 24354

US Forest Service
1400 Independence Avenue NW
Washington, DC 20230

US Geological Survey
John W. Powell Building
12201 Sunrise Valley Drive
Reston, VA 20192

Morgan Griffith
US House of Representatives
Christiansburg District Office
17 West Main Street
Christiansburg, VA 24073

Tim Kaine
US Senate
231 Russell Senate Office Building
Washington, DC 20510

Mark Warner
US Senate
703 Hart Senate Office Building
Washington, DC 20510

Michael Reynolds
US National Park Service
1849 C Street, NW
Washington, DC 20240

Catherine Turton
US National Park Service
US Custom House, 3rd Floor
200 Chestnut Street
Philadelphia , PA 19106

Chris Sullivan
Virginia Department of Forestry
900 Natural Resources Drive
Charlottesville, VA 22903

Jess Jones
Freshwater Mollusk Conservation Center
Virginia Tech
1B Plantation Road
Blacksburg, VA 24061

Brian McGurk
Virginia Dept of Environmental Quality
PO Box 1105
Richmond, VA 23218

Kelly Miller
Virginia Dept of Environmental Quality
355-A Deadmore Street
Abingdon, VA 24210

Bettina Sullivan
Virginia Dept of Environmental Quality
PO Box 1105
Richmond, VA 23218

William Kittrell
VA Dept of Game and Inland Fisheries
1796 Highway Sixteen
Marion, VA 24354

John Copeland
VA Dept of Game and Inland Fisheries
4010 West Broad Street
PO Box 11104
Richmond, VA 23230

Beth Reed
VA Dept of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219

Faye McKinney
VA Dept of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219

Craig Seaver
VA Dept of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219

Julie Langan
VA Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221

DISTRIBUTION LIST

Byllesby-Buck Hydroelectric Project (FERC No. 2514)

Elizabeth Moore
Archaeological Society of Virginia
PO Box 70395
Richmond, VA 23255

Kelly Thomasson
Virginia Council on Indians
1111 East Broad Street, 4th Floor
Richmond, VA 23219

Terry McAuliffe
Office of the Governor
PO Box 1475
Richmond, VA 23218

Tracy Goodson
New River Soil and Water Conservation District
968 East Stuart Drive
Galax, VA 24333

Carroll County
605 Pine Street
Hillsville, VA 24343

C. M. Mitchell
Town of Galax
111 East Grayson Street
Galax, VA 24333

Brian J. Reed
Town of Fries
PO Box 452
Fries, VA 24330

Robert Gray
Pamunkey Indian Tribe
191 Lay Landing Road
King William, VA 23086

John Seebach
American Rivers
1104 14th St NW, Suite 1400
Washington, DC 20005

Kevin Richard Colburn
American Whitewater
PO Box 1540
Cullowhee, NC 28779

Rick Roth
Friends of the New River
1000 Highland Circle
Blacksburg, VA 24060

George Santucci
New River Conservancy
1 N Jefferson Avenue, Suite D
West Jefferson, NC 28694

Andrea Langston
New River Land Trust
PO Box 11057
Blacksburg, VA 24062

Sam Sweeney
New River Trail State Park
116 Orphanage Drive
Max Meadows, VA 24360

Tim Dixon
New River Outdoor Adventures
5785 Fries Road
Galax, VA 24333

New River Watershed Roundtable, Inc.
PO Box 1506
Dublin, VA 24084

Steve Moyer
Trout Unlimited
1777 N. Kent Street, Suite 100
Arlington, VA 22209

American Canoe Association
503 Sophia Street, Suite 100
Fredericksburg, VA 22401

Appalachian Trail Conservancy
110 South Park Drive
Blacksburg, VA 24063

Nature Conservancy
490 Westfield Road
Charlottesville, VA 22901-1633

Byllesby-Buck Hydroelectric Project (FERC Project No. 2514)
Relicensing Pre-Application Document Information Questionnaire

Appalachian Power Company (Appalachian) is the Licensee and operator of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project), located along the New River in Carroll County, Virginia (see attached map). Appalachian, with assistance from HDR, Inc. (HDR), is beginning the Federal Energy Regulatory Commission (FERC) relicensing process for the Project. Accordingly, Appalachian is preparing a Pre-Application Document (PAD). The PAD provides FERC and other entities with existing, relevant, and reasonably available information pertaining to the Project.

This information is intended to help identify items of interest and related information needs, develop study requests and study plans, and prepare documents related to analyzing the relicensing application to be prepared by Appalachian. To prepare the PAD, Appalachian will use information in its possession and information obtained from others. This PAD Questionnaire will be used by Appalachian to help identify sources of existing, relevant, and reasonably available information that is not currently in Appalachian's possession. Comments and/or questions regarding this request may be sent to Sarah Kulpa with HDR via email at sarah.kulpa@hdrinc.com or via phone at (704) 248-3620, or to Elizabeth Parcell who represents Appalachian at ebparcell@aep.com or via phone at (540) 985-2441.

Please return this questionnaire in the enclosed, self-addressed, stamped envelope within 30 days of receipt to allow for any follow-up contact by Appalachian's or HDR's representative that may be needed. Not responding within 30 days indicates that you are not aware of any existing, relevant, and reasonably available information that describes the existing Project environment or known potential impacts of the Project.

Appalachian and HDR respectfully request the following information:

1. Information about person completing the questionnaire:

Name & Title	
Organization	
Address	
Phone	
Email Address	

2. Do you or your organization know of existing, relevant and reasonably available information that describes the existing Byllesby-Buck Hydroelectric Project's environment (i.e., information regarding the New River in or close to the Byllesby-Buck Hydroelectric Project)?

   ___ Yes (*If yes, please complete 2a through 2e*)   __ No (*If no, go to 3*)

   a. If yes, please circle the specific resource area(s) that the information relates to:

- Geology and soils
- Water resources
- Fish and aquatic resources
- Wildlife and botanical resources
- Wetlands, riparian, and littoral habitat
- Rare, threatened & endangered species
- Recreation and land use
- Aesthetic resources
- Cultural resources
- Socio-economic resources
- Tribal resources
- Other resource information

   b. Please briefly describe the information referenced above or list available documents *(additional information may be provided on page 4 of this questionnaire).*

   c. Where can Appalachian obtain this information?

d. Please indicate whether there is a specific representative you wish to designate for a potential follow-up contact by Appalachian's or HDR's representative for the resource area(s) checked above *(additional information may be provided on page 4 of this questionnaire).*

Representative Contact Information

Name	
Address	
Phone	
Email Address	

Name	
Address	
Phone	
Email Address	

e. Based on the specific resources listed in 2a, are you aware of any specific issues or improvements pertaining to the identified resource area(s)? *(Additional information may be provided on page 4 of this questionnaire.)*

___ Yes *(please list specific issues below)* ___ No

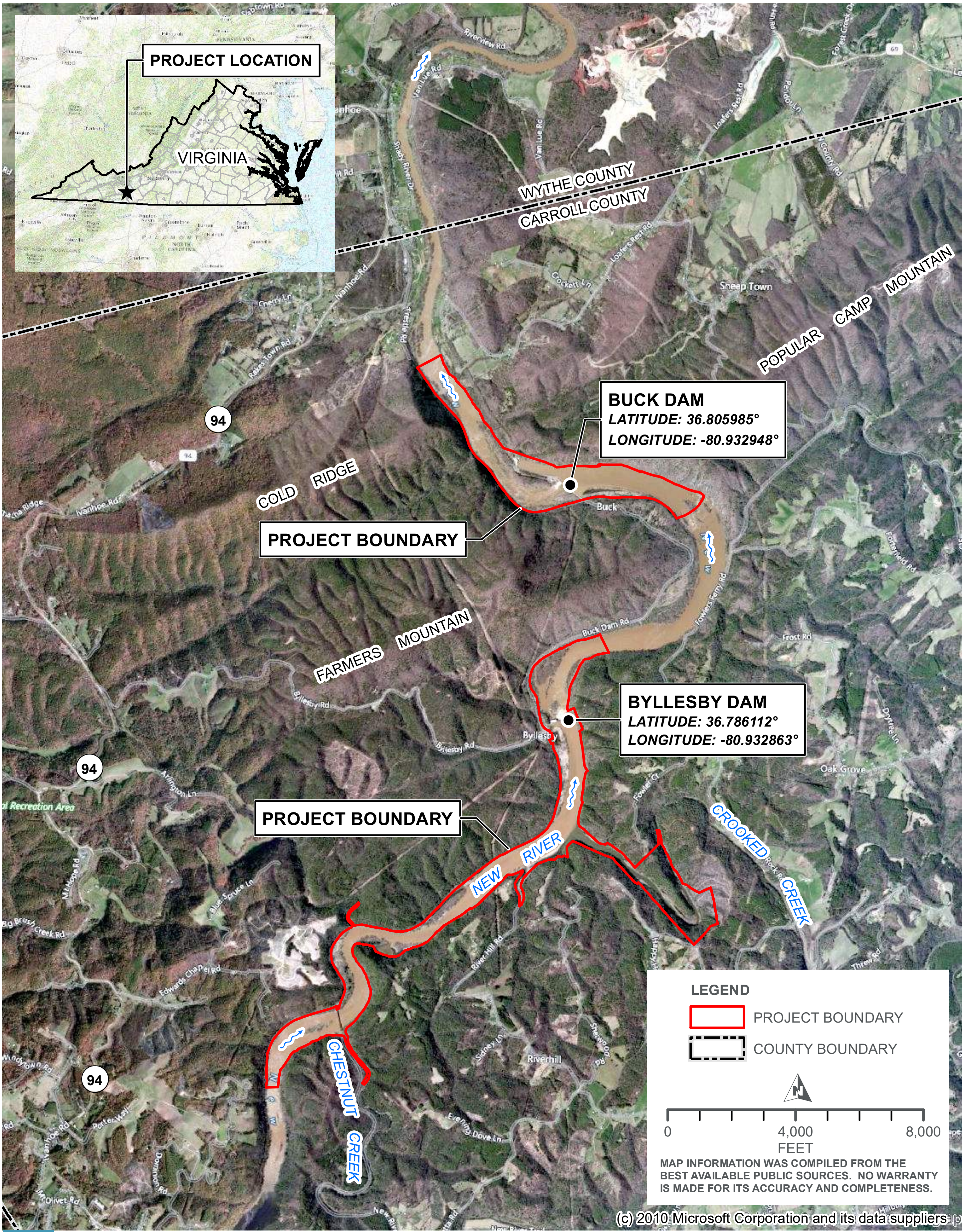
Resource Area	Specific Issue

3. Do you or your organization plan to participate in the Byllesby-Buck Hydroelectric Project relicensing proceeding? ___ Yes ___ No

4. We are interested in your comments. If you have comments and/or questions regarding the Byllesby-Buck Hydroelectric Project or the relicensing process, please provide below. In addition, this questionnaire has been sent to the people/organizations shown on the attached distribution list; please let us know if there is anyone else you believe should receive this questionnaire that is not included on the attached distribution list.

(Comments and/or questions may be sent via email to: sarah.kulpa@hdrinc.com or ebparcell@aep.com)

As noted above, please return this questionnaire in the enclosed, self-addressed, stamped envelope within 30 days of receipt to allow for any follow-up contact by Appalachian's or HDR's representative that may be needed. Not responding within 30 days indicates that you are not aware of any existing, relevant, and reasonably available information that describes the existing Project environment or known potential impacts of the Project.



PROJECT LOCATION MAP

BYLLESBY & BUCK HYDROELECTRIC PROJECT (FERC NO. 2514)

CARROLL COUNTY, VIRGINIA

PATH: N:\GIS2\PROJECTS\AEP\10067919_AEP_BYLLESBY_BUCK_PAD_NOI\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MAP_DOCS\FINAL\MAP_8_5X11P_20170814_PROJECT_LOCATION_MAP.MXD - USER: DSOUCIE - DATE: 8/14/2017

AUGUST 2017

August 15, 2017

Martin Miller, Chief
United States Fish and Wildlife Service
Northeast Region 5
300 Westgate Center Drive
Hadley, MA 01035

Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514)
Request for Threatened and Endangered Species Information

Dear Mr. Miller,

On behalf of Appalachian Power Company (Appalachian), HDR, Inc. (HDR) is gathering information in support of the Pre-Application Document (PAD) for the upcoming Federal Energy Regulatory Commission (FERC) relicensing of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project). In support of this process, HDR has requested an official species list regarding any threatened or endangered species and any critical habitat within the Project area using the United States Fish and Wildlife Service's (USFWS) IPaC system online.

The Byllesby-Buck Hydroelectric Project is located on the New River in Carroll County, Virginia. The attached report was generated from the USFWS' IPaC system and includes a map that shows the area of interest for which the information was requested and the general location of the facility.

It is our intent to include these results in the PAD. Therefore, we respectfully request your concurrence that this information is accurate within 30 days of the date of this letter. If you have any questions or need additional information regarding this Project or its location, please feel free to contact me at (704) 248-3620 or sarah.kulpa@hdrinc.com.

Thank you for your assistance with this request.

Sincerely,
HDR, Inc.

Sarah E Kulpa

Sarah Kulpa
Project Manager

Attachment

cc: Elizabeth Parcell, on behalf of Appalachian

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
http://www.fws.gov/northeast/virginiafield/

In Reply Refer To: August 14, 2017
Consultation Code: 05E2VA00-2017-SLI-4483
Event Code: 05E2VA00-2017-E-09982
Project Name: Byllesby Hydroelectric Project

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2017-SLI-4483

Event Code: 05E2VA00-2017-E-09982

Project Name: Byllesby Hydroelectric Project

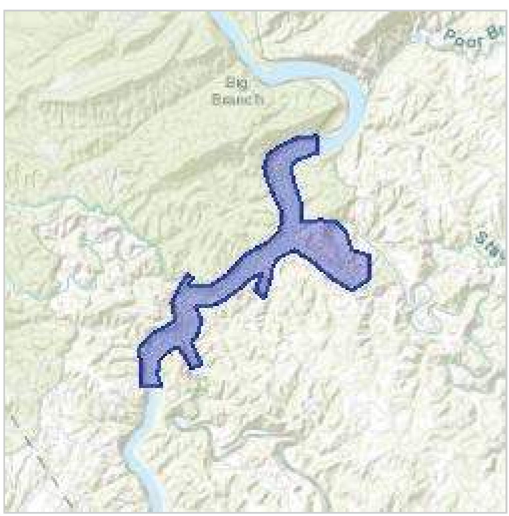
Project Type: DAM

Project Description: Appalachian Power Company (Appalachian) is the Licensee and operator of the 30.1 megawatt Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project) located on the New River in Carroll County, Virginia. The existing Project consists of the Byllesby development and the Buck development. The Project is licensed by the Federal Energy Regulatory Commission (FERC).

The existing FERC license for the Project expires on February 29, 2024. Appalachian intends to pursue a new license for the Project and is preparing the Pre-Application Document (PAD) required by FERC's relicensing process. As part of the data collection for the PAD, Appalachian is requesting information regarding rare, threatened and endangered species and critical habitat within the Project area.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.772652419178215N80.92110110937404W



Counties: Carroll, VA

Endangered Species Act Species

There is a total of 3 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

Mammals

NAME	STATUS
Indiana Bat *Myotis sodalis* There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Flowering Plants

NAME	STATUS
Virginia Spiraea *Spiraea virginiana* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1728	Threatened

Critical habitats

There are no critical habitats within your project area under this office's jurisdiction.

USFWS National Wildlife Refuges And Fish Hatcheries

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuges or fish hatcheries within your project area.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
http://www.fws.gov/northeast/virginiafield/

In Reply Refer To: August 14, 2017
Consultation Code: 05E2VA00-2017-SLI-4482
Event Code: 05E2VA00-2017-E-09980
Project Name: Buck Hydroelectric Project

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2017-SLI-4482

Event Code: 05E2VA00-2017-E-09980

Project Name: Buck Hydroelectric Project

Project Type: DAM

Project Description: Appalachian Power Company (Appalachian) is the Licensee and operator of the 30.1 megawatt Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project) located on the New River in Carroll County, Virginia. The existing Project consists of the Byllesby development and the Buck development. The Project is licensed by the Federal Energy Regulatory Commission (FERC).

The existing FERC license for the Project expires on February 29, 2024. Appalachian intends to pursue a new license for the Project and is preparing the Pre-Application Document (PAD) required by FERC's relicensing process. As part of the data collection for the PAD, Appalachian is requesting information regarding rare, threatened and endangered species and critical habitat within the Project area.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.8098684069521N80.94110266138311W

Counties: Carroll, VA

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

Mammals

NAME	STATUS
Indiana Bat *Myotis sodalis* There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

There are no critical habitats within your project area under this office's jurisdiction.

USFWS National Wildlife Refuges And Fish Hatcheries

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuges or fish hatcheries within your project area.

August 15, 2017

Faye McKinney
Virginia Department of Conservation and Recreation
Natural Heritage Program
600 East Main Street, 24th Floor
Richmond, VA 23219

Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514)
Request for Threatened and Endangered Species Information

Dear Ms. McKinney,

On behalf of Appalachian Power Company (Appalachian), HDR, Inc. (HDR) is gathering information in support of the Pre-Application Document (PAD) for the upcoming Federal Energy Regulatory Commission (FERC) relicensing of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project). In support of this process, HDR is requesting information regarding the following within the Project area:

- State-listed threatened or endangered species;
- Species proposed for listing as threatened or endangered, or species of concern;
- Designated or proposed critical habitat; and
- Candidate species.

The Byllesby-Buck Hydroelectric Project is located on the New River in Carroll County, Virginia. The attached map shows the area of interest for which the information is being requested and the general location of the facility.

It is our intent to include the results of this information request in the PAD. Therefore, we respectfully request a response to this request within 30 days of the date of this letter. If you have any questions or need additional information regarding this Project or its location, please feel free to contact me at (704) 248-3620 or sarah.kulpa@hdrinc.com.

Thank you for your assistance with this request.

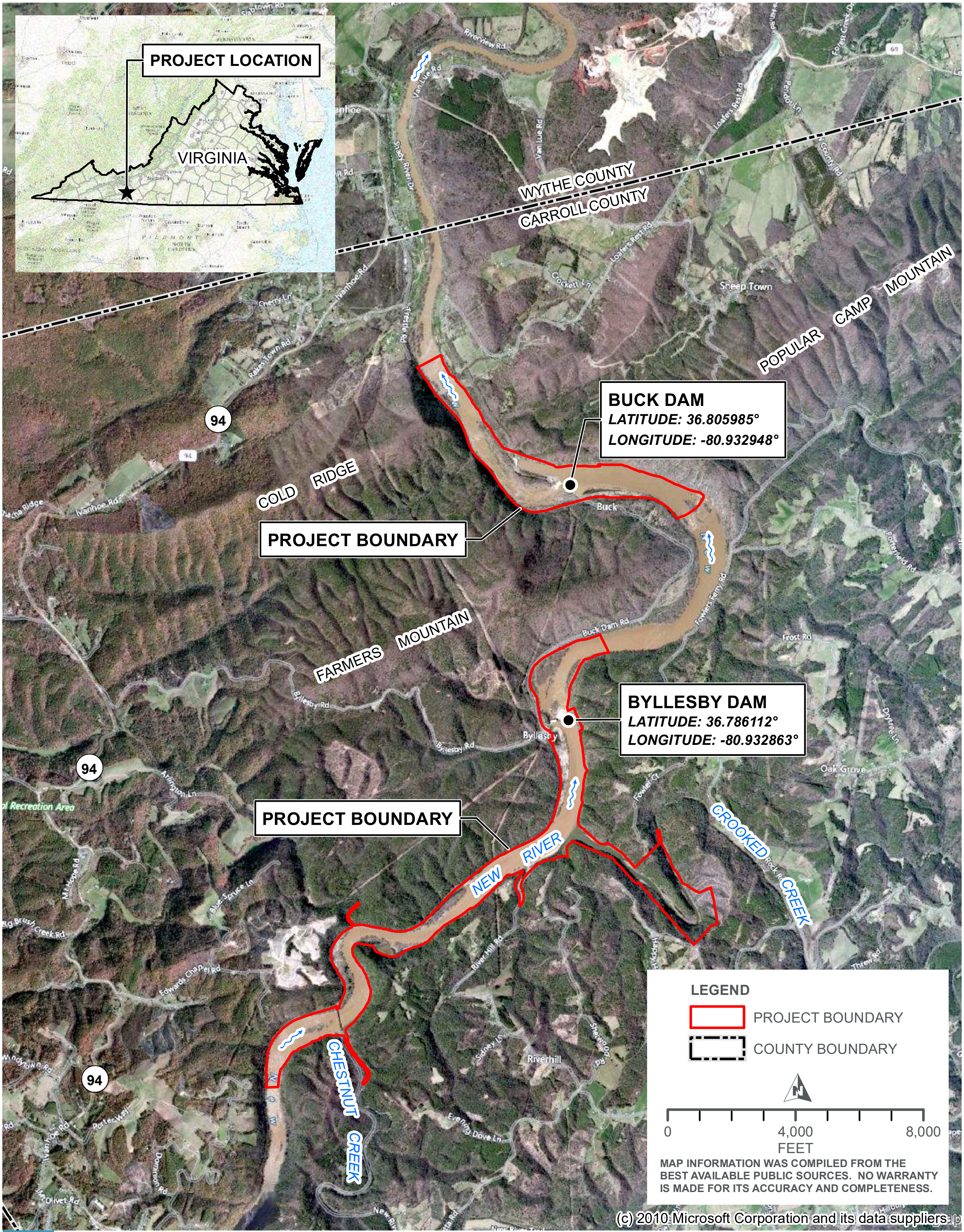
Sincerely,
HDR, Inc.

Sarah E Kulpa

Sarah Kulpa
Project Manager

Attachment

cc: Elizabeth Parcell, on behalf of Appalachian



HDR

APPALACHIAN POWER

An AEP Company

BOUNDLESS ENERGY

PROJECT LOCATION MAP

BYLLESBY & BUCK HYDROELECTRIC PROJECT (FERC NO. 2514)

CARROLL COUNTY, VIRGINIA

PATH: N:\GIS2\PROJECTS\AEP\10067919_AEP_BYLLESBY_BUCK_PAD_NOI\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MAP_DOCS\FINAL\MAP_8_5X11P_20170814_PROJECT_LOCATION_MAP.MXD - USER: DSOUCIE - DATE: 8/14/2017

AUGUST 2017

August 15, 2017

Bettina Sullivan, Manager
Virginia Department of Environmental Quality
Federal Consistency Office
PO Box 1105
Richmond, VA 23218

Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514)
Coastal Zone Consistency Determination

Dear Ms. Sullivan,

On behalf of Appalachian Power Company (Appalachian), HDR, Inc. (HDR) is gathering information in support of the Pre-Application Document (PAD) for the upcoming Federal Energy Regulatory Commission (FERC) relicensing of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project).

Consistent with this effort, HDR is requesting a determination from your office regarding the applicability of the State's Coastal Zone Policies to the Project, which is located on the New River in Carroll County, Virginia. Based on a review of applicable information, we do not believe that the Project is located within the State's Coastal Zone and are requesting confirmation of this determination from your office. In support of this confirmation, we have included a map indicating the location of this facility.

It is our intent to include the results of the determination in the PAD. Therefore, we respectfully request a response to this determination within 30 days of the date of this letter. If you have any questions or need additional information regarding this Project or its location, please feel free to contact me at (704) 248-3620 or sarah.kulpa@hdrinc.com.

Thank you for your assistance with this request.

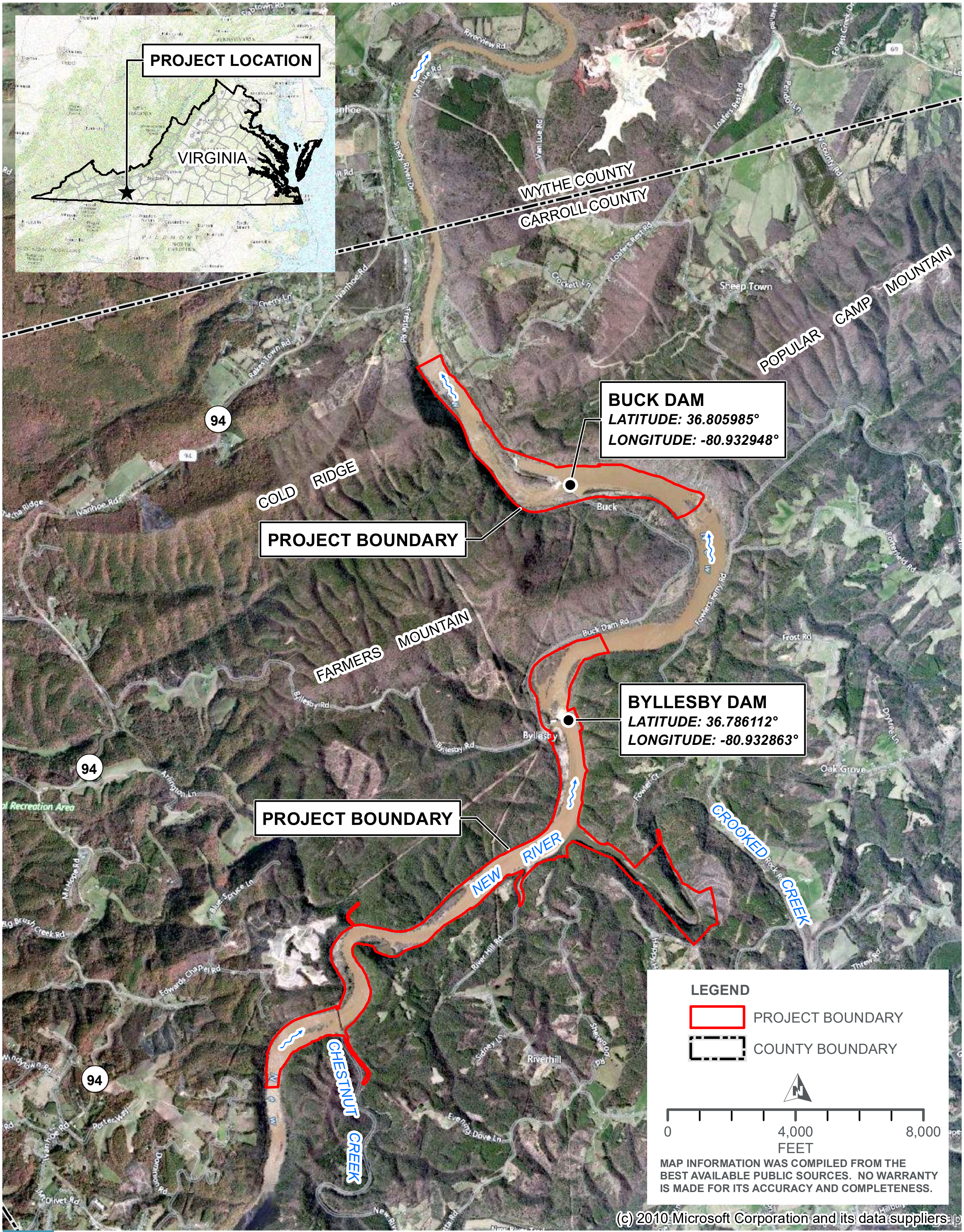
Sincerely,
HDR, Inc.

Sarah E Kulpa

Sarah Kulpa
Project Manager

Attachment

cc: Elizabeth Parcell, on behalf of Appalachian



HDR

APPALACHIAN POWER

An AEP Company

BOUNDLESS ENERGY

PROJECT LOCATION MAP

BYLLESBY & BUCK HYDROELECTRIC PROJECT (FERC NO. 2514)

CARROLL COUNTY, VIRGINIA

PATH: N:\GIS2\PROJECTS\AEP\10067919_AEP_BYLLESBY_BUCK_PAD_NOI\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MAP_DOCS\FINAL\MAP_8_5X11P_20170814_PROJECT_LOCATION_MAP.MXD - USER: DSOUCIE - DATE: 8/14/2017

AUGUST 2017

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

September 1, 2017

Sarah Kulpa
HDR, Inc.
440 S. Church Street, Suites 900 & 1000
Charlotte, North Carolina 28202-2075
Via email: sarah.kulpa@hdrinc.com

RE: Niagara Hydroelectric Project (FERC No. 2466), Roanoke County, Virginia

Dear Ms. Kulpa:

This letter is in response to the scoping request for the above-referenced project.

As you may know, the Department of Environmental Quality, through its Office of Environmental Impact Review (DEQ-OEIR), is responsible for coordinating Virginia's review of federal consistency documents prepared pursuant to the Coastal Zone Management Act which applies to all federal activities which are reasonably likely to affect any land or water use or natural resources of Virginia's designated coastal resources management area must be consistent with the enforceable policies Virginia Coastal Zone Management (CZM) Program. Virginia's coastal management area includes most of Tidewater Virginia, as defined by the Code of Virginia § 28.2-100. Roanoke County is not located within Virginia's coastal management area and it appears to be unlikely that this project would affect any land or water use or natural resources of Virginia's designated coastal resources management area. Therefore, a federal consistency certification is not required for this project.

In addition to coordinating federal consistency reviews, DEQ-OEIR is responsible for coordinating Virginia's review of federal environmental documents prepared pursuant to the National Environmental Policy Act (NEPA) and responding to appropriate federal officials on behalf of the Commonwealth. The information below may assist you in the preparation of any NEPA document.

DOCUMENT SUBMISSIONS

In order to ensure an effective coordinated review of the NEPA document, notification of the NEPA document should be sent directly to OEIR. We request that you submit one electronic to eir@deq.virginia.gov (10 MB maximum) or make the documents available for download at a website or a file transfer protocol (ftp) site.

The NEPA document should include U.S. Geological Survey topographic maps as part of the information. We strongly encourage you to issue shape files with the NEPA document. In addition, project details should be adequately described for the benefit of the reviewers.

DATA BASE ASSISTANCE

Below is a list of databases that may assist you in the preparation of a NEPA document:

- DEQ Online Database: Virginia Environmental Geographic Information Systems

  Information on Permitted Solid Waste Management Facilities, Impaired Waters, Petroleum Releases, Registered Petroleum Facilities, Permitted Discharge (Virginia Pollution Discharge Elimination System Permits) Facilities, Resource Conservation and Recovery Act (RCRA) Sites, Water Monitoring Stations, National Wetlands Inventory:
    - www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx

- DEQ Virginia Coastal Geospatial and Educational Mapping System (GEMS)

  Virginia's coastal resource data and maps; coastal laws and policies; facts on coastal resource values; and direct links to collaborating agencies responsible for current data:
    - http://128.172.160.131/gems2/

- MARCO Mid-Atlantic Ocean Data Portal

  The Mid-Atlantic Ocean Data Portal is a publicly available online toolkit and resource center that consolidates available data and enables users to visualize and analyze ocean resources and human use information such as fishing grounds, recreational areas, shipping lanes, habitat areas, and energy sites, among others.

  http://portal.midatlanticocean.org/visualize/#x=-73.24&y=38.93&z=7&logo=true&controls=true&basemap=Ocean&tab=data&legends=false&layers=true

- DHR Data Sharing System.

  Survey records in the DHR inventory:

    - www.dhr.virginia.gov/archives/data_sharing_sys.htm

- DCR Natural Heritage Search

  Produces lists of resources that occur in specific counties, watersheds or physiographic regions:
    - www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml

- DGIF Fish and Wildlife Information Service

  Information about Virginia's Wildlife resources:
    - http://vafwis.org/fwis/

- Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Database: Superfund Information Systems

  Information on hazardous waste sites, potentially hazardous waste sites and remedial activities across the nation, including sites that are on the National Priorities List (NPL) or being considered for the NPL:
  - www.epa.gov/superfund/sites/cursites/index.htm

- EPA RCRAInfo Search

  Information on hazardous waste facilities:
  - www.epa.gov/enviro/facts/rcrainfo/search.html

- EPA Envirofacts Database

  EPA Environmental Information, including EPA-Regulated Facilities and Toxics Release Inventory Reports:
  - www.epa.gov/enviro/index.html

- EPA NEPAssist Database

  Facilitates the environmental review process and project planning:
  http://nepaassisttool.epa.gov/nepaassist/entry.aspx

If you have questions about the environmental review process and/or the federal consistency review process, please feel free to contact me (telephone (804) 698-4204 or e-mail bettina.sullivan@deq.virginia.gov).

I hope this information is helpful to you.

Sincerely,

Bettina Sullivan

Bettina Sullivan, Program Manager
Environmental Impact Review and
Long-Range Priorities

Subject: FW: project submittal with DCR

From: Rhur, Robbie (DCR) [mailto:Robbie.Rhur@dcr.virginia.gov]
Sent: Wednesday, August 23, 2017 2:30 PM
To: Kulpa, Sarah
Subject: RE: project submittal with DCR

Hi Sarah;

I am your contact for recreation and scenic resources. Information Services is the section Rene manages. Craig Sever is our Park Director, so if a dam is near a park, he needs it too. In other words all three of us could potentially need copies. I prefer an electronic copy and Rene want projects submitted through the website. Craig would likely prefer electronic too cause he will forward it to the Park manager.

Have a great week
Robbie

From: Kulpa, Sarah [mailto:Sarah.Kulpa@hdrinc.com]
Sent: Wednesday, August 23, 2017 2:18 PM
To: Rhur, Robbie (DCR)
Cc: ebparcell@aep.com
Subject: RE: project submittal with DCR

Hi Robbie,

Sorry about that; looked like we were having intermittent email trouble this morning. I received your voicemail – thanks very much for the explanation and directions. We'll resubmit as you've directed.

We would certainly welcome any relevant information regarding recreation and scenic resources. By separate mailings (also addressed to Beth Reed, as well as Craig Seaver and Rene Hypes) we also sent a "PAD Questionnaire" for each of these projects requesting information about a variety of resources, if you are able to respond to those and advise as to any designated DCR contacts for these mailing lists moving forward.

Thank you again for your time and feedback.

Sarah Kulpa
D 704.248.3620 **M** 315.415.8703

hdrinc.com/follow-us

From: Rhur, Robbie (DCR) [mailto:Robbie.Rhur@dcr.virginia.gov]
Sent: Wednesday, August 23, 2017 2:00 PM
To: Kulpa, Sarah
Subject: project submittal with DCR

Good Afternoon Sarah:

My earlier email bounced back, so I thought I would try again.

Two letters, addressed to Beth Reed, were received requesting information regarding potential impacts due to relicensing of the Niagara Dam (FERC # 2466) and Byllesby-Buck Dam (FERC # 2514). While I am happy to provide information regarding recreation and scenic resources you must make a request to DCR's Division of Natural Heritage for our threatened and endangered species information. Please contact Information Services at http://www.dcr.virginia.gov/natural-heritage/infoservices to make your request or Rene Hypes at rene.hypes@dcr.virginia.gov.

Thank you

Robbie Rhur
Environmental Review Coordinator/DCR
600 E Main Street 17th Floor
Richmond VA 23219
804-371-2594

Robbie Rhur
Environmental Review Coordinator/DCR
600 E Main Street 17th Floor
Richmond VA 23219
804-371-2594

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

September 1, 2017

Sarah Kulpa
HDR, Inc.
440 S. Church Street, Suites 900 & 1000
Charlotte, North Carolina 28202-2075
Via email: sarah.kulpa@hdrinc.com

RE: Byllesby-Buck Hydroelectric Project (FERC No. 2514), Carroll County, Virginia

Dear Ms. Kulpa:

This letter is in response to the scoping request for the above-referenced project.

As you may know, the Department of Environmental Quality, through its Office of Environmental Impact Review (DEQ-OEIR), is responsible for coordinating Virginia's review of federal consistency documents prepared pursuant to the Coastal Zone Management Act which applies to all federal activities which are reasonably likely to affect any land or water use or natural resources of Virginia's designated coastal resources management area must be consistent with the enforceable policies Virginia Coastal Zone Management (CZM) Program. Virginia's coastal management area includes most of Tidewater Virginia, as defined by the Code of Virginia § 28.2-100. Carroll County is not located within Virginia's coastal management area and it appears to be unlikely that this project would affect any land or water use or natural resources of Virginia's designated coastal resources management area. Therefore, a federal consistency certification is not required for this project.

In addition to coordinating federal consistency reviews, DEQ-OEIR is responsible for coordinating Virginia's review of federal environmental documents prepared pursuant to the National Environmental Policy Act (NEPA) and responding to appropriate federal officials on behalf of the Commonwealth. The information below may assist you in the preparation of any NEPA document.

DOCUMENT SUBMISSIONS

In order to ensure an effective coordinated review of the NEPA document, notification of the NEPA document should be sent directly to OEIR. We request that you submit one electronic to eir@deq.virginia.gov (10 MB maximum) or make the documents available for download at a website or a file transfer protocol (ftp) site.

The NEPA document should include U.S. Geological Survey topographic maps as part of the information. We strongly encourage you to issue shape files with the NEPA document. In addition, project details should be adequately described for the benefit of the reviewers.

DATA BASE ASSISTANCE

Below is a list of databases that may assist you in the preparation of a NEPA document:

- DEQ Online Database: Virginia Environmental Geographic Information Systems

  Information on Permitted Solid Waste Management Facilities, Impaired Waters, Petroleum Releases, Registered Petroleum Facilities, Permitted Discharge (Virginia Pollution Discharge Elimination System Permits) Facilities, Resource Conservation and Recovery Act (RCRA) Sites, Water Monitoring Stations, National Wetlands Inventory:
    - www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx

- DEQ Virginia Coastal Geospatial and Educational Mapping System (GEMS)

  Virginia's coastal resource data and maps; coastal laws and policies; facts on coastal resource values; and direct links to collaborating agencies responsible for current data:
    - http://128.172.160.131/gems2/

- MARCO Mid-Atlantic Ocean Data Portal

  The Mid-Atlantic Ocean Data Portal is a publicly available online toolkit and resource center that consolidates available data and enables users to visualize and analyze ocean resources and human use information such as fishing grounds, recreational areas, shipping lanes, habitat areas, and energy sites, among others.

  http://portal.midatlanticocean.org/visualize/#x=-73.24&y=38.93&z=7&logo=true&controls=true&basemap=Ocean&tab=data&legends=false&layers=true

- DHR Data Sharing System.

  Survey records in the DHR inventory:

    - www.dhr.virginia.gov/archives/data_sharing_sys.htm

- DCR Natural Heritage Search

  Produces lists of resources that occur in specific counties, watersheds or physiographic regions:
    - www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml

- DGIF Fish and Wildlife Information Service

  Information about Virginia's Wildlife resources:
    - http://vafwis.org/fwis/

- Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Database: Superfund Information Systems

  Information on hazardous waste sites, potentially hazardous waste sites and remedial activities across the nation, including sites that are on the National Priorities List (NPL) or being considered for the NPL:
    - www.epa.gov/superfund/sites/cursites/index.htm

- EPA RCRAInfo Search

  Information on hazardous waste facilities:
    - www.epa.gov/enviro/facts/rcrainfo/search.html

- EPA Envirofacts Database

  EPA Environmental Information, including EPA-Regulated Facilities and Toxics Release Inventory Reports:
    - www.epa.gov/enviro/index.html

- EPA NEPAssist Database

  Facilitates the environmental review process and project planning:
  http://nepaassisttool.epa.gov/nepaassist/entry.aspx

If you have questions about the environmental review process and/or the federal consistency review process, please feel free to contact me (telephone (804) 698-4204 or e-mail bettina.sullivan@deq.virginia.gov).

I hope this information is helpful to you.

Sincerely,

Bettina Sullivan, Program Manager
Environmental Impact Review and
Long-Range Priorities

Molly Joseph Ward
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of Administration and Finance

David C. Dowling
Deputy Director of Soil and Water Conservation and Dam Safety

Thomas L. Smith
Deputy Director of Operations

MEMORANDUM

DATE: September 13, 2017

TO: Sarah Kulpa, HDR

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: DCR 17-021, Byllesby-Buck Dam relicensing FERC # 2514

Division of Planning and Recreation Resources

The Department of Conservation and Recreation (DCR), Division of Planning and Recreation Resources (PRR), develops the *Virginia Outdoors Plan* and coordinates a broad range of recreational and environmental programs throughout Virginia. These include the Virginia Scenic Rivers program; Trails, Greenways, and Blueways; Virginia State Park Master Planning and State Park Design and Construction. The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

The Byllesby-Buck Dams impounds the New River, which is an established water trail and is a potential scenic river. There are five water access points along the project limits as described on the map submitted for review, all of which are DCR and DGIF sites. The dams are adjacent to segments of New River Trail State Park. All of these factors lead DCR to recommend serious consideration for safe portage around the dams for the boating/paddling community and that any and all safety measures are put into place to allow a safe boating experience. We recommend coordination with the New River Tail State Park Manager, Sam Sweeney. He can be reached at sam.sweeney@dcr.virginia.gov. Further we recommend a recreation plan be created or updated by applicant, the Appalachian Power Company. If a recreation plan has been created, we request a copy.

Cc Sam Sweeney, DCR

Molly Joseph Ward
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH *of* VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of Administration and Finance

David C. Dowling
Deputy Director of Soil and Water Conservation and Dam Safety

Thomas L. Smith
Deputy Director of Operations

September 23, 2017

Sarah Kulpa
HDR Engineering, Inc.
440 S Church Street, Suites 900 & 1000
Charlotte, NC 28202

Re: P-2514 Byllesby-Buck Hydroelectric Project

Dear Ms. Kulpa:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the New River – Big Branch Stream Conservation Unit (SCU) is located within the project site. SCUs identify stream reaches that contain aquatic natural heritage resources, including 2 miles upstream and 1 mile downstream of documented occurrences, and all tributaries within this reach. SCUs are also given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain. The New River – Big Branch SCU has been given a biodiversity ranking of B4, which represents a site of moderate significance. Natural heritage resources associated with this site are:

Gomphus adelphus	Moustached clubtail	G4G5/S1/NL/NL
Ophiogomphus howei	Pygmy snaketail	G3/S1S2/NL/NL

The Moustached Clubtail is a gray-green and black dragonfly which inhabits mostly rapid clear rocky streams and rivers and occasionally the exposed shorelines of lakes (Dunkle, 2000). The Moustached Clubtail occurs in the northeastern United States and southeastern Canada, extending its range southward along the Appalachian Mountains rarely reaching into North Carolina and Georgia (Lasley accessed 25 February 2010). In Virginia, *G. adelphus* is known from areas of the New River (Grayson, Carroll, and Wythe counties) and has historical occurrences in Augusta and Bath counties. As with all dragonflies, its larvae are aquatic and adults emerge from the water to forage and mate (Dunkle, 2000). Because of their aquatic lifestyle and limited mobility, the larvae are particularly vulnerable to shoreline disturbances that cause the loss of shoreline vegetation and siltation. They are also sensitive to alterations that result in poor water quality, aquatic substrate changes, and thermal fluctuations.

The Pygmy snaketail is a very small sized, stocky dragonfly with amber basal field hindwings, ranging from northeast Maine west to Wisconsin, and south to Virginia and Kentucky. This species requires big, clear rivers with high water quality and stable flow over coarse cobbles and periodic rapids. The larva of this species is unique due to the small size and lack of a dorsal abdominal spine. These larvae overwinter and take flight late April to early June. The major threat to this species is habitat degradation by the impoundment of running waters from poorly drained roads, damming, and channelization (NatureServ, 2009).

Adult Odonata (dragonflies and damselflies), commonly seen flitting and hovering along the shores of most freshwater habitats, are accomplished predators. Adults typically forage in clearings with scattered trees and shrubs near the parent river. They feed on mosquitoes and other smaller flying insects, and are thus considered highly beneficial. Odonates lay their eggs on emergent vegetation or debris at the water's edge. Unlike the adults, the larvae are aquatic and typically inhabit the sand and gravel substrates. Wingless and possessing gills, the larvae crawl about the submerged leaf litter and debris stalking their insect prey. The larvae seize unsuspecting prey with a long, hinged "grasper" that folds neatly under their chin. When larval development is complete, the aquatic larvae crawl from the water to the bank, climb up the stalk of the shoreline vegetation, and the winged adult emerges (Hoffman 1991; Thorpe and Covich 1991).

Because of their aquatic lifestyle and limited mobility, the larvae are particularly vulnerable to shoreline disturbances that cause the loss of shoreline vegetation and siltation. They are also sensitive to alterations that result in poor water quality, aquatic substrate changes, and thermal fluctuations.

In addition, the New River has been designated by the VDGIF as a "Threatened and Endangered Species Water" for the Pistolgrip.

Due to the legal status of the Pistolgrip, DCR recommends coordination with the VDGIF, Virginia's regulatory authority for the management and protection of this species to ensure compliance with the Virginia Endangered Species Act **(**VA ST §§ 29.1-563 – 570).

DCR reiterates the presence of Virginia spiraea (*Spiraea virginiana*,G2/S1/LT/LE) in the New River and additional suitable habitat for this rare plant as indicated in the 2017 survey report. Any change of water levels and/or drastic flow alterations could have potential negative impacts on this species.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. Survey results should be coordinated with DCR-DNH and USFWS. If it is determined the species is present, and there is a likelihood of a negative impact on the species, DCR-DNH will recommend coordination with VDACS to ensure compliance with Virginia's Endangered Plant and Insect Species Act.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

New and updated information is continually added to Biotics. Please re-submit a completed order form and project map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

A fee of $125.00 has been assessed for the service of providing this information. Please find enclosed an invoice for that amount. Please return one copy of the invoice along with your remittance made payable to the Treasurer of Virginia, Department of Conservation and Recreation, Division of Natural Heritage, 600 East Main Street, 24th Floor, Richmond, VA 23219. Payment is due within thirty days of the invoice date. Please note late payment may result in the suspension of project review service for future projects.

The VDGIF maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov.

Should you have any questions or concerns, feel free to contact me at 804-371-2708. Thank you for the opportunity to comment on this project.

Sincerely,

S. René Hypes
Project Review Coordinator

CC: Ernie Aschenbach, VDGIF
Keith Tignor, VDACS

Literature Cited

Dunkle, Sidney W. 2000. Dragonflies through Binoculars: A field guide to dragonflies of North America. Oxford University Press, New York, NY. Pages 74-75.

Hoffman, R. 1991. Arthropods. Pp. 173 in: K. Terwilliger (ed.), Virginia's Endangered Species: proceedings of a symposium. The McDonald and Woodward Publishing Company, Blacksburg, VA.

Lasley, Greg. 2009. Greg Lasley nature photography at: http://www.greglasley.net/moustachedclub.html.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: August 9, 2010).

Thorpe, J.H., and A.P. Covich. 1991. Ecology and Classification of North American Freshwater Invertebrates. Academic Press, Inc., San, Diego, California.

COMMONWEALTH OF VIRGINIA
Department of Conservation and Recreation

DCR – Natural Heritage
600 East Main Street, 24th Floor
Richmond, VA 23219

Make checks payable to: ***TREASURER OF VIRGINIA***
Send payment to the address at the left
Payment is due 30 days after receipt of invoice

Fed I.D. # 54-6004497
DUNS # 8097 44444

Accounts Payable

Sarah Kulpa HDR Engineering, Inc. 440 S Church Street, Suites 900 & 1000 Charlotte, NC 28202	Invoice Number: **H-12669** Invoice Date: September 23, 2017

TAXPAYER ID:	47-0680568
CONTACT	Liz Dean, Business Manager, Division of Natural Heritage
CONTACT Number	(804) 371-2671
FAX Number	(804) 371-2674

DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
Impact Review	1	EA	90.00	90.00
Element Occurrences	1-5	AT	35.00	35.00
Site Reference				
P-2514 Byllesby-Buck Hydroelectric Project				
			Amount Due:	**125.00**

BUSINESS UNIT	COST CENTER	ACCOUNT	FUND	PROGRAM	DEPT	AMOUNT	PROJECT	AGENCY USE I	FY
19900	304	4002199	02199	503017	19900	125.00	0000109675	732320000	18

AGENCY REFERENCE	DESCRIPTION

Meeting Summary

Project:	Byllesby-Buck Hydroelectric Project, FERC No. 2514
Subject:	PAD Information Request
Date:	Tuesday, October 24, 2017
Location:	Conference Call
Attendees:	John Copeland [Virginia Department of Game and Inland Fisheries (VDGIF)] Brian Watson (VDGIF) Bill Kittrell (VDGIF) Liz Parcell [American Electric Power (AEP)] Sarah Kulpa (HDR) Kelly MacVane (HDR)

AEP and HDR participated in a call with VDGIF to discuss information requests related to the Pre-Application Document (PAD) for the upcoming relicensing of the Byllesby/Buck Project.

The group discussed the process and schedule for the relicensing, information that VDGIF may be able to provide in support of the PAD, and preliminary issues of potential concern or interest to VDGIF. A summary of discussion and action items follows.

Relicensing Process and Schedule

At this time AEP intends to use FERC's Integrated Licensing Process (ILP) for this relicensing. VDGIF agreed that this process was appropriate, particularly given the range of resources to be addressed. The deadline for filing the PAD is February 28, 2019. The earliest PAD filing date is September 1, 2018. AEP has not yet decided when to file the PAD and formally initiate the relicensing process but anticipates an early filing to maximize the time under the ILP for completion of studies and the necessary reports and licensing documents.

Data and Information from VDGIF

VDGIF stated the following information is available and may be useful in preparation of the PAD:

- Surveys and studies conducted in support of the Fries Relicensing (VA Tech Conservation Management Institute). VDGIF noted the Fries DLA may be complete as early as November 2017. Data may be available for the reach between Fries and Byllesby regarding mussels, macroinvertebrates, and fish. HDR and AEP noted that AEP was in contact with Don Orth and TRC regarding available data from this relicensing, and had already obtained some preliminary data and reports.

- Mussel surveys – best/most recent available expected to be those by Alderman and Stantec as part of the Claytor monitoring. Mike Pinder's mussel study also a useful historical reference (John Copeland provided by email 11/1/2017). VDGIF noted there are data gaps of mussel information in the upper reach of Buck reservoir.

- DEQ may have collected some macroinvertebrate data in the Upper New River; VDGIF has not.

- Fishery surveys – VDGIF noted they started doing a lot of work on the New River in the 1990s (after the last relicensing). The following may be available; VDGIF will attempt to locate and provide to HDR/AEP:
    - George Palmer's Byllesby Reservoir electrofishing data in a spreadsheet with some metadata (collection years were 2004, 2005, and 2009 – all spring collections). (John Copeland to provide)
    - John Copeland may be able to locate data from additional sampling events on the upper end of Byllesby Reservoir as well (2000-2003).
    - Muskie habitat survey data (Joe Williams conducted this in the early 1990's) – Data was collected during New River float trips where widths, lengths, and depths of pools were measured. Data not available electronically. (John Copeland to provide if located.)
    - Upper New River fish species list – Previously assembled for the Fries relicensing and a good starting point for the Buck/Byllesby Project. VDGIF does not have any fisheries information in Buck reservoir. (John Copeland provided by email 11/1/2017.)

- Upper New River Walleye Management Plan – not yet final, VDGIF to provide.

- List of VDGIF Recreational Access Issues (including Buck Campground) – primarily notes from site visit in March 2017.

- Information from Jim McNeely, Appalachian Trail history buff, regarding potential recreational access via the old Appalachian Trail section near these reservoirs. (John Copeland provided by email 11/1/2017.)

Preliminary Issues of Concern or Interest

VDGIF requested the following issues be addressed in the PAD and/or through the relicensing process:

- **Reservoir drawdowns and the impact to mussels and recreation/navigation.** Mussels of primary concern are green floater, pistolgrip, and paper pondshell. Recreation impacts due to drawdowns are especially applicable to the boating access point at Byllesby. VDGIF noted that the topography of the drawdown zone is not well documented, and this information may be needed. VDGIF noted that periodic maintenance drawdowns (3-5 feet) are the more significant impact than normal project operation within the licensed reservoir elevation limits. Past drawdowns have typically been to reinstall flashboards (at both Byllesby and Buck). The group discussed how replacement of the flashboards with the Obermeyer (inflatable) crest gates (ongoing project) is expected to significantly reduce the frequency of such drawdowns. As AEP explained, the gate installation will allow AEP to handle excess/flood flows remotely and will reduce the frequency of maintenance drawdowns and instances of sudden flashboard failure.

- **Species of concern**
    - **Federally protected species**. VDGIF noted that USFWS will likely be concerned about the following federally listed species that may occur in the vicinity of the Project, and the PAD should present baseline information about occurrences or potential habitat.
        - Virginia spiraea- AEP and HDR noted that a study was conducted by Environmental Science and Innovation (ESI) in support of the recent license amendment for the Obermeyer gate installation. The PAD will present the results of this study and any other available information.
        - Bald eagle - nesting and foraging habitat present in vicinity of Project.
    - **State species of concern**.
        - Pygmy snaketail (dragonfly) – Pygmy snaketail, which has a very limited range, may be in the area. VDGIF suggested HDR check with Caitlin Carey (VA Tech Conservation Management Institute) who conducted surveys at the Fries Project.
        - Eastern hellbender known to be in the area. Subject of post-doctoral study at VA Tech. HDR asked about recommended hellbender survey methods for the New River/Virginia. VDGIF suggested HDR check with J.D. Kleopfer of the Charles City VDGIF office as he is engaged with multiple ongoing hellbender surveys (combination of snorkel surveys and nesting boxes).
    - **New River endemic species.** Eight endemic fish species occur in the New River Basin, some known to occur in vicinity of the Project (e.g., New River shiner, Kanawha minnow, Kanawha/Appalachian darter). Only about 50% of the fish in New River Basin are native. No particular management objectives or interests for this reach related to these species. Will be included on species list to be provided by VDGIF.

- **Past fish stranding/mortality events below Buck Dam.** VDGIF noted there have been past occurrences of fish stranding in this bypassed reach, including as recently as September 2010. AEP noted this event, and previous instances, was associated with flow fluctuations caused by flashboard failure, and that the replacement of the flashboards with the Obermeyer crest gate is expected to mitigate this impact. The bypass reach is dominantly [scoured] bedrock substrate. VDGIF and AEP discussed how fish are attracted to pools/deep gullies in the bedrock up closer to the dam during higher flow periods, and that as flows recede fish can become stranded. Anglers have observed isolated pockets of good quality fish in these areas during past events.

- **Potential need for seasonal minimum flow at Buck Dam.** VDGIF noted seasonal flows in the bypassed reach may be important for walleye spawning and water quality in the bypass reach. Walleye spawn below the Buck Dam and this area is considered a primary spawning area in addition to Foster Falls. Walleye spawning occurs between February and May.

- **Fish passage.** VDGIF conveyed their general interest in managing the Upper New River for walleye, a species that requires riverine passage for reproduction. VDGIF explained that fish passage has not been pursued in the past in the New River by VDGIF or other agencies. Instead VDGIF has focused their efforts on establishing walleye populations between Allisonia and Buck and between Byllesby and Fries through stocking, though the populations are not as robust as they would be expected to be if fish could migrate around the dams. VDGIF noted similar impacts on freshwater mussels – lack of passage of host fish leads to isolated populations, though VDGIF is not currently engaged in active management plans or activities to stock mussels or typical host species.

- **Potential impacts of maintenance dredging**. HDR and AEP noted the most recent maintenance dredging was conducted in 2014, following flooding conditions at the Project. Dredging in the vicinity of the Project intakes has historically been conducted infrequently on an as-needed basis.

- **Sediment transport.** Sediment transport is disrupted by the dams. VDGIF noted this is an issue to be discussed.

- **Improvements to recreation access.** VDGIF representatives on the call previously discussed site needs with VDGIF conservation officers and have identified potential recreation improvements. VDGIF is willing to discuss priorities for improvements in support of or through a relicensing Recreation Study. Specific items discussed during the call were as follows:
    - Old route of Appalachian Trail goes through Project (land ownership largely unknown). May be interest in developing as recreation trail or river access. VDGIF to provide information and contact from the recent New River Symposium.
    - Abandoned U.S. Forest Service campground at Buck reservoir. In response to question from HDR, VDGIF confirmed this campground was not previously operated by VDCR.

- **Existing wetland and shoreline habitat**. VDGIF noted extensive wetland habitat in both reservoirs (and the resultant benefits for water fowl and other species) and the need for mapping/documentation of this habitat.

Other Stakeholders

The USFWS point of contact for this relicensing will be Janet Norman from the Chesapeake Bay office. Richard McCorkle has been previously engaged with the Project. VDGIF and AEP discussed the challenge of engaging stakeholders in the Project area for the duration of the relicensing, noting that even for the larger/more complex Claytor Project most meetings and discussions came down to a primary group of individuals. VDGIF offered to review the PAD questionnaire mailing list and let AEP know if there are additional potential stakeholders who should be added. VDGIF noted that Robby Rhur is the contact for VDCR, and the New River Conservancy (Laura Walters) should be included. HDR confirmed both of these entities had responded to the PAD questionnaire.

From: Copeland, John (DGIF) <John.Copeland@dgif.virginia.gov>
Sent: Wednesday, November 1, 2017 5:09 AM
To: Kulpa, Sarah
Cc: Elizabeth B Parcell; Kittrell, Bill (DGIF); Copeland, John (DGIF); Watson, Brian (DGIF); Pinder, Mike (DGIF)
Subject: Buck/Byllesby PAD information
Attachments: Pinder Wilhelm and Jones New River Mussel Survey.pdf; Upper New Fish List.pdf

I am going to be on leave a lot in November, from today through November 27 (with a few exceptions, like the Claytor Lake mussel salvage on November 11), and only occasionally handling email.

I did not have time to begin assembling most of the information we discussed by phone last week due to other deadlines in the last week. I will work on compiling information for you over the coming weeks when I get a chance, but most of it won't be sent until the last week of November and first week of December.

Attached are a couple of 'low hanging fruit' items I could easily put my hands on this morning. I will follow with more of the information we discussed through the rest of November as time permits.

Following are items I noted when we talked last Tuesday, October 24, 2017:

1. George Palmer's Byllesby Reservoir electrofishing data in a spreadsheet with some metadata (collection years were 2004, 2005, and 2009 – all spring collections).
   NOTE: I think I collected data once on the upper end of Byllesby Reservoir as well, probably back in 2000-2003 before George took over that end of the New River. I'll check my electronic files and paper sampling datasheets.
2. **Mike Pinder's New River mussel study (attached).**
3. Muskie habitat survey data (Joe Williams conducted this in the early 1990's) – Data was collected during New River float trips where widths, lengths, and depths of pools were measured. Finding this one will require some digging into files in my office, since this data is not available in electronic form. It is most likely summarized in a federal aid report, which I will also have to track down. Stay tuned on this one.
4. **Upper New River fish species list (attached, please note 1 error – walleye are a confirmed species on this list and should have an asterisk next to their name on the list, I cannot correct it this morning) – This was assembled for the Fries Dam relicensing and certainly is an adequate starting point for the Buck/Byllesby Project.**
5. Upper New River walleye management plan – I have to do a few revisions and get a couple of more reviews on this plan before I send it to you.
6. List of VDGIF Recreational Access Issues (including Buck Campground) – I'll clean up my notes from our agency site visit in March 2017 and send it soon.
7. Email from Jim McNeely, Appalachian Trail history buff, regarding potential recreational access via the old Appalachian Trail section near these reservoirs. I will forward this information by separate email. This information will require some 'on the ground' work to find the section he mentions, since it doesn't show up on Google maps or modern topographic maps. Note that he attaches a historical topographic map to his email, which I send separately.

These are all the items I noted on my list during our phone call on October 24th. If I missed anything, let me know. We look forward to continuing our excellent working relationship with Appalachian Power Company!

Conservation means development as much as it does protection. I recognize the right and duty of this generation to develop and use the natural resources of our land; but I do not recognize the right to waste them, or to rob, by wasteful use, the generations that come after us.
Theodore Roosevelt

John R. Copeland, Fisheries Biologist, Blacksburg Office; VA Dept of Game and Inland Fisheries
https://www.linkedin.com/pub/john-copeland/2a/292/691
Advisor, New River Valley Chapter of the Virginia Master Naturalist Program
Agency Cell Phone Number: (540) 871-6064

Walkerana, 2002, *13(29/30)*: 189-223

STATUS SURVEY OF THE FRESHWATER MUSSELS (BIVALVIA: UNIONIDAE) IN THE NEW RIVER DRAINAGE, VIRGINIA

Michael J. Pinder[1], Eric S. Wilhelm[2] and Jess W. Jones[3]

ABSTRACT

Although the Kanawha-Ohio River mussel fauna has been extensively studied, little is known about the status and distribution of species in the upper New River, Virginia. Eleven species have been documented from relatively few surveys. In 1997-1998, we conducted a drainage-wide survey to determine the current status and distribution of freshwater mussels in the New River, Virginia. We collected eight species, represented by 1,181 individuals from 50 of 134 survey sites. The mainstem New River contained the greatest species richness and abundance, although most sites had low numbers. The two most common and widely distributed species were purple wartyback, *Cyclonaias tuberculata*, and spike, *Elliptio dilatata*. The rarest species were elktoe, *Alasmidonta marginata*, at one site and green floater, *Lasmigona subviridis*, at three sites. The most unique find was the discovery of the Tennessee heelsplitter, *Lasmigona holstonia*, a species usually found in the adjacent Tennessee River drainage. Based on the presence of relic shell material and a limited number of live individuals, the New River mussel fauna has demonstrated a marked loss in species richness and abundance. With known threats such as sedimentation, water withdrawal, and nutrification, additional declines of mussel populations are likely before conservation measures can be implemented.

Key words: Freshwater mussels, New River, Virginia, status, distribution, threats.

INTRODUCTION

The New River is reported to be the oldest, large river in the eastern United States (Jenkins & Burkhead, 1994). Together with its receiving stream, the Kanawha River, they comprise a major tributary of the Ohio River basin. Although the Ohio River is known for its high diversity of mollusks, fishes, and crayfishes, the New River, despite its age and size, has historically maintained a low diversity of aquatic fauna (Neves, 1983; Jirka & Neves, 1987; Jenkins & Burkhead, 1994). Less than 56% of fish and 35% of mussel species known from the Kanawha River are found in the New River drainage. This disparity is likely the result of unique geologic features (e.g., New River Gorge & Kanawha Falls), and the effects of glaciation that prevented faunal dispersal since the late Pliocene and early Pleistocene (Neves, 1983).

[1]Wildlife Diversity Division, Virginia Department of Game and Inland Fisheries, 2206 South Main Street, Suite C, Blacksburg, Virginia 24060.

[2]U.S. Department of Agriculture, Animal Plant Health Inspection Services - Wildlife Services, 105 B Ponderosa Drive, Christiansburg, Virginia 24073.

[3]Virginia Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey, Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061.

Even though most drainages in the Ohio River basin have been extensively studied (Ortmann, 1913; Turgeon *et al.*, 1998; Parmalee & Bogan, 1998), very little is known of the freshwater mussels in the Virginia portion of the New River. Most previous surveys in the New River drainage have been in West Virginia or limited to the lower portions in Virginia (Bates, 1979; Markham *et al.*, 1980; USFWS, 1984). Of the mussel surveys in Virginia, none have comprehensively determined status or distribution of species throughout the entire drainage.

Among the few surveys on freshwater mussels of the New River drainage in Virginia, 11 species have been identified (Table 1). These include: elktoe, *Alasmidonta marginata* (Say 1818); spike, *Elliptio dilatata* (Rafinesque 1820), green floater, *Lasmigona subviridis* (Conrad 1835), purple wartyback, *Cyclonaias tuberculata* (Rafinesque 1820), pistolgrip, *Tritogonia verrucosa*, (Rafinesque 1820), pocketbook, *Lampsilis ovata* (Say 1817), wavy-rayed lampmussel, *Lampsilis fasciola* (Rafinesque 1820), Tennessee heelsplitter, *Lasmigona holstonia* (Lea 1938), and mucket, *Actinonaias ligamentina*; (Lamarck 1819)

TABLE 1. Mussel species collected in the New River Drainage of Virginia. Collection records by Ortmann (1913), Stansbery & Clench (1966-1969 *in* Clarke 1981 & 1985), Dillon (1977), Markham *et al.* (1980), Neves & Moyer (1988), Dr. David Stansbery (personal communication), Dr. Matt Winston (personal communication, 1997, and this paper, 2003). RS = relic shell material only.

	Reference date						
Species	1913[1]	1966-69[2]	1977[3]	1980[4]	1988[5]	1997[6]	2003
Actinonaias ligamentina				X			
Alamindonta marginata	X	X	X/RS			RS	X
Cyclonaias tuberculata			X	X			X
Elliptio dilatata	X	X	X				X
Lampsilis fasciola							X
Lampsilis ovata			X				X
Lasmigona holstonia		X					X
Lasmigona subviridis	X	X	X/RS		X		X
Tritogonia verrucosa			X	X			X
Total number of species (9)	3	4	6	3	1	1	8

[1]Sites were surveyed at New River mainstem, Pearisburg and Reed Creek.
[2]Sites were surveyed at Walker Creek, Giles Co., Wolf Creek (Bland Co.), and Little River, Floyd Co.
[3]Sites were surveyed at New River mainstem at Radford, Montgomery Co. upstream to state boundary including tributaries.
[4]Sites were surveyed at New River mainstem, between Glen Lyn and VA/WV
[5]Site at New River mainstem at McCoy, Montgomery Co.
[6]Site at Sinking Creek, Giles Co.

(Ortmann, 1913; Stansbery & Clench 1966-1969 *in* Clarke 1981 & 1985; Dillon, 1977; Markham *et al.*, 1980; Dr. David Stansbery, Ohio State University, personal communication; Dr. Richard Neves, Virginia Polytechnic Institute and State University, personal communication). Two additional species, the paper pondshell, *Utterbackia imbecillis* (Say 1828) and giant floater, *Pyganodon grandis* (Say 1829), are known from Claytor Lake reservoir (Dr. Richard Neves, personal communication).

Several factors linked to mussel declines throughout the United States, such as dam construction, water pollution, and exotic species introductions, are present in the New River drainage of Virginia (Neves *et al.*, 1997). Since Ortmann's initial surveys in the early 1900's, three dams have been built on the New River, Virginia. Dams affect mussel populations by inhibiting the movement of fishes that are hosts to their larval life stage. Dams also alter seasonal flow regimes, decrease oxygen levels, and increase depth and sedimentation rates that can negatively affect mussels adapted to riverine environments. Point source pollution from industrial and wastewater discharges is prevalent throughout the mainstem and some tributaries in the drainage. Chlorine, the primary disinfectant used in the treatment of wastewater, is detrimental to aquatic organisms (Brungs, 1973). Nonpoint pollution such as siltation dates to the mid-1800's from wide-scale deforestation and agriculture throughout the drainage (USDA, 1992). Siltation can harm freshwater mussels by clogging gills and reducing feeding efficiency (Neves *et al.*, 1997). Lastly, exotic species such as the Asian clam (*Corbicula fluminea* Müller 1774) are abundant throughout the drainage and can compete for food and space with native bivalves (Sickel, 1986; Yeager *et al.*, 2000).

A comprehensive mussel survey was initiated because much of the New River drainage has not been sampled for mussels or investigated for immediate threats to their populations. The objective of this study was to determine the distribution and status of freshwater mussels in the mainstem and tributaries of the New River drainage in Virginia. This paper summarizes the survey effort, collections, habitat, and observed threats to mussels in the drainage. In addition, management recommendations are provided for the mussel fauna.

STUDY AREA

The New River originates in the Blue Ridge Mountains of North Carolina, and flows northward through the Valley and Ridge Province of Virginia, and the Appalachian Plateaus of West Virginia (Fig. 1). It becomes the Kanawha River at the confluence of the Gauley River in southcentral West Virginia. The Virginia portion of the New River extends for 249 km and drains an area of 7,927 km^2. Mean annual discharge is 143 m^3/sec at Glen Lyn, near the West Virginia border. High flows occur during late winter and early spring, and low baseflows

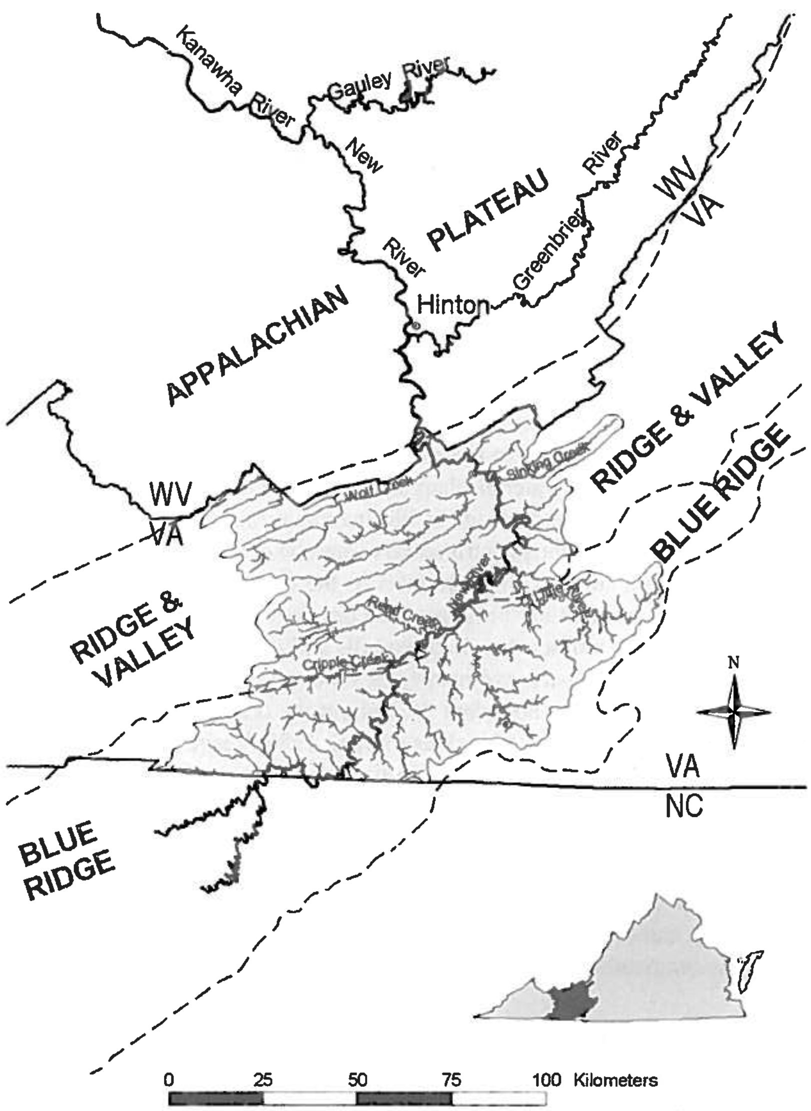


FIG. 1. Basinwide map of the New-Kanawha River drainage, including physiographic provinces and tributaries.

are summer and early fall.

The chemical and physical characteristics of the New River in Virginia are directly influenced by the two physiographic provinces from which it drains

(Fig. 1). Highly resistant igneous and metamorphic rock underlies 3,550 km^2 of the Blue Ridge Province in the upper basin. Most of Grayson, Carroll, and Floyd counties are within this province (Fig. 2). In this region, the mainstem and its tributaries contain low levels of water hardness and alkalinity in high to moderate gradient fluvial morphology. Sedimentary rocks of limestone, dolomite, shale, and sandstone comprise the Ridge and Valley Province, which drains 4,377 km^2 of the lower basin. Layers of sandstone cap the ridges in this region and produce streams with similar water quality and physical characteristics to those in the Blue Ridge Province (USDA, 1992). Valley streams have relatively high to moderate hardness and alkalinity and moderate to low gradients. In several areas streams disappear underground because of the karst geology that characterize the region. The majority of Wythe, Pulaski, and Montgomery counties, and all of Craig, Giles and Bland counties drain the Ridge and Valley province (Fig. 2). Foster's Falls in Wythe County represents the division between the two provinces on the mainstem river. Elevations range from 427 to 1,743 m above sea level. The forest composition of the New River drainage is 75% oak-hickory and 10% white pine-hemlock, with the remaining in a mix of pine and associated deciduous trees (USDA, 1992).

Land-use in the New River Drainage

The New River drainage in Virginia is 58% forested, 37% agriculture, and 5% urban (DCR, 2000). Because of its steep topography, most agriculture is confined to the valleys and along the floodplain of the mainstem. The towns of Wytheville, Bluefield, Christiansburg, Blacksburg, Radford, and Galax are the major urban centers in the drainage. Industrial centers include furniture manufacturers in Carroll and Pulaski counties, the Radford Army Ammunition Plant in Pulaski County, and the Hoechst Celanese Plant and American Electric Power Plant in Giles County (USDA, 1992). Claytor Lake, directly upstream of the town of Radford, is the largest impoundment (1810 ha) on the New River and is popular for boating and fishing (Fig. 2). This reservoir is used to demarcate the upper and lower sections of the mainstem because of its location approximately midway along the Virginia portion of the New River. Two smaller mainstem impoundments are Buck and Byllseby reservoirs, which are 27 ha and 96 ha, respectively. Other small impoundments also occur on the mainstem and the tributary streams of Reed Creek in Wythe County, Peak Creek in Pulaski County, and Little River in Floyd County.

METHODS

Mussels were sampled at 134 sites in the New River basin between June 1997 and October 1998 (Fig. 3; Appendix A). Sites were sequentially numbered based on sampling order. Stream order

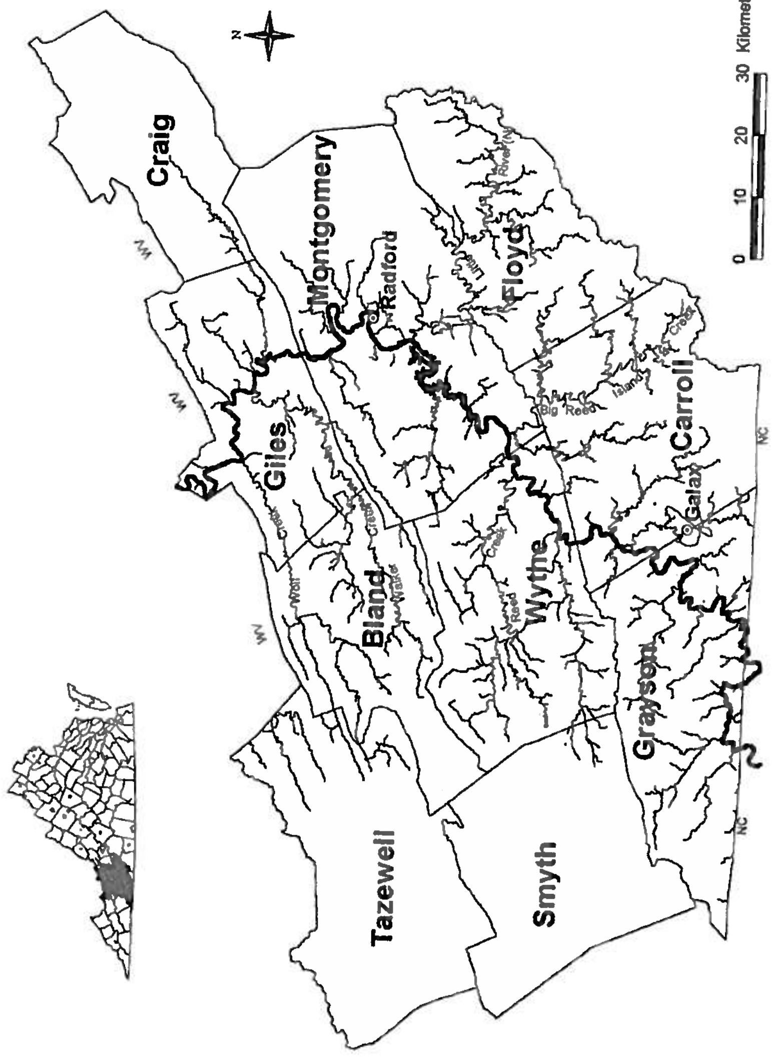


FIG. 2. Counties and major towns in the New River drainage, Virginia.

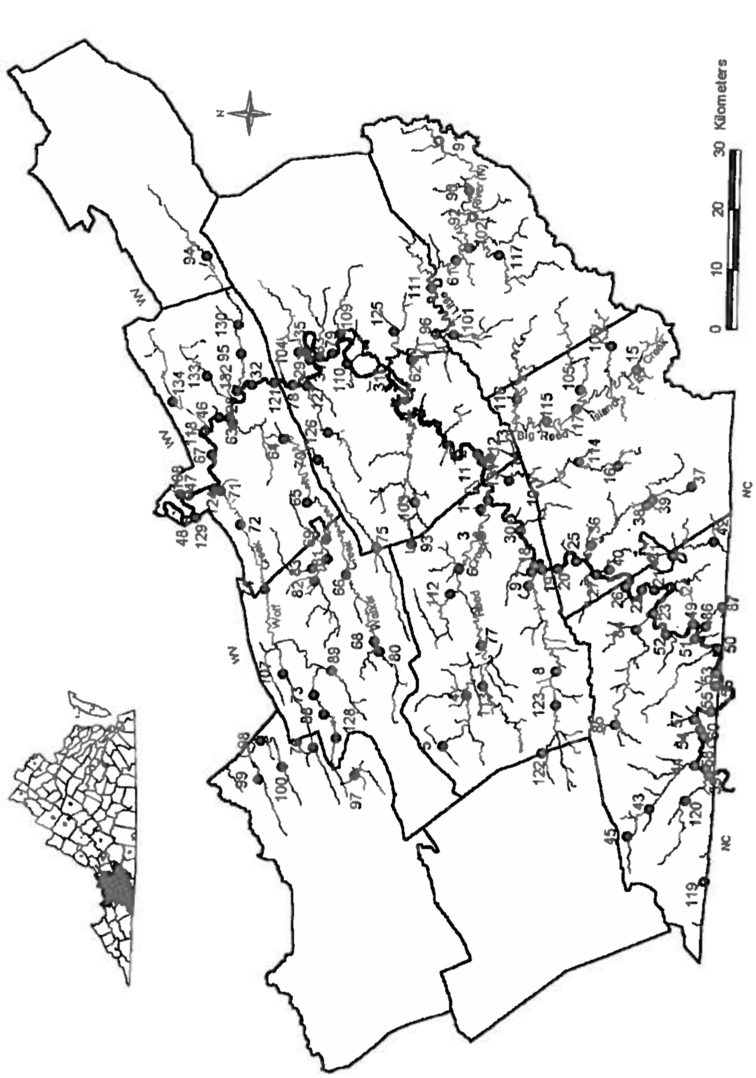


FIG. 3. Survey sites in 1997-1998 for freshwater mussels in the New River drainage, Virginia. Sites are numbered sequentially based on sampling order.

(Strahler, 1957) was defined as blue-lines on a 1:100,000-scale map. We sampled forty-six 4th order mainstem sites, nineteen 3rd order stream sites, thirty-three 2nd order stream sites, and thirty-six 1st order stream sites. Site selection was determined by habitat suitability, accessibility, and historical species records (Ortmann, 1913; Stansbery & Clench 1966-1969 *in* Clarke 1981 & 1985; Neves & Moyer, 1988). Sampling was conducted in summer and early fall during low flow and clear stream conditions. Depending on stream size, field crews ranged from one to eight individuals. Most sites were snorkeled by moving upstream, scanning the stream bottom and lifting small boulders for mussels. A distance of 500 m on mainstem and 250 m on most tributary sections was sampled using these techniques. In streams too shallow to snorkel, we used viewscopes and hand-picked mussels from the substrate. At one deep section, we used SCUBA equipment to sample. We also examined the shoreline to search for mussel shells in muskrat (*Ondatra zibethicus*) middens.

General characteristics including stream width, substrate composition, habitat type (pool, riffle, run), and depth were recorded at each site. In addition, direct impacts and threats to mussels (siltation, nutrification, channelization), obvious water pollution (water discoloration, foam, bacteria growth), and potential causes of impacts (cattle in streams, nearby factories, or roadways) were documented. A Magellan NAV 5000 GPS unit was used to obtain UTM coordinates.

Most live mussels were checked for gravidity. Shell material (with and without lustrous nacre) was collected and recorded at the survey site. Species identifications were confirmed by Dr. David H. Stansbery, Ohio State University (OSU). Voucher specimens are deposited in the Museum of Biological Diversity at OSU. Common and scientific nomenclature follows Turgeon *et al.* (1998).

RESULTS

Sampling Effort

Effort in person-hours varied depending on stream size, habitat type, and number of mussels present (Appendix B). We spent a total of 500 person-hours during the

TABLE 2. Number of sites and abundance (in parentheses) of freshwater mussels by stream order in the New River drainage, Virginia. All 4th order sites were in the New River mainstem. Species codes are in brackets.

	Stream order				
Species	1	2	3	4	Total sites
Elliptio dilatata [EDIL]	1 (16)	2 (28)	2 (13)	24 (316)	29
Cyclonaias tuberculata [CTUB]	–	–	2 (27)	24 (674)	26
Lampsilis ovata [OVA]	–	–	–	12 (27)	12
Lampsilis fasciola [LFAS]	–	–	1 (4)	6 (15)	7
Lasmigona holstonia [LHOL]	4 (20)	–	–	–	4
Tritogonia verrucosa [TVER]	–	–	–	4 (15)	4
Lasmigona subviridis [LSUB]	1 (9)	1 (8)	–	1 (7)	3
Alasmidonta marginata [AMAR]	–	–	–	1 (2)	1
Total Mussel Abundance	45	36	44	1056	50 (1181)

survey, averaging 3.79 person-hours/site. Mean sampling effort varied from 2.4 person-hours on 1st order streams to 5.8 person-hours on 4th order streams.

Species Richness and Diversity

A total of 1,181 live mussels representing eight species from 50 sites, were collected during this study (Table 2). Eighty-nine percent of the mussels were from the mainstem and 11% were from tributaries. Species richness ranged from 0-4 species/site (Fig. 4). The highest species richness was recorded on the New River between Reed and Cripple Creeks, Wythe County, and one site near Rich Creek, Giles County. Most mainstem sites with mussels had from 1 to 3 species. Most 3rd order tributaries had ≤ 2 species, and most 1st and 2nd tributary streams had ≤ 1 species.

The following paragraphs summarize the species, distribution, habitat, and life history characteristics of mussels collected in this survey. Species are listed in order of number of sites where they were found.

Elliptio dilatata (Rafinesque 1820), Spike

Elliptio dilatata was the most widely distributed and second most abundant species found in the survey (Table 2). We found 85% (316) of all individuals in the mainstem. The remaining specimens occurred in headwater streams and large tributaries (Fig. 5). This species was common to abundant at sites in the Blue Ridge Province near the North Carolina border. Relic shell material was found throughout the drainage. Cripple and Walker creeks contained an abundance of shell material but lacked live individuals. We found seven live specimens in Reed Creek, Wythe County, a historical site for this species (Ortmann, 1913). Spike mussels were found in shallow runs dominated by cobble substratum. Gravid specimens were observed in late June and early July, 1997; and again in early August, 1998.

Cyclonaias tuberculata (Rafinesque 1820), Purple Wartyback

Cyclonaias tuberculata was the most abundant species, with 701 individuals comprising 59% of total number collected (Table 2). This species was found at 24 mainstem and two tributary sites (Fig. 6). The largest aggregations (>60 individuals) were found above and below Claytor Lake. *Cyclonaias tuberculata* was found in a wide variety of habitats that included shallow runs, riffles, and moderately deep pools with gravel, boulder or bedrock substrate. Many individuals were found partially buried and covered with an unidentified aquatic moss. Relic shell material was found throughout the mainstem (Fig. 6). Individuals were found gravid in late June, 1997. We observed a female releasing conglutinates during this same time period.

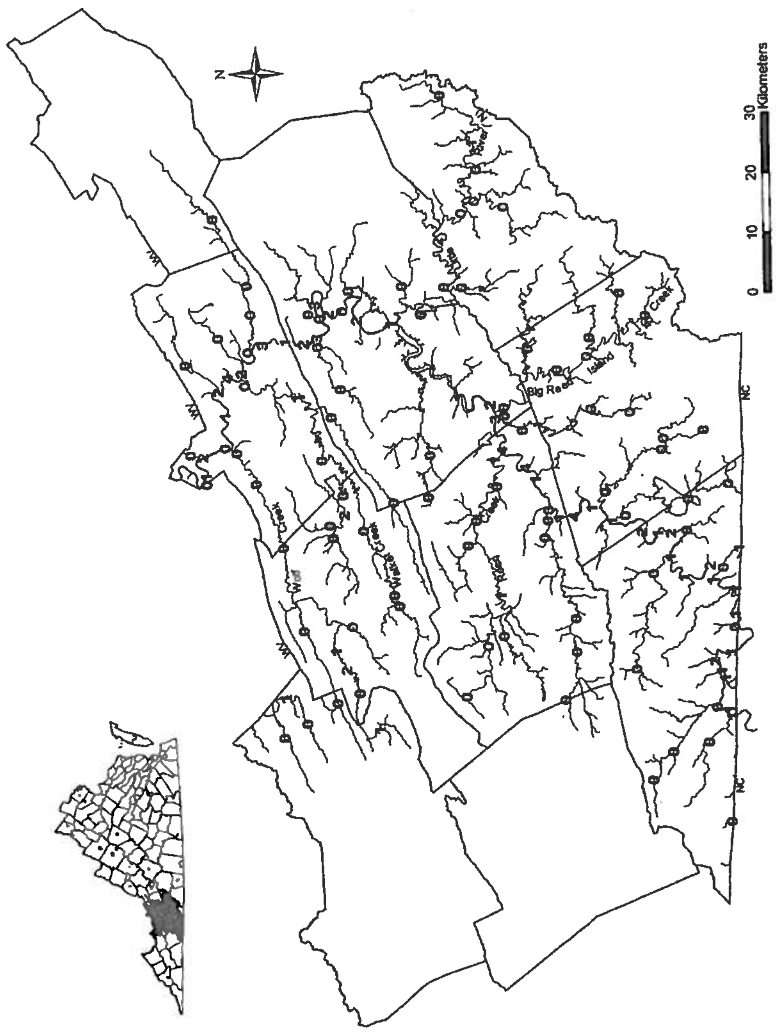


FIG. 4. Number of freshwater mussel species at each sampling site in the New River drainage, Virginia.

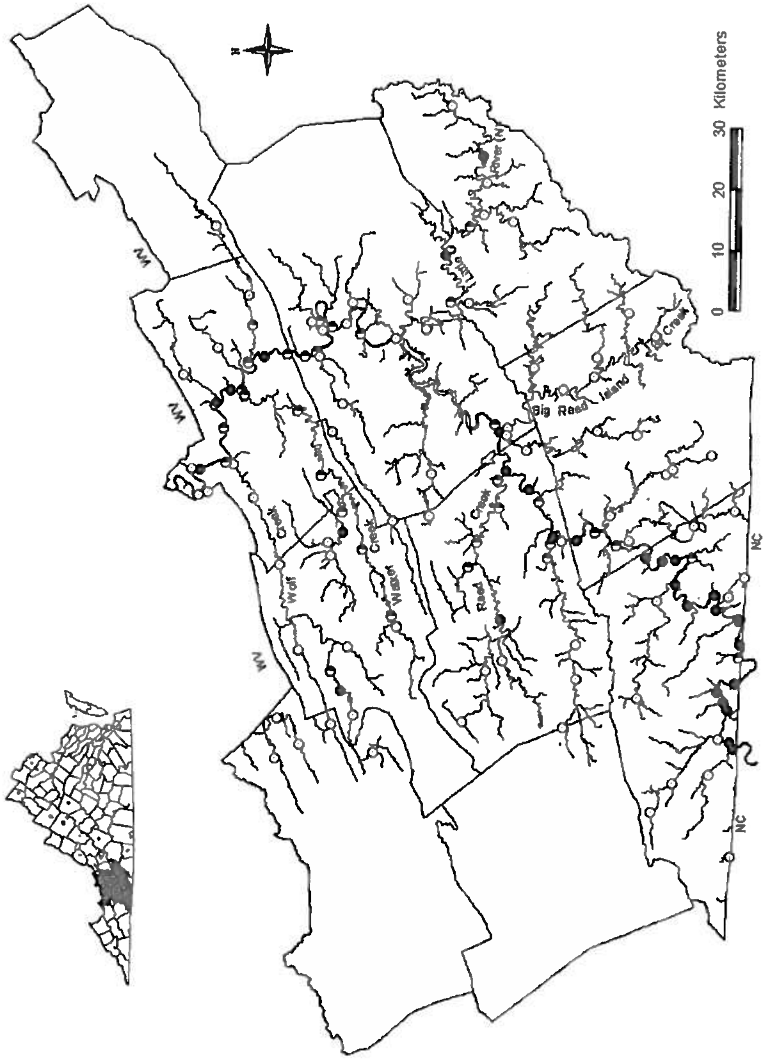


FIG. 5. Distribution of *Elliptio dilatata* (Rafinesque) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

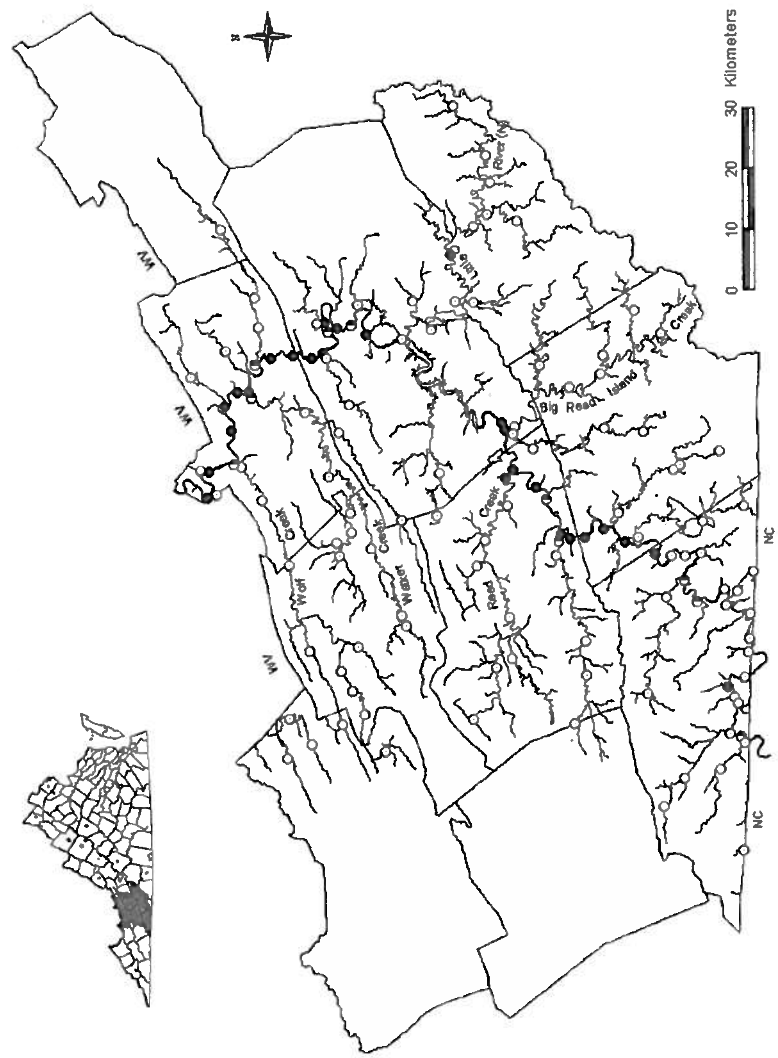


FIG. 6. Distribution of *Cyclonaias tuberculata* (Rafinesque) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

Lampsilis ovata (Say 1817), Pocketbook

Lampsilis ovata was found at 12 mainstem sites, totally 27 individuals (Table 2). Relic shell material was found in Reed Creek. In the mainstem, shell material was uncommon but widely distributed from Giles to Carroll counties. Only one live individual was found in the Blue Ridge province. This species was found in runs with sand, pebble, and gravel substratum. In late June, 1997, we observed a male releasing what appeared to be sperm through its excurrent aperture. Gravid females were found in late June, September, and October, 1998.

Lampsilis fasciola (Rafinesque 1820), Wavy-rayed Lampmussel

Lampsilis fasciola was collected at seven sites, totaling 19 individuals (Table 2). This species was limited to sites below Claytor Lake (Fig. 8). We found 15 individuals in the mainstem, and an additional four specimens in the lower reach of Walker Creek. We found specimens in shallow runs with large gravel and cobble substrate, and observed gravid individuals in July, 1997.

Lasmigona holstonia (Lea 1838), Tennessee Heelsplitter

Lasmigona holstonia were found at four sites, totaling 20 individuals (Table 2). Three sites were in the upper Wolf Creek system, Bland County, and at one site in the Bluestone River, Tazewell County (Fig. 9). In the Wolf Creek system, this species was found from Burkes Garden to approximately 23.4 km downstream in moderate to low gradient reaches. In Burkes Garden, we found eight specimens in a small, heavily-silted, pasture stream (< 2.5 m wide and 35 cm depth). We were unable to find live specimens at historical sites in upper Walker Creek, but several relic shells were present (Dr. David Stansbery, personal communication). Most specimens were found in small, low gradient streams containing clean gravel and cobble. Gravid specimens were found in late August, 1998.

Tritogonia verrucosa (Rafinesque 1820), Pistolgrip

Tritogonia verrucosa was found at four sites, totaling 15 individuals (Table 2). All sites were on the mainstem New River, from above Claytor Lake to just upstream of Fosters Falls, Carroll County (Fig. 10). Except for relic shell material found near the Grayson and Carroll County line, this species was absent from the upper-most portions of the New River. Only relic shells were found below Claytor Lake. At Foster's Falls, we found several individuals in moderately deep runs containing sand, pebble, gravel, and boulder substratum. We found no gravid specimens during our survey.

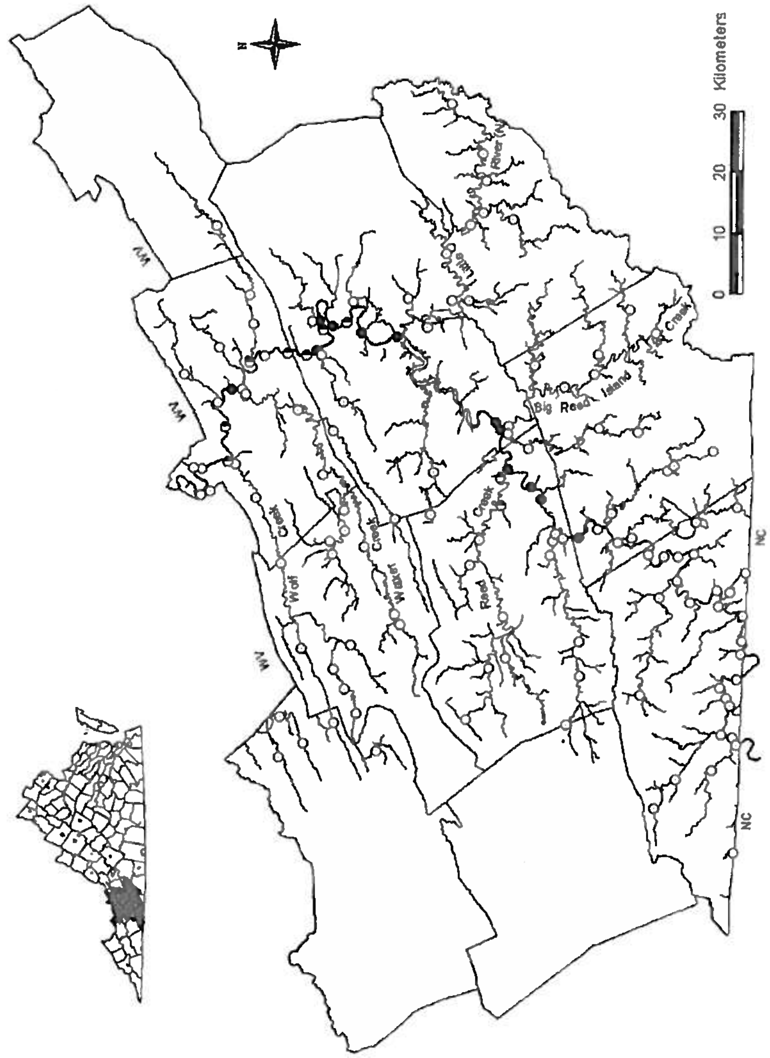


FIG. 7. Distribution of *Lampsilis ovata* (Say) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

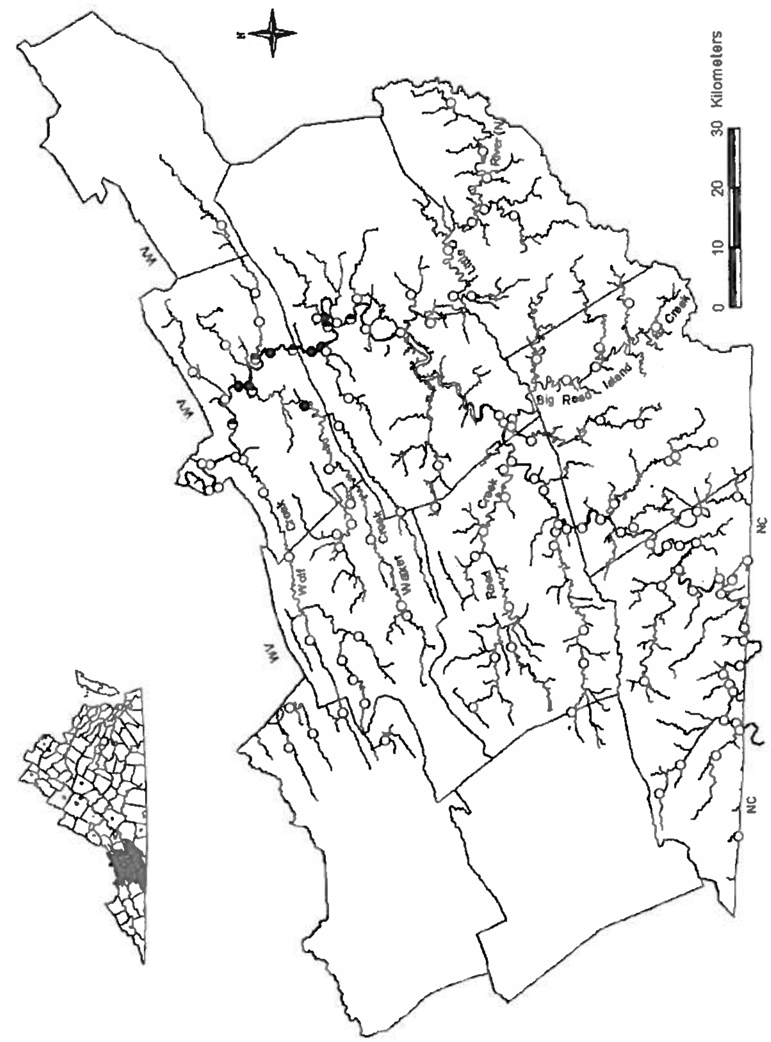


FIG. 8. Distribution of *Lampsilis fasciola* Rafinesque – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

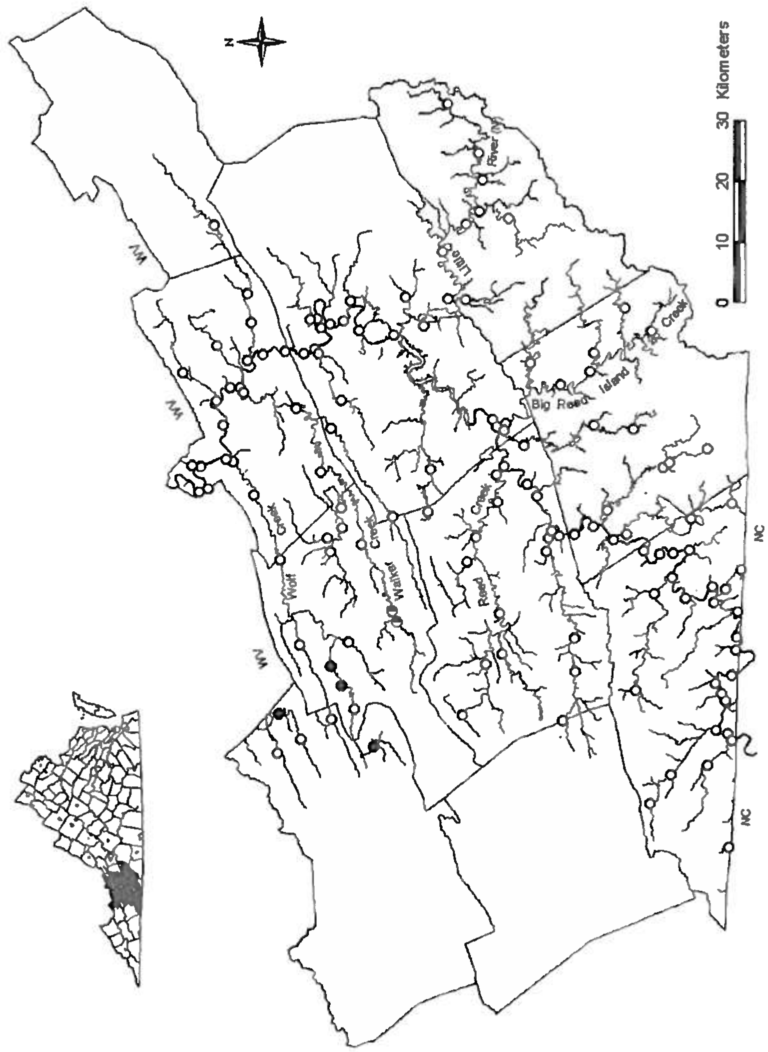


FIG. 9. Distribution of *Lasmigona holstonia* (Lea) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

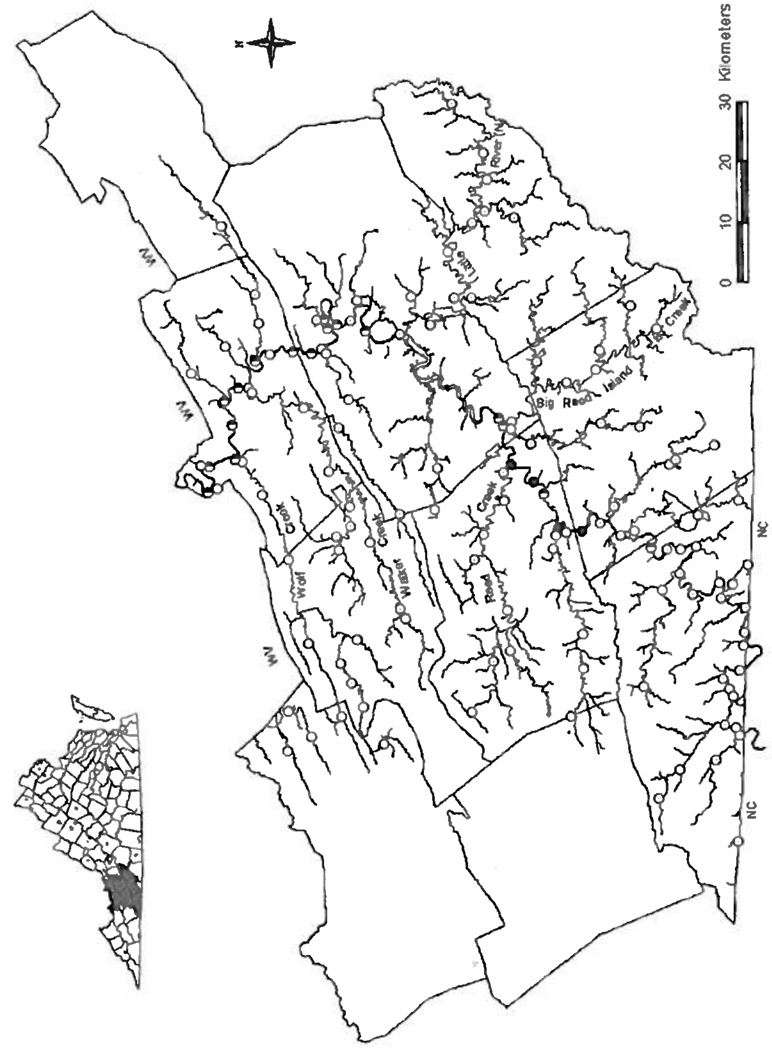


FIG. 10. Distribution of *Tritogonia verrucosa* (Rafinesque) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

Lasmigona subviridis (Conrad 1835), Green Floater

Lasmigona subviridis was found at three sites, totaling 24 individuals (Table 2). Live specimens were found in Kimberling Creek, Bland County; Little River, Grayson County; and New River above Rt.58/221 bridge, Grayson County (Fig. 11). Relic shell material was collected at three mainstem sites below and one site above Claytor Lake. Among historical sites that contained this species, we failed to find live mussels in the Little River, Floyd County (Stansbery & Clench, 1968 *in* Clarke 1985), Reed Creek, Wythe County (Ortmann, 1913), or the mainstem New River, Montgomery County (Neves & Moyer, 1988). In Little River, Grayson County, the habitat was a single shallow run (< 35 cm depth) with gravel and sand substrate. In Kimberling Creek, we found eight specimens in a shallow run with gravel and silt substratum interspersed among large boulders. Sand deposits behind bedrock and boulders in shallow runs characterized habitat for the seven individuals found in the mainstem site. Gravid individuals were collected in August, 1998.

Alasmidonta marginata Say 1818, Elktoe

Alasmidonta marginata was found at one site, totaling only two live individuals (Table 2). Specimens were found at one mainstem river site in Carroll County in early July, 1997 (Fig. 12). Habitat was a shallow run with pebble substrate, and neither was gravid. We failed to find this species in the mainstem river near Pearisburg, Giles County (Ortmann, 1913); Wolf Creek, Bland County (Stansbery & Clench, 1968 *in* Clarke 1981); Reed Creek, Wythe County (Ortmann, 1913); and Walker (Stansbery & Clench, 1968 *in* Clarke 1981) and Sinking creeks (Dr. Matt Winston, Virginia Polytechnic Institute and State University, personal communication), Giles County where the species was known historically. Relic shells were found at one mainstem river site above Claytor Lake and in the upper Wolf Creek system, Bland County.

DISCUSSION

Distribution and Status of Mussels in the New River Drainage

Our findings indicate that freshwater mussels in the New River of Virginia have declined in abundance and diversity, and are now patchy in distribution. Based on the relative abundance of the eight species collected in our survey, the purple wartyback and spike were common, the pocketbook was uncommon, the wavy-rayed lampmussel, Tennessee heelspitter, green floater, and pistolgrip were rare, and the elktoe was extremely rare. The dominance of purple wartyback concurred with results of earlier surveys (Markham *et al.*, 1980; USFWS, 1984).

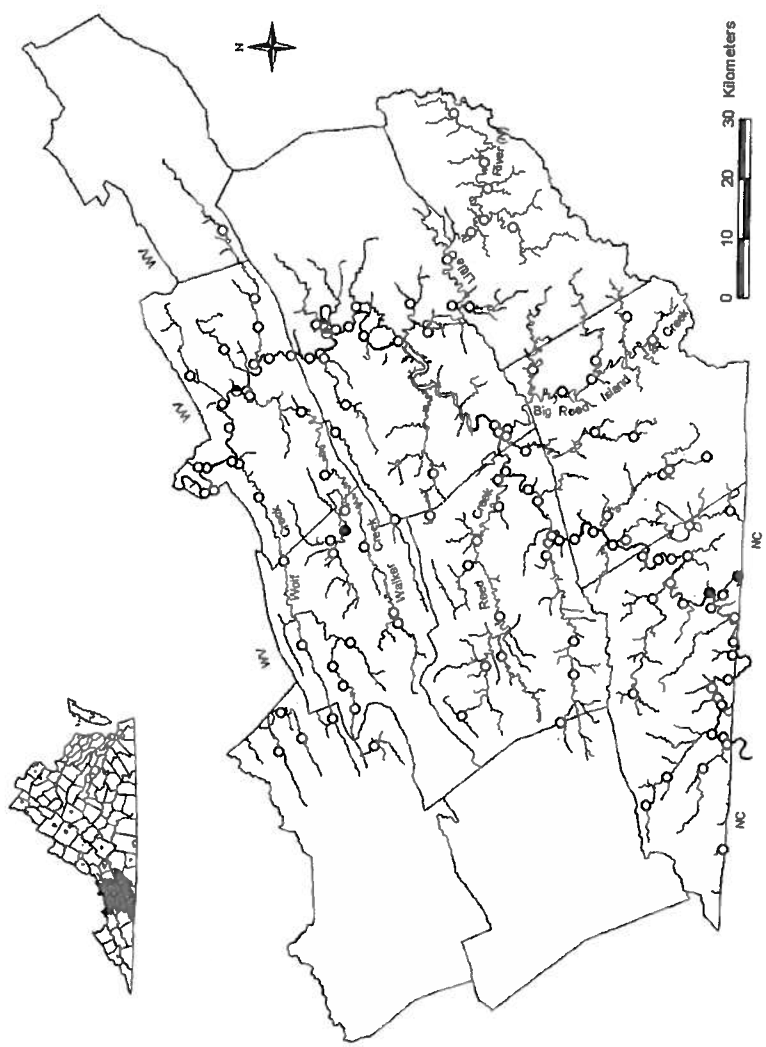


FIG. 11. Distribution of *Lasmigona subviridis* (Conrad) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

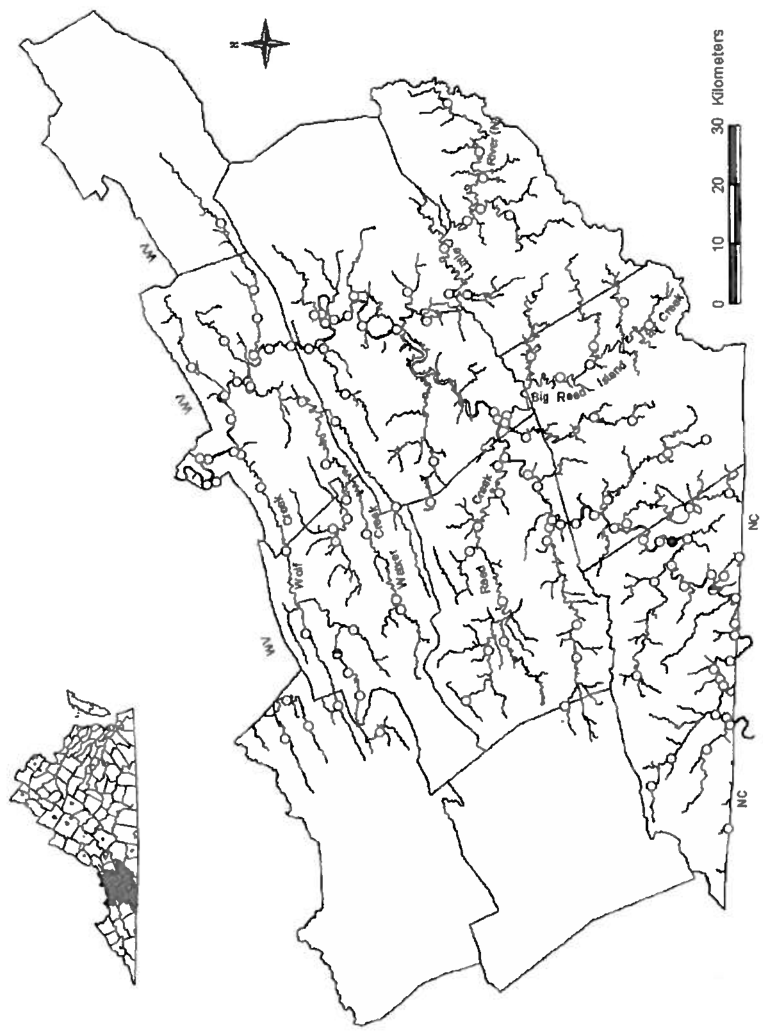


FIG. 12. Distribution of *Alasmidonta marginata* Say – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

The only species that occurred historically in the New River that was not collected was the mucket (*Actinonaias ligamentina*). Markham *et al.* (1980) found five specimens in Giles County, Virginia near the West Virginia border in 1979. Two other mussel species, the paper pondshell and giant floater, also occur in the New River, but were not collected in our survey. These species are usually associated with lakes and ponds, locations that we did not sample. Both species are known from Claytor Lake reservoir and other lentic systems in the New River drainage (Dr. Richard Neves, personal communication).

Because of insufficient survey effort, the historic distribution of many mussel species in the New River of Virginia is unknown. Ortmann (1913) did not report the presence of pistolgrip, purple wartyback, wavy-rayed lampmussel, or pocketbook in the Virginia portion of the New River, although he did find most of these species in downstream sections of the New River in West Virginia. Archeological evidence from a Late Woodland village site at the Radford Army Ammunition Plant, Montgomery County location found large numbers of purple wartyback valves dated to 1120 A.D. (Benthall, 2000). The abundance and wide distribution of live individuals and relic shells of purple wartyback and pistolgrip indicates that these species were once well-established in the drainage. Host fish native to the New River drainage of Virginia include flathead catfish (*Pylodictis olivaris*) and channel catfish (*Ictalurus punctatus*) for purple wartyback and flathead catfish for pistolgrip (Hove *et al.*, 1994b; Howells, 1996; Hove, 1997). These fish species are primarily found in mainstem and large tributaries of the New River drainage (Jenkins & Burkhead, 1994), habitats associated with the presence of both mussel species.

In contrast to the pistolgrip and purple wartyback, the pocketbook and wavy-rayed lampmussel may be recent introductions based on their restricted distributions in the New River drainage, Virginia. The New River has the largest number and proportion (42 of 89) of introduced fish species of any system in the eastern United States (Jenkins, 1987). None of the presently known host fishes for either species are native to the New River drainage of Virginia (Jenkins & Burkhead, 1994), even though extensive fish host research has been conducted (Table 3). Mussel introductions have occurred in other areas as a result of stocking infested host fishes. For example, the pocketbook mussel was probably introduced to the Shenandoah River in 1889 via glochidia attached to stocked game fishes (Johnson, 1970). The smallmouth bass (*Micropterus dolomieu*), a nonnative centrarchid that is host to both species (Watters, 1994), was first stocked in the New River tributaries of Virginia in 1877 (Jenkins & Burkhead, 1994). Because the initial and subsequent bass stock originated from the Holston River drainage, where both the wavy-rayed lampmussel and pocketbook are native, these two species may derive from those introduced fish.

TABLE 3. List of brooding periods and fish hosts for freshwater mussels in the New River drainage, Virginia. Original citations are presented in Watters (1994) and Parmalee & Bogan (1998) unless otherwise noted. Fish species status is reported in Jenkins & Burkhead (1994).

Species	Brooding period	Known fish hosts	
Actinonaias ligomentino	August – May[1]	bluegill[2] (I)	*Lepomis mocrochirus*
		black crappie[2] (I)	*Pomaxis nigramaculatus*
		green sunfish[2] (N)	*Lepomis cyanellus*
		largemouth bass[2] (I)	*Micropterus salmoides*
		smallmouth bass[2] (I)	*Micropterus dolamieu*
		rockbass[2] (I)	*Ambloplites rupestris*
		white bass[2] (I)	*Morone chrysops*
		white crappie[2] (I)	*Pomoxis annuloris*
		yellow perch[2] (I)	*Perca flovescens*
Alasmidonta marginata	July – June[1]	northern hogsucker[2] (N)	*Hypentelium nigricons*
		rockbass[2] (I)	*Ambloplites rupestris*
		warmouth[2] (I)	*Lepomis gulosus*
		white sucker[2] (N)	*Catostomus commersoni*
Cyclanaias tuberculato	May – August[1]	black bullhead[1] (IP)	*Ameiurus melas*
		channel catfish[1] (N)	*Ictolurus punctotus*
		flathead catfish[1] (N)	*Pylodictis olivaris*
		yellow bullhead[1] (IP)	*Ameiurus natalis*
Elliptio dilatata	May – August[1]	banded sculpin[1] (N)	*Cottus corolinae*
		black crappie[1] (I)	*Pomoxis nigromaculatus*
		flathead catfish[1] (N)	*Pylodictis alivoris*
		gizzard shad[1] (I)	*Darosomo cepedionum*
		rainbow darter[1] (NI)	*Etheastomo coeruleum*
		rockbass[1] (I)	*Ambloplites rupestris*
		yellow perch[1] (I)	*Perca flovescens*
Lampsilis fasciola	September – June[3]	largemouth bass[3] (I)	*Micropterus salmoides*
		smallmouth bass[2] (I)	*Micropterus dalamieu*
Lampsilis ovata	August – July[1]	bluegill[1] (I)	*Lepomis mocrochirus*
		largemouth bass[1] (I)	*Micropterus salmoides*
		smallmouth bass[1] (I)	*Micropterus dolomieu*
		white crappie[1] (I)	*Pomoxis annuloris*
		yellow perch[1] (I)	*Perca flavescens*
Lasmigona holstonia	September – May[4]	banded sculpin[4] (N)	*Cottus carolinae*
		rock bass[4] (I)	*Ambloplites rupestris*
Lasmigona subviridis	August – May[5]	mottled sculpin[3] (N)	*Cattus bairdi*
Tritogonia verrucosa	April – August[1]	flathead catfish[1] (N)	*Pylodictis alivoris*
		yellow bullhead[1] (IP)	*Ameiurus notalis*

I – Introduced
N – Native
NI – Regarded as native, possibly introduced
IP – Regarded as introduced, possibly native

(1) Parmalee & Bogan, 1998
(2) Watters, 1994
(3) Jones & Neves, pers. comm.
(4) Stegg, 1998
(5) Ortmann, 1919

Lasmigona subviridis (Conrad 1835), Green Floater

The population of green floaters in the Kanawha-New River drainage is unique because it is one of the few interior distributions of the species (Clarke, 1985), and is suspected to be where the species evolved (Ortmann, 1913). It is generally found in the Atlantic slope from the St. Lawrence-Hudson River system of New York, to the Cape Fear River system in North Carolina. Dillon (1977) reported the green floater to be uncommon above Claytor Lake, finding relic shells and a few live individuals. Ortmann (1919) indicated that the green floater is found in quiet pools and eddies with gravel and sand substratum of small streams, typically absent from strong currents and large rivers. We also found specimens in similar substrate types but found individuals in both small tributary and large mainstem river sections.

The decline of green floater in the New River is perplexing. During his survey in the early 1900's, Ortmann (1913) reported that this species was "extremely abundant" in the Kanawha River system (Greenbrier & New rivers). In the mid-1980s, it was common at several sites at McCoy, Montgomery County (Neves & Moyer, 1988). Except for a few isolated sites, the green floater has recently disappeared from the New River drainage in Virginia. Because of declining populations throughout its range, the U.S. Fish and Wildlife Service is currently investigating the green floater as a candidate for federal listing (Roble, 1998). Presently it is listed as threatened in New York and endangered in North Carolina. In Virginia, the green floater is listed as a species of concern, rare but widespread in most Atlantic slope drainages.

Alasmidonta marginata Say 1818, Elktoe

The elktoe is widely distributed in North America from the St. Lawrence River system, Canada, to the Ouachita River drainage, Arkansas (Clarke, 1981). It is typically known from gravel substrate in riffle habitat of large to moderate sized streams (Clarke, 1981b). Our one site with live individuals is similar to its habitat of gravel substrate in large to moderate size streams (Clarke & Berg, 1959).

The northern hogsucker (*Hypentelium nigricans*) and white sucker (*Catostomus commersoni*), both native to the drainage, serve as hosts for the elktoe [Table 3] (Watters, 1994). White suckers inhabit small creeks to medium-sized rivers, while northern hogsuckers are found primarily in large creeks and large rivers (Jenkins & Burkhead, 1994). Because both sucker species are common in the New River, the rarity of the elktoe mussel is not related simply to the lack of host fishes.

Williams *et al.* (1993) rank the elktoe as a species of special concern throughout its range. It is listed as endangered in Kansas, threatened in Minnesota, and of special concern in New York, Tennessee, and Michigan. In Virginia, the elktoe occurs in the New and upper Tennessee River drainages, and is listed as a species of special concern. Historical records indicate that this species was once widely distributed in New River tributaries draining the Ridge and Valley and the Blue Ridge provinces (Clarke, 1981). Dillon (1977) reported specimens at two Reed Creek sites and at one mainstem site above Claytor Lake; however, it is unclear if these samples were of live individuals or relic shells. In 1997, Dr. Matt Winston (personal communication) found relic valves in Sinking Creek, Giles County. Since this survey was conducted, senior author found one live elktoe at the Wolf Creek, Bland County site. Due to its extreme rarity, we suspect that the elktoe may be on the verge of extripation from the Virginia portion of the New River drainage.

Tritogonia verrucosa (Rafinesque 1820), Pistolgrip

In Virginia, the pistolgrip is confined to the mainstem New River where it is becoming increasingly rare. Dillon (1977) reported that it was uncommon to very common from Claytor Lake to Foster's Falls. We found it to be rare above Claytor Lake and absent in our survey below the reservoir. The species is adapted to a wide variety of habitats, from deep pools to shallow runs with gravel, sand, and silt substratum (Parmalee & Bogan, 1998). The pistolgrip is widely distributed in the Mississippi River drainage, from Pennsylvania, west to southern Minnesota, Oklahoma, and Texas (Ortmann, 1919). Williams *et al.* (1993) listed this species as currently stable throughout its range. In Minnesota and Wisconsin, where it occurs at the periphery of its range, the pistolgrip has received additional protection. The pistolgrip is at the extreme edge of its range in Virginia, but it is not protected.

Lasmigona holstonia (Lea 1838), Tennessee Heelsplitter

The Tennessee heelspitter is listed as a state-endangered species in Virginia and primarily occurs in tributaries of the Clinch, Powell, and Holston drainages (Neves, 1991). It is known from the Tennessee River basin and in the headwaters of the Coosa River drainage, Alabama (Parmalee & Bogan, 1998). Its distribution in the Coosa River drainage and now in the New River drainage clearly classifies it as trans-divide headwater species. The New River distribution includes upper Walker Creek (Dr. David Stansbery, personal communication), upper Wolf Creek including Burkes Garden, and upper Bluestone River above Bluefield, Virginia, it appears well established and distributed in upper Wolf Creek, Tazewell and Bland counties. Based on the abundance of relic shell material and the lack of live individuals, this species may be extirpated from Walker Creek, Bland County.

How the Tennessee heelspitter became established in the New River system is unknown. Possible explanations include stream capture, infected host fish movement via subterranean streams, and the inter-drainage transfer of infected host fish by humans. The Tennessee heelsplitter is found in cool, headwater streams, which may increase the likelihood of establishment in the headwaters of adjacent drainages. Both the upper Wolf Creek and Bluestone River systems contain fish species, such as the snubnose darter (*Etheostoma simoterum*), whitetail shiner (*Cyprinella galactura*) and banded sculpin (*Cottus carolinae* sp.) that are native to the Tennessee River basin. Banded sculpin occupy the same habitat as the heelsplitter and is a known host fish (Stegg, 1998). Geological evidence indicates that Wolf Creek captured a tributary of Burkes Garden that once drained into the North Fork Holston River (Ross & Carico, 1963). The "Old Bluestone River" once flowed into the Clinch River, but now drains into the New River (Ross, 1972). Although there is no documented evidence of stream capture on Walker Creek, the divide from the North Fork Holston River is less than one kilometer wide in a flat, karst valley. Further investigation is needed to determine whether stream capture may have occurred between these two drainages.

Threats to Mussels in the New River Drainage

Sedimentation and excessive nutrients were the most obvious impacts to streams in our survey. These factors are considered the primary pollutants to lentic and lotic ecosystems in the United States (Neves *et al.*, 1997). According to the Virginia Department of Conservation and Recreation's Biennial Nonpoint Source Pollution report (2000), nonpoint impairment sources within the New River drainage are from urban (185 km), agriculture (117 km), mineral extraction (13 km), and other/unknown (40 km) sources. During field sampling, we observed heavy silt in the stream bottoms of many tributaries draining agricultural valleys. The most obvious source of siltation was unrestricted access by livestock to creeks and rivers. Because juvenile mussels are associated with surface sediments, they are highly susceptible to sever sedimentation and contaminants when compared to adults (Yeager *et al.*, 1994). Streams containing high levels of silt include Little River in Floyd County, upper Cripple Creek in Wythe County, upper Wolf Creek in Tazewell and Bland counties, and Walker Creek in Giles and Bland counties. The mainstem New River appears less impacted by sedimentation, except during high flows when the river becomes highly turbid.

Nutrient enrichment in the mainstem New River below Claytor Lake was evident by the presence of dense beds of *Elodea* and large mats of filamentous algae that cover the river bottom during the summer. Possible nutrient sources include fertilizer runoff from agricultural and residential plots, and discharge by wastewater treatment plants. Monitoring data from the Virginia Department of Environmental Quality indicates that levels of phosphorus and total nitrogen are generally fair to good, although some watersheds below Claytor Lake are rated poor because of high nutrient loading (DCR, 2000).

Wastewater treatment plants that use chlorine for disinfection occur throughout the New River drainage. Goudreau *et al.* (1993) reported that *Villosa iris* glochidia responded to harmful levels of total residual chloride and ammonia below a wastewater treatment plant by closing their valves, and thus inhibiting reproduction. In addition to chlorine, bacteria and protozoans that proliferate below wastewater discharges may attack the eggs in the gill marsupium of female mussels (Fuller, 1974). The negative effects of chlorine on aquatic biota may prevent mussels from recolonizing suitable habitat of the New River drainage, even if reproducing populations occur upstream.

Biological interactions between exotic species and native fauna may also contribute to the decline of mussels in the New River drainage. The Asian clam is a nonindigenous species that is abundant and widely distributed in the mainstem and in most tributary streams. These highly prolific filter feeders may compete with native bivalves for space and food (Sickel, 1986; Yeager *et al.*, 2000). Interestingly, Asian clams were rare or absent in Kimberling Creek in Bland County, Little River in Grayson County, and upper Wolf Creek in Bland and Tazewell counties, sites that still have rare mussels. An abundance of Asian clams would serve as a food source and an attraction to muskrats, which could predate on native mollusks. Muskrats can intensively feed on small mussels and can affect species abundance at a local level (Neves & Odum, 1989). Neves and Moyer (1988) found significant muskrat predation on green floaters in a previous study in the New River. Because of their small size, adult mussels of the elktoe, spike, Tennessee heelsplitter, green floater, or juveniles of any species would be especially susceptible to muskrat predation.

RECOMMENDATIONS

Because of the rarity of certain species in the New River and throughout Virginia, we strongly recommend listing the green floater and elktoe under the Commonwealth's endangered species law. Specifically, we support listing the elktoe as endangered and the green floater as threatened. The presence of several green floater populations in other Virginia watersheds precludes us from recommending endangered status. The rarity of the pistolgrip may be an artifact of the sampling methods that avoided deeper areas where the species may still persist. Until such sampling can occur, we propose listing the pistolgrip as a state species of special concern.

Because the New River is an expansive system that makes intensive sampling difficult, future mussel surveys should be concentrated on the Little River in Floyd County, Kimberling Creek in Bland County and upper Wolf Creek in Bland

and Tazewell counties. To maximize sampling efficiency, efforts should be concentrated in river reaches that contain high mussel densities, species diversity, or both. We recommend intensive sampling in the mainstem New River between Reed and Cripple Creeks to reveal additional sites with the green floater and elktoe. We also recommend concentrating survey efforts on the river section between Glen Lyn and the West Virginia border, which may harbor the mucket.

Restoring riparian vegetation and restricting cattle access to these waters would significantly improve water quality by reducing siltation and nutrient enrichment. As with most aquatic restoration efforts, obtaining support of riparian landowners is critical (Neves *et al.*, 1997). The headwaters of Wolf Creek, including Burkes Garden, is one area that needs immediate attention. Waters draining Burkes Garden are a significant sediment source in the New River drainage. We failed to observe any trees or buffer vegetation along the creeks in this area. One of the best green floater populations in Virginia occurs in a section of Little River, which is downstream of the town of Sparta, North Carolina. The North Carolina Wildlife Resource Commission and the Division of Environmental Management could provide additional protection to this green floater population.

From 1980 to 2000, New River Valley has increased its human population from 244,983 to 268,393, an 8.7% growth rate (U.S. Census, 2001). As the population increases so will additional demands on the river for water withdrawal and effluent discharge. In rivers and streams with significant mussel resources, other less harmful alternatives such as ozonation and ultra-violet radiation should be considered to disinfect discharges. Water quality monitoring for heavy metals, pathogens, and organic enrichment will also be necessary to document sources of impacts to mussels in the New River.

ACKNOWLEDGMENTS

We are grateful to Scott Cooney and Jason Young for providing technical expertise on this survey. John Copeland, Shay Garriock, Marvin Gautier, Dr. Monte McGregor, Bob Greenlee, Ralph Steinberg, Erin Swiader, and Joe Watson assisted in field sampling. Lenee Harner and Chris Mattson of the VDGIF Fish and Wildlife Information Section produced the maps. Drs. Richard Neves and Monte McGregor provided editorial review of the report. We are also grateful to Dr. David Stansbery for species identifications and access to the bivalve collection at Ohio State University. Finally and most importantly, we would like to thank the landowners who granted us permission access to their property and conduct this survey.

LITERATURE CITED

BATES, J. M. 1979. Mussel investigations, State of West Virginia. West Virginia Project 3-97-R. 91 pp. [WV Division of Natural Resources, 1900 Kanawha Blvd., East, Charleston, WV 25305. (304) 558-2754]

BENTHALL, J.L. 2000. The Stroubles Creek site (44MY7) excavations, Radford Army Ammunition Plant, Montgomery County, Virginia. *Archeological Society of Virginia*, 55(1): 2-54.

BRUNGS, W.A. 1973. Effects of residual chlorine on aquatic life. *Journal of Water Pollution Control Federation*, 45: 2180-2193.

CLARKE, A.H. 1981. The tribe Alasmidontini (Unionidae: Anodontinae). Part I. *Pegias, Alasmidonta*, and *Arcidens*. *Smithsonian Contributions to Zoology* (326): 101 pp.

CLARKE, A.H. 1985. The tribe Alasmidontini (Unionidae: Anodontinae). Part II. *Lasmigona and Simpsonaias*. *Smithsonian Contributions to Zoology* (399): 75 pp.

DCR (Department of Conservation and Recreation). 2000. The biennial nonpoint source pollution water quality assessment report. DCR – Division of Soil and Water Conservation, Richmond, Virginia. 92 pp. [Department of Conservation and Recreation, Division of Soil and Water Conservation, 203 Governor Street, Suite 206, Richmond, Virginia 23219-2094. (804) 786-2064]

DILLON, R.T., Jr. 1977. *Factors in the distributional ecology of upper New River mollusks (Virginia/North Carolina)*. Honors thesis, Biology Department, Virginia Polytechnic Institute State University, Blacksburg, Virginia.

FULLER, S.L.H. 1974. Clams and mussels (Mollusca: Bivalva). Pages 215-273. *In* C.W. Hart, Jr., and S.L.H. Fuller, editors. Pollution Ecology of Freshwater Invertebrates. Academic Press, New York, NY. 389 pp.

GOUDREAU, S.E., NEVES, R.J. & SHEEHAN, R.J. 1993. Effects of wastewater treatment plant effluents on freshwater mollusks in the upper Clinch River, Virginia, USA. *Hydrobiologica*, 252: 211-230.

HOVE, M. 1997. Ictalurids serve as suitable hosts for the purple wartyback. *Triannual Unionid Report*, 11: 4.

HOVE, M.C., ENGELKING, R., EVERS, E., PETELER, M. & PETERSON, E. 1994. *Cyclonaias tuberculata* host suitability tests. *Triannual Unionid Report*, 5: 9.

HOWELLS, R. 1996. Pistolgrip and gulf mapleleaf hosts. *Info-Mussel Newsletter*, 4(3): 3.

JENKINS, R.E. 1987. Introduced fishes of Virginia drainages, with special references to cryptic introductions and biogeographic study. Page 57. Abstracts of the 67th Annual Meeting of the American Society of Ichthyologists and Herpetologists.

JENKINS, R.E. & BURKHEAD, N.M. 1994. Freshwater fishes of Virginia. American Fisheries Society, Bethesda, Maryland. 1080 pp.

JIRKA, K.J. & NEVES, R.J. 1992. Reproductive biology of four species of freshwater mussels (Mollusca: Unionidae) in the New River, Virginia and West Virginia. *Journal of Freshwater Ecology*, 7(1): 35-44.

JOHNSON, R.I. 1970. The systematics and zoogeography of the Unionidae (Mollusca: Bivalva) of the southern Atlantic Slope Region. *Bulletin of the Museum of Comparative Zoology Harvard University*, 140 (4): 449 pp.

MARKHAM, S.L., HOCUTT, C.H. & STAUFFER, J.R., Jr. 1980. The crayfish (Decapoda: Astacidae and Cambaridae) and the freshwater mussels (Mollusca: Pelecypoda) of the lower New River, Virginia and West Virginia. *Natural History Miscellanea* (208): 11 pp.

NEVES, R.J. 1983. Distributional history of the fish and mussel fauna in the Kanawha River drainage. Pages 47-67. *Proceedings New River Symposium*, Blacksburg, VA. [Proceeding New River Symposium, Eastern National, P.O. Box 117, Lansing, WV 25862. (304) 574-0305]

NEVES, R.J. & MOYER, S.N. 1988. Evaluation of techniques for age determination of freshwater mussels (Unionidae). *American Malacological Bulletin*, 6(2): 179-188.

NEVES, R.J. & ODUM, M.C. 1989. Muskrat predation on endangered freshwater mussels in Virginia. *Journal of Wildlife Management*, 53: 934-941.

NEVES, R.J. 1991. Mollusks. *in* Terwilliger (coord.). Virginia's Endangered Species, pp. 251-320. McDonald and Woodward Publishing Company. Blacksburg, VA. 672 pp.

NEVES, R.J., BOGAN, A.E., WILLIAMS, J.D., AHLSTEDT, S.A. & HARTFIELD, P.W. 1997 *in* Benz, G.W. & Collins, D.E. (editors). Aquatic fauna in peril: the southeastern perspective, pp.

43-85. Special Publication 1, Southeast Aquatic Research Institute, Lenz Design & Communications, Decatur, Georgia. 554 pp.

ORTMANN, A.E. 1913. The Alleghenian divide and its influence upon the freshwater fauna. Pages 287-387. *Proceedings of the American Philosophical Society*, Philadelphia, PA.

ORTMANN, A.E. 1919. A monograph of the naiads of Pennsylvania. Part III: Systematic account of the genera and species. *Memoirs of the Carnegie Museum*, 8(1): xvi-384.

PARMALEE, P.W. & BOGAN, A.E. 1998. The freshwater mussels of Tennessee. The University of Tennessee Press, Knoxville. 328 pp.

ROBLE, S.M. 1998. Status survey for the green floater (*Lamigona subviridis*) in Virginia. Natural Heritage Technical Report. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. Unpublished Report, U.S. Fish and Wildlife Service, Annapolis, Maryland. 66 pp. [U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, 117 Admiral Cochrane Drive, Annapolis, Maryland 21401. (410) 573-4500]

ROSS, R.D. 1972. The drainage history of the Tennessee River. *Virginia Polytechnic Institute and State University Research Division Monograph*, 4:11-42.

ROSS, R.D. & CARICO, J.E. 1963. Records and distributional problems of fishes of the North, Middle, and South Forks of the Holston River, Virginia. *Virginia Agricultural Experimental Station Technical Bulletin* (161): 23 pp.

SICKEL, J.B. 1986. *Corbicula* population mortalities: factors influencing population control. *American Malacological Bulletin, Special Edition Number*, 2: 89-94.

STEGG, M.B. 1998. *A determination of host fishes for several state-listed mussel species in Virginia*. Unpublished masters thesis. Virginia Polytechnic Institute and State University. 101 pp.

STRAHLER, A.N. 1957. Quantitative analysis of watershed geomorphology. *Transactions of the American Geophysical Union*, 38: 913-920.

TURGEON, D.D., BOGAN, A.E., COAN, E.V., EMERSON, W.K., LYONS, W.F., PRATT, W.L., ROPER, C.F.E., SCHELTEMA, A., THOMPSON, F.G. & WILLIAMS, J.D. 1998. Common and scientific names of aquatic invertebrates from the United States and Canada: mollusks. American Fisheries Society Special Publication 16.

US Census Bureau 2001. Census 2000 profiles of general demographic characteristics/ Virginia. Prepared by the U.S. Census Bureau 2001, Washington, D.C. [U.S. Census Bureau, 4700 Silver Hill Rd., Suitland, MD 20746. (301) 763-4636]

USDA (U.S. Department of Agriculture, Soil Conservation Service) 1992. Land and water resources study for hydrologic units, New River Basin. Richmond, VA. [USDA Soil Conservation Service, 400 N. 8th St. Federal Building, Richmond, VA 23240-9999. (804) 771-2455]

USFWS (U.S. Fish & Wildlife Service) 1984. Mussel survey of the New River, Indian Creek, and Bluestone River above Bluestone Dam. Planning Aid Report. U.S. Fish and Wildlife Service, Elkins, West Virginia sub-office. 26 pp. [U.S. Fish and Wildlife Service, 694 Beverly Pike, Elkins, WV 26241. (304) 636-6586]

WATTERS, G.T. 1994. An annotated bibliography of the reproduction and propagation of the Unionoidea (Primarily of North America). *Ohio Biological Survey Miscellaneous Contributions* (1): 158 pp.

WILLIAMS, J.D., WARREN, M.L. Jr., CUMMINGS, K.S., HARRIS, J.L. & NEVES, R.J. 1993. Conservation status of freshwater mussels of the United States and Canada. *Fisheries*, 18(9): 6-22.

YEAGER, M.M., CHERRY, D.S. & NEVES, R.J. 1994. Feeding and burrowing behaviors of juvenile rainbow mussels, *Villosa iris* (Bivalvia: Unionidae). *Journal of the American Benthological Society*, 13: 217-222.

YEAGER, M.M., NEVES, R.J. & CHERRY, D.S. 2000. Competitive interactions between early life stages of *Villosa iris* (Bivalvia: Unionidae) and adult Asian clams (*Corbicula flaminea*). Pages 253-259. *Proceedings of the First Freshwater Mollusk Conservation Society Symposium*. Ohio Biological Survey, Columbus, OH. 274 pp.

APPENDIX A. Location of 134 sampling sites in the New River drainage, Virginia.

Site	Stream Name	Order	UTM X	UTM Y
1	Reed Creek	3	514329	4087457
2	New River	4	523467	4088155
3	Reed Creek	3	509818	4087241
4	Reed Creek	1	483161	4089035
5	Reed Creek	1	474768	4092804
6	Reed Creek	3	504112	4090818
7	Cripple Creek	4	503999	4078719
8	Cripple Creek	3	487543	4074222
9	Cripple Creek	3	501706	4079148
10	New River @ Foster Falls	4	512800	4082373
11	New River at Big Reed Island Creek	4	522246	4087429
12	Little Reed Island Creek	2	521600	4086194
13	Big Reed Island Creek	3	522858	4085983
14	Little Reed Island Creek	2	519148	4082806
15	Big Reed Island Creek	1	538030	4061832
16	Little Reed Island Creek	2	521908	4064719
17	Big Reed Island Creek	2	531360	4071888
18	New River near Ivanhoe	4	505130	4078259
19	New River @ Ivanhoe	4	504384	4076908
20	New River near Ivanhoe	4	504564	4074376
21	New River @ Galax	4	501476	4058059
22	New River Below Galax	4	501427	4060249
23	New River off Rt. 274	4	497540	4058181
24	New River @ Rt. 94	4	501964	4055410
25	New River Below Byllseby Dam	4	505870	4071305
26	New River Below Fries Dam	4	501839	4062934
27	New River @ Rt. 606	4	503741	4067890
28	New River @ Big Walker Creek	4	528637	4129908
29	New River @ Parrot	4	534992	4117638
30	New River @ Rt. 52	4	510883	4080713
31	New River Below Rt. 81	4	537318	4104570
32	New River @ Rt. 730	4	534122	4126237
33	New River @ RAAP	4	539060	4115086
34	New River @ RAAP	4	538468	4116595
35	New River @ RAAP	4	539990	4117229
36	Crooked Creek	2	508602	4068976
37	Crooked Creek	1	518727	4052384
38	Crooked Creek	2	515568	4059793
39	Crooked Creek	2	516361	4058761
40	Chestnut Creek	2	504580	4065711
41	Chestnut Creek	2	507140	4055111
42	Chestnut Creek	2	509654	4048367
43	Fox Creek	2	464994	4058149
44	Fox Creek	2	472334	4050698
45	Fox Creek	1	460308	4061599
46	New River @ Ripplemead	4	528613	4131641
47	New River @ Rich Creek	4	515578	4136518

APPENDIX A (continued).

Site	Stream Name	Order	UTM X	UTM Y
48	New River @ Glen Lynn	4	511368	4136716
49	New River Above Rt. 52/221	4	495921	4051507
50	New River @ Rt. 629	4	491919	4047249
51	New River @ Rt. 715	4	493426	4051211
52	New River @ Rt. 274	4	493995	4055981
53	New River @ Rt. 700	4	487754	4047382
54	New River @ Rt. 601	4	478345	4049842
55	New River @ Rt. 708	4	481456	4048145
56	New River @ Rt. 21/221	4	485621	4047523
57	New River @ Rt. 711, Saddle Creek	4	480001	4050919
58	New River Above Rt. 93	4	471876	4048806
59	New River @ Rt. 716	4	470709	4048166
60	New River @ Rt. 711, VDGIF Launch	4	477204	4049266
61	Little River	3	555665	4092485
62	Little River	3	538829	4099541
63	Walker Creek	3	527806	4129370
64	Walker Creek	3	525237	4120698
65	Walker Creek	3	514700	4116602
66	Walker Creek	2	502807	4109800
67	New River @ Rt. 680, 640	4	522410	4132770
68	Big Walker Creek	2	491890	4104715
69	Kimberling Creek	2	508778	4113144
70	Little Walker Creek	2	521889	4114939
71	Wolf Creek	3	516389	4131102
72	Wolf Creek	3	510908	4127645
73	Wolf Creek	1	482765	4114625
74	Wolf Creek	3	500161	4123332
75	Little Walker Creek	2	507420	4104665
76	Clear Fork	2	474076	4114505
77	Reed Creek	3	491503	4086798
78	New River @ McCoy Falls	4	534226	4119448
79	New River @ Peppers Ferry Bridge	4	539640	4112810
80	Walker Creek	1	490099	4103842
81	Kimberling Creek	2	505470	4112978
82	Wilderness Creek	1	501677	4114951
83	Nobusiness Creek	1	503779	4115410
84	Elk Creek	2	494779	4061090
85	Elk Creek	1	478897	4064073
86	Little River	1	495616	4049369
87	Little River	1	498838	4046742
88	Wolf Creek	1	479539	4112868
89	Hunting Camp Creek	1	486799	4111826
90	Little River	2	567349	4090448
91	Little River	1	575443	4095722
92	Pine Creek	1	562932	4089795
93	Peak Creek	1	508206	4098815
94	Sinking Creek	1	555409	4134278

APPENDIX A (continued).

Site	Stream Name	Order	UTM X	UTM Y
95	Sinking Creek	1	539333	4128192
96	Little River	3	543366	4095569
97	Spring Creek @ Burkes Garden	1	469536	4107476
98	Bluestone River	1	474992	4123314
99	Mud Fork	1	468438	4123538
100	Bluestone River	1	470727	4119620
101	Indian Creek	2	543265	4092543
102	West Fork Little River	3	557673	4090225
103	Peak Creek	1	515197	4098422
104	Tom's Creek	2	539814	4118449
105	Burk's Fork	1	534531	4071299
106	Laurel Fork	1	541891	4066170
107	Clear Fork	2	486185	4119948
108	Rich Creek	1	515706	4137911
109	Crab Creek	1	543013	4111669
110	New River @ Radford	4	538018	4110305
111	Little River	3	551010	4096421
112	Cove Creek	2	500008	4092264
113	South Fork Reed Creek	1	484798	4086351
114	Little Reed Island Creek	2	522550	4071228
115	Big Reed Island Creek	2	529223	4076854
116	Greasy Creek	1	532802	4081771
117	West Fork Little River	2	556609	4085348
118	New River @ Big Stony Creek	4	526415	4133882
119	Helton Creek	1	453122	4048511
120	Big Wilson Creek	2	466530	4052149
121	New River Below McCoy Falls	4	534613	4122445
122	Trib. of Cripple Creek	1	473947	4076181
123	Cripple Creek	3	481957	4074139
124	New River @ Narrows	4	516800	4132284
125	Meadow Creek	2	543628	4102634
126	Back Creek	1	526542	4113314
127	Back Creek	2	534217	4117009
128	Wolf Creek	1	475671	4110759
129	East River	1	511839	4135157
130	Sinking Creek	1	544132	4128761
131	New River @ Reed Creek	4	515760	4086206
132	New River Below Eggleston	4	533054	4128758
133	Little Stony Creek	2	535493	4133769
134	Stony Creek	2	531056	4139385

APPENDIX B. Number of live mussel species found at 134 sampling sites in the New River drainage, Virginia. Species codes are indicated in Table 2.

Site	EDIL	CTUB	LOVA	LFAS	LHOL	TVER	LSUB	AMAR	Total/site	Mussels/hr effort
1	—	23	—	—	—	—	—	—	23	3.8
2	—	59	1	—	—	—	—	—	60	10
3	—	—	—	—	—	—	—	—	0	0
4	—	—	—	—	—	—	—	—	0	0
5	—	—	—	—	—	—	—	—	0	0
6	—	—	—	—	—	—	—	—	0	0
7	—	—	—	—	—	—	—	—	0	0
8	—	—	—	—	—	—	—	—	0	0
9	—	—	—	—	—	—	—	—	0	0
10	6	86	7	—	—	11	—	—	110	6.4
11	1	70	2	—	—	—	—	—	73	12.1
12	—	—	—	—	—	—	—	—	0	0
13	—	—	—	—	—	—	—	—	0	0
14	—	—	—	—	—	—	—	—	0	0
15	—	—	—	—	—	—	—	—	0	0
16	—	—	—	—	—	—	—	—	0	0
17	—	—	—	—	—	—	—	—	0	0
18	4	38	—	—	—	1	—	—	43	5.7
19	—	3	—	—	—	—	—	—	3	0.7
20	6	15	2	—	—	2	—	—	25	6.2
21	26	—	—	—	—	—	—	2	28	4.7
22	3	—	—	—	—	—	—	—	3	1.5
23	9	—	—	—	—	—	—	—	9	1.8
24	—	—	—	—	—	—	—	—	0	0
25	—	1	—	—	—	—	—	—	1	0.5
26	2	115	—	—	—	—	—	—	117	26
27	—	15	—	—	—	—	—	—	15	10
28	—	10	—	2	—	—	—	—	12	2
29	—	3	1	2	—	—	—	—	6	1.5
30	—	—	3	—	—	—	—	—	3	0.7
31	—	—	1	—	—	—	—	—	1	0.3
32	3	50	—	1	—	—	—	—	54	10.8
33	—	1	1	—	—	—	—	—	2	0.3
34	—	—	—	—	—	—	—	—	0	0
35	—	1	1	2	—	—	—	—	4	0.3
36	—	—	—	—	—	—	—	—	0	0
37	—	—	—	—	—	—	—	—	0	0
38	—	—	—	—	—	—	—	—	0	0
39	—	—	—	—	—	—	—	—	0	0
40	—	—	—	—	—	—	—	—	0	0
41	—	—	—	—	—	—	—	—	0	0
42	—	—	—	—	—	—	—	—	0	0
43	—	—	—	—	—	—	—	—	0	0
44	—	—	—	—	—	—	—	—	0	0
45	—	—	—	—	—	—	—	—	0	0

APPENDIX B (continued).

Site	EDIL	CTUB	LOVA	LFAS	LHOL	TVER	LSUB	AMAR	Total/site	Mussel effor
46	4	49	1	2	—	—	—	—	56	9.3
47	2	60	—	—	—	—	—	—	62	15.5
48	—	2	—	—	—	—	—	—	2	0.5
49	1	—	—	—	—	—	7	—	8	1.8
50	78	—	—	—	—	—	—	—	78	22.3
51	3	—	—	—	—	—	—	—	3	1.2
52	3	—	—	—	—	—	—	—	3	1.5
53	8	—	—	—	—	—	—	—	8	2.7
54	1	—	—	—	—	—	—	—	1	0.33
55	50	—	—	—	—	—	—	—	50	20
56	—	—	—	—	—	—	—	—	0	0
57	13	1	—	—	—	—	—	—	14	4.6
58	6	—	—	—	—	—	—	—	6	1.5
59	64	—	—	—	—	—	—	—	64	21.3
60	20	—	—	—	—	—	—	—	20	6.7
61	—	—	—	—	—	—	—	—	0	0
62	—	—	—	—	—	—	—	—	0	0
63	—	—	—	—	—	—	—	—	0	0
64	—	—	—	4	—	—	—	—	4	1
65	—	—	—	—	—	—	—	—	0	0
66	—	—	—	—	—	—	—	—	0	0
67	—	3	—	—	—	—	—	—	3	0.5
68	—	—	—	—	—	—	—	—	0	0
69	—	—	—	—	—	—	—	—	0	0
70	—	—	—	—	—	—	—	—	0	0
71	—	—	—	—	—	—	—	—	0	0
72	—	—	—	—	—	—	—	—	0	0
73	—	—	—	—	1	—	—	—	1	0.2
74	—	—	—	—	—	—	—	—	0	0
75	—	—	—	—	—	—	—	—	0	0
76	—	—	—	—	—	—	—	—	0	0
77	7	—	—	—	—	—	—	—	7	0.8
78	—	22	—	6	—	—	—	—	28	0.9
79	—	—	—	—	—	—	—	—	0	0
80	—	—	—	—	—	—	—	—	0	0
81	26	—	—	—	—	—	8	—	34	9.7
82	—	—	—	—	—	—	—	—	0	0
83	—	—	—	—	—	—	—	—	0	0
84	—	—	—	—	—	—	—	—	0	0
85	—	—	—	—	—	—	—	—	0	0
86	—	—	—	—	—	—	—	—	0	0
87	—	—	—	—	—	—	9	—	9	1.6
88	16	—	—	—	3	—	—	—	19	6
89	—	—	—	—	—	—	—	—	0	0
90	2	—	—	—	—	—	—	—	2	0.5
91	—	—	—	—	—	—	—	—	0	0

APPENDIX B (continued).

Site	EDIL	CTUB	LOVA	LFAS	LHOL	TVER	LSUB	AMAR	Total/site	Mussels/hr effort
92	—	—	—	—	—	—	—	—	0	0
93	—	—	—	—	—	—	—	—	0	0
94	—	—	—	—	—	—	—	—	0	0
95	—	—	—	—	—	—	—	—	0	0
96	—	—	—	—	—	—	—	—	0	0
97	—	—	—	—	14	—	—	—	14	12
98	—	—	—	—	2	—	—	—	2	0.7
99	—	—	—	—	—	—	—	—	0	0
100	—	—	—	—	—	—	—	—	0	0
101	—	—	—	—	—	—	—	—	0	0
102	—	—	—	—	—	—	—	—	0	0
103	—	—	—	—	—	—	—	—	0	0
104	—	—	—	—	—	—	—	—	0	0
105	—	—	—	—	—	—	—	—	0	0
106	—	—	—	—	—	—	—	—	0	0
107	—	—	—	—	—	—	—	—	0	0
108	—	—	—	—	—	—	—	—	0	0
109	—	—	—	—	—	—	—	—	0	0
110	—	3	3	—	—	—	—	—	6	0.6
111	6	4	—	—	—	—	—	—	10	2.1
112	—	—	—	—	—	—	—	—	0	0
113	—	—	—	—	—	—	—	—	0	0
114	—	—	—	—	—	—	—	—	0	0
115	—	—	—	—	—	—	—	—	0	0
116	—	—	—	—	—	—	—	—	0	0
117	—	—	—	—	—	—	—	—	0	0
118	2	13	—	—	—	—	—	—	15	1.5
119	—	—	—	—	—	—	—	—	0	0
120	—	—	—	—	—	—	—	—	0	0
121	—	4	—	—	—	—	—	—	4	0.5
122	—	—	—	—	—	—	—	—	0	0
123	—	—	—	—	—	—	—	—	0	0
124	—	—	—	—	—	—	—	—	0	0
125	—	—	—	—	—	—	—	—	0	0
126	—	—	—	—	—	—	—	—	0	0
127	—	—	—	—	—	—	—	—	0	0
128	—	—	—	—	—	—	—	—	0	0
129	—	—	—	—	—	—	—	—	0	0
130	—	—	—	—	—	—	—	—	0	0
131	1	50	4	—	—	1	—	—	56	10.2
132	—	—	—	—	—	—	—	—	0	0
133	—	—	—	—	—	—	—	—	0	0
134	—	—	—	—	—	—	—	—	0	0

Upper New River Fish List*

Clupeidae – Herring
Dorosoma cepedianum – Gizzard Shad
Alosa pseudoharengus – Alewife

Esocidae – Pikes
Esox masquinongy – Muskellunge

Cyprinidae – Minnows
Cyprinus carpio – Common Carp
Carassius auratus – Goldfish
Ctenopharyngodon idella – Grass Carp
Notemigonus crysoleucas – Golden Shiner
Chrosomus oreas – Mountain Redbelly Dace
Clinostomus funduloides – Rosyside Dace
Rhinichthys cataractae – Longnose Dace
Rhinichthys obtusus – Western Blacknose Dace
Campostoma anomalum – Central Stoneroller
Semotilus atromaculatus – Creek Chub
Exoglossum laurae – Tonguetied Minnow
Exoglossum maxillingua – Cutlip Minnow
Nocomis platyrhynchus – Bigmouth Chub
Nocomis leptocephalus – Bluehead Chub
Phenacobius teretulus – Kanawha Minnow
Cyprinella galactura – Whitetail Shiner
Cyprinella spiloptera – Spotfin Shiner
Luxilus coccogenis– Warpaint Shiner
Luxilus albeolus – White Shiner
Lythrurus ardens – Rosefin Shiner
Notropis micropteryx – Highland Shiner
Notropis rubricroceus – Saffron Shiner
Notropis chiliticus – Redlip Shiner
Notropis photogenis – Silver Shiner
Notropis telescopus – Telescope Shiner
Notropis hudsonius – Spottail Shiner
Notropis scabriceps – New River Shiner
Notropis volucellus – Mimic Shiner
Notropis procne – Swallowtail Shiner
Pimephales promelas – Fathead Minnow
Pimephales notatus – Bluntnose Minnow

Catostomidae – Suckers
Carpiodes cyprinus – Quillback Carpsucker
Hypentelium nigricans – Northern Hogsucker
Thoburnia rhothoeca – Torrent Sucker
Moxostoma cervinum – Blacktip Jumprock
Moxostoma erythrurum – Golden Redhorse
Moxostoma anisurum – Silver Redhorse
Moxostoma collapsum – Notchlip Redhorse
Catostomus commersoni – White Sucker

Ictaluridae – Catfishes
Ictalurus punctatus – Channel Catfish
Ameiurus natalis – Yellow Bullhead
Noturus insignis – Margined Madtom
Pylodictis olivaris – Flathead Catfish

Salmonidae – Trouts
Salvelinus fontinalis – Brook Trout
Salmo trutta – Brown Trout
Onchorynchus mykiss – Rainbow Trout

Poeciliidae – Livebearers
Gambusia holbrooki – Eastern Mosquitofish

Cottidae – Sculpin
Cottus bairdi – Mottled Sculpin
Cottus kanawhae – Kanawha Sculpin

Centrarchidae – Sunfish
Ambloplites rupestris – Rock Bass
Pomoxis nigromaculatus – Black Crappie
Pomoxis annularis – White Crappie
Micropterus dolomieu – Smallmouth Bass
Micropterus punctulatus – Spotted Bass
Micropterus salmoides – Largemouth Bass
Lepomis cyanellus – Green Sunfish
Lepomis auritus – Redbreast Sunfish
Lepomis megalotis – Longear Sunfish
Lepomis macrochirus – Bluegill
Lepomis gibbosus – Pumpkinseed
Lepomis microlophus – Redear Sunfish

Percidae – Perches
Sander vitreus vitreus – Walleye
Perca flavescens – Yellow Perch
Percina oxyrhynchus – Sharpnose Darter
Percina caprodes – Logperch
Percina gymnocephala – Appalachia Darter
Percina roanoka – Roanoke Darter
Etheostoma kanawhae – Kanawha Darter
Etheostoma blennioides – Greenside Darter
Etheostoma nigrum – Johnny Darter
Etheostoma flabellare – Fantail Darter

*Highlighted species indicate species confirmed collected in the river segment of interest (including tributaries), while those included on the list but not highlighted have not been observed but are possible inhabitants based on proximity to known populations.

Data Sources

This list was produced by gathering data from the Virginia Fish and Wildlife Information Service database (http://vafwis.org/fwis/) by searching for fish data within the upper New River watershed, specifically in the NRCS unit comprising Chestnut Creek and the adjacent section of the New River. Additional data was gathered from Freshwater Fishes of Virginia (Robert E. Jenkins, Noel M. Burkhead, 1994), as well as fisheries survey data from the Virginia Department of Game and Inland Fisheries (VDGIF).

*Highlighted species indicate species confirmed collected in the river segment of interest (including tributaries), while those included on the list but not highlighted have not been observed but are possible inhabitants based on proximity to known populations.

Subject: FW: Old AT section near Byllesby Dam
Attachments: NRSPresentation516.pdf; MAPTECH Historical Map - MaxMeadows30sw.jpg

---

From: Copeland, John (DGIF) [mailto:John.Copeland@dgif.virginia.gov]
Sent: Wednesday, November 1, 2017 5:14 AM
To: Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>
Cc: Elizabeth B Parcell <ebparcell@aep.com>; Kittrell, Bill (DGIF) <Bill.Kittrell@dgif.virginia.gov>; Copeland, John (DGIF) <John.Copeland@dgif.virginia.gov>; Watson, Brian (DGIF) <Brian.Watson@dgif.virginia.gov>; Pinder, Mike (DGIF) <Mike.Pinder@dgif.virginia.gov>
Subject: FW: Old AT section near Byllesby Dam

Here is the information I mentioned in my other email this morning on potential recreational access at the Buck/Byllesby Project from Jim McNeely, Appalachian Trail historian.

From: Jim McNeely [mailto:thepathsproject@hotmail.com]
Sent: Thursday, September 07, 2017 4:24 PM
To: Copeland, John (DGIF)
Subject: Re: Old AT section near Byllesby Dam

Mr. Copeland:

The section of old AT we discussed is the old road paralleling the railroad upstream of Byllesby. Because of the close proximity of the old road to the railroad, it is difficult to map. The best map I now of to show the entire road is a section of the 1930's era Max Meadows USGS 15' Quad. I attach a jpg copy of the SW section of that quad that shows, upon zooming, the old road. The part of the road from Byllesby to Brush Creek is also shown on the 1965 Austinville USGS Quad, which served a the base map for USGS revisions through the 1980's, at least. So you may find te road on a recent USGS Auistinville Quad. And it may be displayed on some modern digital map programs, since such programs often scoop up all kinds of old roads in their data collection.

I have a pdf copy of the presentation I made, and that includes a pdf map that shows the route. I attach it, although that map is too small a scale to show any detail.

From Byllesby, the road runs to the right (west) of the RR to Brush Creek, crossed the RR just before Brush Creek, then crossed Brush Creek on a bridge (apparently beside the RR bridge on the river side). From Brush Creek, the old road ran beside the RR on the river side, then crossed the RR at Fries Junction and continued to a road intersection with a road that is now an unimproved road out to VA 94 called "Old Fries Junction Rd." Beyond that point, the road apparently originally continued upstream beside the RR but was later abandoned in favor of a road that climbed out of the valley.

The only part of the road that is currently open is that part from Byllesby to Brush Creek, which is about 2 miles in length. I walked it recently, and it is traveled by four-wheel drive vehicles. The portion of the road descending back to the RR at Brush Creek is no longer in use (the vehicle traffic diverts toward Va. 602) and is overgrown, but appears used for foot travel. You can see that old roadbed coming down to the RR on the downstream side of the Brush Creek Bridge if you look left on the hillside.

The road generally stays well away from the RR, but comes into contact at two points at which a guardrail separates the road from the New River Trail SP. The first is the site of Bowers Ferry, and the second the site of the community of Grayson. The road has considerable annual growth in each of those two areas, but is otherwise a very pleasant walk and kept open by the infrequent vehicle traffic.

The road from Byllesby is open to travel and is not posted. It is apparently on NF property for almost its entire length, with a short initial section in the Byllesby area apparently on APCo property.

Its a very easy road to find, and its an easy walk up to Brush Creek with a return by the New River Trail to Byllesby. To get on it at Byllesby, you just follow the gravel road between the New River Trail and the APCo substation and that leads into the unimproved old road. It gets a little confusing toward the Brush Creek end as there are a couple of diverting roads, with the vehicle road diverting uphill, to the right, but if you just stay left at that point on a more faint road you'll find your way down to the New River Trail at Brush Creek. It would actually be easier to follow from the Brush Creek end.

The old roadbed upstream of Brush Creek to Fries Junction is overgrown completely, but can still be made out in places on the river side of the New River Trail. Above Fries Junction, the old roadbed is distinct on the hillside above the New River Trail.
One problem I now recognize (having hiked that area a couple of times recently) is that any change in that road that would stop vehicle traffic would disrupt an extensive network of four-wheel drive roads that are now in use in that corner of land bounded by the New River, Brush Creek and VSR 602. In fact, the road may still be a state right-of-way, as I've come to understand that there are numerous former secondary roads in Virginia that are no longer maintained but are still available for travel. The Old Fries Road is, as I understand it, in that category of roads. So while the very infrequent, and likely seasonal, vehicle use doesn't disturb hiking (in fact, that is what keeps the road open), changing the road's status to no-vehicles-allowed would likely ruffle some local feathers. So if you could designate it for angler access, note by markers or otherwise it was the original AT, but still allow vehicles, that might well work for a number of interests.

This road was a part of what used to be a continuous road from Ivanhoe to Fries. It was apparent VSR 737 when in the state system. The road from

Byllesby to Buck, and perhaps a dead-end section off Va. 94 near Hilltown, is all that is left of that former state road.

I hope this is helpful Let me know if I can provide additional information. And if I can take you on a tour one day, just say when --- although I don't think you'll need a guide to find it.

Jim McNeely
P.O. Box 667
Peterstown, WV 24963
(304) 753-9904

From: Copeland, John (DGIF) <John.Copeland@dgif.virginia.gov>
Sent: Thursday, September 7, 2017 10:33 AM
To: thepathsproject@hotmail.com
Cc: Copeland, John (DGIF)
Subject: Old AT section near Byllesby Dam

We spoke briefly at the New River Symposium in May about an old AT section near Byllesby Dam. You said you have pdf maps you could share that show the location. I am interested in seeing those maps so I can look at it on the ground to evaluate potential angler access to Byllesby Reservoir. We are entering the first stage of consultation with Appalachian Power Company on the new federal operating license for Buck and Byllesby dams, so I am assembling information for that process. If you can send what you have available, I would appreciate it.

John R. Copeland, Fisheries Biologist, Blacksburg Office; VA Dept of Game and Inland Fisheries

https://www.linkedin.com/pub/john-copeland/2a/292/691

John Copeland | Professional Profile | LinkedIn

www.linkedin.com

View John Copeland's professional profile on LinkedIn. LinkedIn is the world's largest business network, helping professionals like John Copeland discover inside connections to recommended job candidates, industry experts, and business partners.


Siloam
Dividing Ridge
Sanders Ridge
Chestnut Ridge Sch.
Laswell
Raper Ridge
Walton Sch.
Galena
Hematite Mtn
(Speedwell)
Brown Hill Ch.
Olive Branch Ch.
Mill
Creek
Jackson Ferry
Porter
Dean Br.
Cripple
Creek
Pierce Mill
N. AND W.
Austinville
WESTERN
Poplar Camp
Bethany
Ivanhoe
APPALACHIAN
POPLAR CAMP
50'
WYTHE CO.
CARROLL CO.
NORFOLK AND
Ewing Mtn
Grays Sch.
Sheeptown
Powder Mill
POWER
McGee Sch.
Branch
Cold Ridge
Big Br.
Buck
UNAKA
Round Top
Byllesby Sch.
FOWLER FERRY
Rocky
Corinth
Farmer Mtn
APPALACHIAN
COMPANY
NATIONAL
Byllesby
Oak Grove
Little Brush
FOREST
Creek
Grayson
Crooked
Brush
Fries Junction
Nebo Sch.
River Hill Sch.
1545000

The Old Appalachian Trail in the New River Valley
1931 - 1955

A Presentation for the 2017 New River Symposium
May 16, 2017

Jim McNeely
P.O. Box 667
Peterstown, WV 24963
(304) 753-9904
thepathsproject@hotmail.com

The Old Appalachian Trail in the New River Valley 1931 - 1955

A Presentation to the 2017 New River Symposium by Jim McNeely

I. Introduction

This presentation is an overview and summary of the results of my studies and field investigation of the former routes of the Appalachian Trail in southern Virginia. For the purposes of this presentation to the 2017 New River Symposium, my primary focus will be on Old AT routes in the New River Valley of southwestern Virginia during the period 1931through 1955.

From its inception in the early 1930's until the mid-1950's, the Appalachian Trail route south of the Roanoke/Salem area in Virginia followed a route along the Virginia Blue Ridge to Fisher Peak, on the North Carolina line, then turned north through Galax and then followed alongside the New River to Byllesby where it turned west along the Iron Mountains ridge toward Damascus, Virginia. That AT route was relocated in 1955 to a more northerly route through the Jefferson National Forest.

My interest in the "Old AT" in Virginia extends back to 1962 when, as a 15-year-old on an extended AT hike through the Southern Appalachian region, I learned of the existence of that former AT route in Southern Virginia. From that initial introduction to the subject of a "lost Appalachian Trail," I've continued to "poke and prod" at Old AT research and field studies in Virginia (as well as through the Southern Appalachians) as time and resources were available over the decades. In 2011, I finally put together the results of my Old AT studies in an article (unpublished, but circulated on-line) that presented information about the Old AT in southern and central Virginia by reference to the 1948 AT hike of Earl Shaffer and, to a lesser extent, the 1951 AT hike of Eugene Espy. In 2016 I published, on-line, a research article that included my 2011 article as well as extensive research materials relating to Old AT routes in Virginia.

For an on-line site to host the research article, I chose the "Hiking" topic tab of the "crazyguyonabike" website. That article can therefore currently be found at www.crazyguyonabike.com in the "Hiking" Topic, under the "Articles" tab of that Topic, under the title " Earl Shaffer's 1948 Appalachian Trail Hike: Report And Research Resources" with the subtitle "A report on the actual route of Earl Shaffer's 1948 AT Hike with supplemental research resource materials."

The direct on-line link to the research article is

http://hiking.topicwise.com/doc/Shaffer48ATHikeReport

This presentation is an introduction to and overview/summary of the materials available in that research article. As such, it will not include extensive specific citations to sources. Anyone interested in more information on the subject of the "Old AT" is encouraged to make reference to that research article as well as other materials available on the history of the Appalachian Trail.

The 1955 relocation abandoned the former AT route from a point on Catawba Mt., west of Salem, to the Va. 16 (formerly US 58) crossing of Iron Mt., between Sugar Grove and Troutdale, a distance of more than 200 miles. Coupled with the abandonment of the 117 miles of AT route between Rockfish Gap and Cloverdale in another relocation finalized in 1951, more than 300 miles of the former AT route in Central and Southern Virginia was abandoned by relocations finalized in the 1950's. An important distinction between the two relocations is that while the old AT route through southern Virginia remained in place, maintained and documented by contemporary trail guides during the process of development of the new AT route, the 1930's era Rockfish Gap - Cloverdale AT route was officially abandoned with publication of the 1941 Guide, which did not include trail data for that section of the AT. It was not until July 1951, after a non-continuous period of about ten years, that the AT again became a continuous trail from Maine to Georgia with the completion of the last link in the "new" AT in July 1951[1] and an official "silver nail" ceremony held atop The Priest on November 1, 1951, to mark what was then hailed as the "second completion of the entire Appalachian Trail."

As a result of that very different treatment of the two AT sections pending relocation, research as to the Old AT through Southern Virginia has the use of trail data from the 1941 and 1950 Guides while research as to the Rockfish Gap - Cloverdale section has available only the 1930's era Guides. It is, in fact, the availability of the 1950 Guide detailing the route of the AT through southern Virginia by reference to modern-era road names and numbers and features identification that substantially facilitates research into that AT route.

This presentation therefore describes the AT route through southern Virginia from Catawba

[1] Eugene Espy was the first AT "thru-hiker" to hike the newly continuous AT as he reached and traveled the completed final link (in the vicinity of The Priest) on July 16, 1951, just a couple of weeks after its completion, on his northbound AT hike.

Mt. (northwest of Salem, Virginia) to the current crossing of Va. 16 on Iron Mt. (near Sugar Grove, Virginia) that was abandoned in that 1955 AT relocation, with a particular focus on that former AT route in the New River watershed.

There are three maps included with this presentation that display selected former routes of the Appalachian Trail in southern Virginia. The "baseline" historic AT route for this presentation is that described in the 4th Edition of the "Guide To Paths in the Blue Ridge," the AT Guide to the region published by the Potomac Appalachian Trail Club (PATC). Earlier editions of that Guide were published by the PATC in 1931 (lst Edition), 1934 (2nd Edition), 1938 (Supplement to the 2nd Edition), and 1941 (3rd Edition). The fact that the PATC published the Guides, rather than the Appalachian Trail Conference (now Conservancy) (ATC) suggests that the AT in southern Virginia was very much a project of that organization. It should also be noted that Trail Data for the AT through southern Virginia in all those guides was prepared only in a North - South direction, which meant that northbound AT hikers had to read the data in reverse.

Maps 2 and 3 display the 1950 Guide AT route in the New River watershed as well as one older route – the "Norvale Crags" route (Map 3) between Fisher Peak and Galax from the '34 and '38 AT Guides. Map 1 is included to display both the original (from the 1931 Guide) and the 1950 AT routes through the Roanoke River watershed.

Appendix 1 to this Presentation is a Legend for the added features and symbols appearing on those maps.

Appendix 2 to this Presentation includes copies of the three maps discussed above.

The route of the original (1931 Guide) AT through the Roanoke Valley displayed on Map 1 is one that has been identified through AT Guide, map and field research. Although at a scale of 1:200,000 Map 1 is at too small a scale to show details of the route, the study route used to develop that route was one using 1:24,000 USGS topographical maps. The route as displayed is therefore the product of detailed route study. However, because the description of the AT route in the 1931 Guide was brief and since many of the landscape features described have been substantially modified, renamed, or have disappeared in the intervening decades, it was found to be sometimes difficult to exactly identify the route in the modern landscape. Further complicating field research of the Old AT route in that area is that most of the off-road '31 AT route was, and remains, on private property. In addition, the mileage stated in the 1931 Guide were found to be difficult to match against known modern features. The route displayed on Map 1 should therefore be generally considered only in the approximate location of the '31 AT. It is displayed only for general historical interest and as a study guide for anyone interested in doing further research to more exactly locate that historic AT route.

The other AT routes displayed on the maps were similarly developed on large-scale USGS topographical maps and transferred to the medium-scale maps included with this Presentation.

The baseline 1950 AT route was documented as of 1949, and was presented in that Guide in considerable detail. Fortunately, by the time of preparation of the 1950 Guide the modern-era identification system of names and numbers had been adopted in Virginia. The detail of that Guide as well as the use therein of modern references for identities of roads and other features makes the 1950 Guide an outstanding, and readily readable, guide to the AT route of that era in a modern landscape.

While the 1950 AT route was often in the same general, or the same, location as earlier AT routes, the route through southern Virginia did change, and sometimes substantially change, its location over the nearly quarter-century the AT was in that area. Some of those changes will be discussed later in this Presentation as to certain areas of particular interest. But locating the Old AT from those earlier guides is often more of a challenge than with the 1950 Guide. The 1941 Guide shared some of the same modern references as the 1950 Guide, but the earlier Guides (1931, '34, '38) become increasingly obscure with increased age as to identifiable references. Part of that problem is a result, however, of lack of access to the extensive private land sites for older AT routes to conduct detailed field studies to locate old roads and trails referenced in the older AT Guides.

Other sources of information about the Old AT in southern Virginia may be found in the reports of hikers who traveled that trail. The two books I am familiar with that include descriptions of that section of the AT before it was abandoned are "Walking With Spring" by Earl V. Shaffer, which describes his 1948 AT hike through the region, and "The Trail Of My Life" by Eugene Espy, which describes his 1951 AT hike through the area. There well may be other books or articles that describe that section of the AT of which I am not aware.

Other potential sources of information are any reports submitted to the Appalachian Trail Conference by Shaffer, Espy or other AT hikers of the era. Also now available is the digitized field notebook journal of Shaffer (his "Little Black Notebook"), a copy of which is available for download in my research article, There may also still be in existence newspaper articles, personal letters, or photographs in private hands that document the Old AT in southern Virginia. A search for such items in that region would be a worthwhile subject for further research.

Before beginning our Old AT travelog , some general discussion of the nature of that Old AT through Virginia might be useful.

While most AT sections have assigned maintenance clubs, the AT south of Sweet Annie Hollow was, in 1950, noted in ATC literature as largely "unassigned" for maintenance purposes.[2] "Unassigned" did not, however, mean "unmaintained," To the contrary, the 1950 Guide makes reference to a blaze remarking program in 1947 as well as the "cutting" of the off-road trail section in the Fisher Peak area, all apparently conducted by PATC or ATC members in ad hoc organizational efforts. Since much of the AT through that area was on maintained local roads, "maintenance" would require nothing more than driving down the roads checking and renewing, as needed, AT white paint blazes or diamond-shaped AT metal markers on trees, fence posts and utility poles.[3] Any off-road trail sections would be either maintained by the Blue Ridge Parkway (in Smart View and Rocky Knob Recreation Areas) or easily accessible from nearby roads. So the 1949 AT, as documented by the 1950 Guide, through southern Virginia would likely have been well-marked and maintained after suffering neglect during the WW II years. It is likely, however, that little or no maintenance was performed after 1949 outside the Dan River area.

The general relationship between the Blue Ridge Parkway and the Appalachian Trail in Virginia is worthy of a brief note.

First off, the Old Appalachian Trail did not follow the Blue Ridge Parkway except for short sections made necessary by topography or connecting to local road/trail networks. While the Old AT route through southern Virginia frequently paralleled the Parkway and often crossed it, the motor highway and the hiking route were not co-located except where for short sections where Parkway construction had interrupted the continuity of local roads and made travel on the Parkway necessary to link the disjointed sections of that local road.

---

[2] With the exception of the personal maintenance activities of John R. Barnard of the Dan River section, which we shall discuss later,

[3] Some of those AT markers can still be found attached to old trees along the Old AT route.

The Appalachian Trail pre-dated the Blue Ridge Parkway, and that the original route of the AT along the crest of the Blue Ridge in Virginia was, in general, the same route chosen for the Blue Ridge Parkway. But while it is a common belief that construction of the Parkway "obliterated" the original AT route, that is not actually the case. In fact, Parkway construction techniques and policies tended to leave the AT route relatively undisturbed.

While the early AT was primarily a ridgetop trail in mountainous areas, Parkway construction techniques tended to make the Parkway a "sideridge" road, swinging around mountain ridges and crossing through gaps. As a result, the existing AT route was directly impacted by Parkway construction only in such Parkway "crossing gaps" in the ridge or in relatively infrequent instances in which the Parkway was located along the ridgecrest. So while the ATC declared the original AT route between Rockfish Gap and Cloverdale "obliterated" by Parkway construction, that was primarily for the purpose of causing the federal government to build a new AT route to mitigate for the original AT's purported destruction by Parkway construction. That was the case north of Roanoke, Virginia, where the "new" AT route finally completed in 1951 was constructed by the federal government to replace the existing AT route purportedly "obliterated" by Parkway construction.

In fact, substantial sections of historically pristine sections of 1930's era AT route still exist along the Parkway corridor between Rockfish Gap and Cloverdale, and can still be followed using the 1931, '34 and '38 Guides. In any area in which there has been no development or other ground disturbance since AT route abandonment in the 1930's or 40's (such as in or near the Parkway corridor), any old trail or roadbed formerly used by the AT likely still exists, undisturbed. In addition, the expansion of both National Forest and NPS land ownership in that area over the intervening decades since the 1930's has resulted in substantial portions of what was private land AT routes in the 1930's now being on public land.

Parkway construction policies as to local roads also tended to have the effect of avoiding impacts to the existing AT route in agricultural areas, including the Blue Ridge south of Roanoke. In such areas, the old AT tended to follow either public secondary roads or privately maintained, but open to public travel, "community roads." In fact, a common routing for the early AT along the Virginia Blue Ridge was the old "ridge road," a pre-Parkway road generally located along the crest of the Blue Ridge. Since the Parkway prohibits commercial traffic, its construction policies were intended to preserve local roads, such as the old ridge road, in the Parkway corridor in order to maintain non-Parkway access to private lands adjoining the Parkway. As a result of that policy, such local roads were commonly avoided or relocated during Parkway construction and Parkway travelers, particularly along the Virginia Blue Ridge, are commonly not aware that such local roads frequently discretely parallel the Parkway. Since the AT route commonly followed such roads, Parkway construction policies to preserve such local roads had the effect of generally avoided impact to the AT route as it followed such roads.

Because of such policies, Parkway construction directly impacted less that a mile of the Old AT route south of Roanoke. In fact, because of that minimal impact the federal government refused to construct a “new” AT south of Roanoke as it had agreed to do north of Roanoke. In my research article, I develop a case to suggest that federal decision to not construct a new AT south of Roanoke played an important role in the 1940's ATC decision to relocate that part of the AT into the Jefferson National Forest where federal assistance was available for AT construction.

Another consequence of the presence of the Parkway on the Old AT route through southern Virginia was the relative lack of modernization of many of the roads formerly followed by the AT. Whether from land use restrictions, a low volume of vehicle use, or other governmental policy, the local roads near the Parkway have not commonly be subject to the degree of widening and paving seen on other local roads in the area. As a consequence, travel on the Old AT roads frequently has a much more “1950-ish” feel than that experienced on other local roads. Since the 1950 AT Guide remains generally strikingly accurate in following the Old AT route through the modern landscape[4], the less developed state of many of those roads adds much to the 1950 “feel” of following the 1950 AT in the modern era on foot, by bicycle, or by motor vehicle.

II. The Old AT in Southern Virginia

We will begin our travel through the New River Basin on the Old AT through southern Virginia just north of the New River watershed, at Sweet Annie Hollow,[5] at Milepost 138.6 on the

---

[4] The primary impact on secondary roads over the decades has been the closure and/or relocation of a number of secondary road intersections with the Parkway.

[5] While the AT Guides referred to the location as “Sweet Anne Hollow,” its locally accepted name is apparently “Sweet Annie Hollow”.

Blue Ridge Parkway. That is an appropriate start point because it was, in 1950, the southern limit of the AT maintenance activities of the Roanoke Appalachian Trail Club (RATC). North of that point is displayed, on Map 1, the route of both the 1931 AT along the Blue Ridge, east of Roanoke, and the 1950 AT route connecting to the current ANST on Catawba Mt., est of Salem, Virginia.

Sweet Annie Hollow is also an appropriate place to begin a journey along the Old AT because of the interesting history of its name. William G. Lord, long-time Parkway Ranger, related in his Blue Ridge Parkway Guide (1969) that Annie, "a widow by fate ands a friendly sort by nature" lived in that hollow during the American Revolution. Lord relates, at page 6_B that soldiers were "frequent visitors" and that Annie reportedly "entertained them 'in a most irreligious manner.'" Since the neighbors took "a dim view" of her activities, Lord writes that Annie left the area but that ". . . the troopers landmarked her homesite as "Sweet Annie's Hollow."

1. AT Section 4: Sweet Annie Hollow to VA 8 (Tuggle Gap)

Beginning, therefore, our travel south on the Old AT from Sweet Annie Hollow (AT MP 4-1.72[6]), the 1950 AT followed roads parallel to the Parkway to an intersection with the Blue Ridge Parkway just south of the Pine Spur Overlook (Parkway MP 144.8: AT MP 4-8.58), an AT distance of 6.86 miles. Earlier AT routes had continued along the ridge in what is now the Parkway corridor from Sweet Annie Hollow, and the old trailway used by the early AT is still apparent (and apparently in use) in that area. The AT was relocated to an all road route by 1950, perhaps because of a lack of maintenance resources for off-road AT sections.

It is in the Old AT approach to Pine Spur that the 1950 AT Route could be said to enter the New River watershed, with the headwaters of Little River draining the northerly and westerly slopes of the Blue Ridge as the Old AT route left the Roanoke River watershed. .

What is now the Pine Spur Overlook on the Parkway was a noted viewpoint in the 1934 AT Guide. By 1950, the relocated followed roads parallel to the Parkway from Sweet Annie Hollow to the Parkway corridor just south of Pine Spur Overlook. At that point the AT followed a foot trail than ran parallel to and within the Parkway corridor for about 1.5 miles (AT MP 4-10.0). That location of the AT within the Parkway corridor (which was also seen south of Sweet Annie Hollow

[6] AT Mile Point from Chapter VII, Southern Virginia, in the 1950 Guide, referencing Section Number and MP, southbound.

in pre-1950 Guides) suggested the potential future of the AT as a trail within an ever-widening Parkway and National Trails Act corridor in that area if the AT had not been relocated as it was.

From MP 10.0, the AT followed secondary roads to the crossroads at Graysville (AT MP 10.21) where the 1950 AT guide noted the presence of an abandoned store (the building is still there) and that lodging was available at this point. The 1950 AT then continued beyond Graysville, again on secondary roads, to AT MP 4-11.72 where it followed a now-abandoned secondary road (then VSR 651) to an intersection with current VSR 651 (Stuart Rd.) at MP 4- 12.01. It then followed secondary roads to cross the Parkway at AT MP 4-12.79, with the presence of the former Kelley School noted in the 1950 AT Guide as then being a store (the building is still there). Beyond that crossing of the Parkway, the AT continued to follow secondary roads toward Thompson Store (AT MP 4-16.05), a store noted in the 1931 AT Guide as being the ". . . first store on the Trail since the 55.6 miles since leaving Vinton." That store building still exists, apparently used for private storage.

Just north of Thompson's Store, at AT MP 4-15.8, the 1950 AT Guide notes a .55 mile side route to "Pumpkin Stem Knob," with the view from that point noted as "Extraordinary view; should not be missed." That reference is one to that same named summit on the original, 1931 AT, with the AT later moved to road locations most likely as a result of lack of maintenance resources.

South from Thompson's Store, the 1950 AT continued on secondary roads to AT MP 4-19.23 where it entered the Smart View Recreation Area of the Blue Ridge Parkway. Through Smart View (from AT MP 4-19.23 to 4-21.13), the 1950 AT followed a trail through that recreation area developed by the NPS in the early 1940's. That trail still exists as part of the Smart View trail system, extending from the Smart View Overlook to VSR 793 (Runnet Bog Rd), with the linkage trail from the existing Smart View loop trail to VSR 793 now abandoned and overgrown.

VSR 793 was followed into Cannaday Gap. South of Cannaday Gap on the 1950 AT, the Trail followed secondary roads alongside or in the vicinity of the Blue Ridge Parkway, passing a store at AT MP 4-22.32 (building still there and used as an artisan studio), then crossing the Parkway and reaching County Line Church at MP 4-23.69. Moving east of and more remote from the Parkway, the AT continued on secondary roads to cross the "Low Gap" near a double summit called "The Haycocks" at MP 4-27.15 and reached the community of Haycock at MP 4-27.75. The 1950 AT Guide includes data for a side trail from Haycock to the summit of Rakes Knob. That side trail included part of the original 1931 AT route.

South of Haycock on the 1950 AT, the Trail followed secondary roads paralleling the Parkway to Tuggle Gap (Va. 8) at MP 4-32.05 and the beginning of Section 5 of the 1950 AT Guide. The 1950 Guide noted the presence of a "store and filling station" in Tuggle Gap where it noted ". . . accommodations are available."

2. AT Section 5: VA 8 (Tuggle Gap) to U.S. 58

South of Tuggle Gap on the 1950 AT, the Trail entered the Rocky Knob area. The original 1931 AT followed an apparently indistinct route more-or-less along the crest of the ridge to the summit of Rocky Knob and beyond. The AT was shifted to a route following roads along the east side of the ridge in the '34 and '38 Guides because of the difficulty in marking, and following, the crestline trail. By the publication of the 1941 Guide, however, the NPS had developed a trail for the AT through the Rocky Knob Recreation Area (and constructed a shelter on the summit of Rocky Knob) that was followed in the '41 and '50 Guides.

Beginning with the 1934 Guide, all AT routes through the Rocky Knob area utilized VSR 716 (Tuggle Gap Rd) south of Tuggle Gap (with that road having since been relocated in the Tuggle Gap area to intersect Va. 8 west of the Parkway). The '34 and '38 routes continued on VSR 716 around the Rocky Knob area and reached the ridge crest by a now-abandoned upper portion of VSR 723 (Patrick Rd SW). That abandoned road and former AT route is now part of the NPS Black Ridge Trail. The '41 and '50 routes left VSR 716 at MP 5-1.67 to follow a farm road uphill and reach the crest of a ridge in what is now the Rocky Knob Campground. It then continued to follow a farm road up the ridge (now part of the NPS Rock Castle Gorge Loop Trail) to a Parkway Overlook at MP 5-3.02 where it joined an NPS trail to the summit of Rocky Knob, where there was a three-sided NPS lean-to, with no bunks or water. (AT MP 5-3.33). That shelter is still a feature of the summit of Rocky Knob, and the old AT route east of the Parkway is now incorporated into the Rocky Knob trail system.

Rocky Knob, at 3572' elevation, is one of the three prominent Blue Ridge peaks associated with the Old AT route through southern Virginia. The other two are Buffalo Mountain (3971') and Fisher Peak (3565'), both of which will be discussed later. The outstanding characteristic of Rocky Knob, as well as other peaks of the Blue Ridge, is their towering height and resultant sight distances over the Piedmont area to the east and south as well as impressive sight distances to other prominent Blue Ride peaks up and down the Blue Ridge. It was the views from those peaks, along with the

Dan River Gorge and Pinnacles of Dan (also to be discussed later) , that made the AT through southern Virginia a remarkable, if not uniquely outstanding, feature of the early Appalachian Trail.

Beyond Rocky Knob, the 1950 AT continued to follow an NPS trail (now part of the NPS Rock Castle Gorge Loop Trail) through the recreation area and beyond through fields, leaving the Rocky Knob Recreation Area, to reach VSR 720 (Rock Castle Gorge Rd.) at AT MP 5-5.83.

In pre-Parkway times, VSR 720 was part of a continuous road extending across the ridge and down to what is now VSR 716. In fact, that portion west of the Parkway appears to have been the '34 and '38 AT route. But Parkway constriction and abandonment of the portion of the road west of the Parkway cut off and substantially isolated a winding section of VSR 720 that laid east of the Parkway. As a result of that isolation and limited use, VSR 720 continues to be the same narrow, unpaved road it was when it was the route for the AT from the 1931 Guide to the 1950 Guide, and AT route abandonment. But while VSR 720 has been largely forgotten as part of the original AT route, it is now well-known regionally as the access road to the "FloydFest" Festival site.

Headed south on the 1950 AT from Rocky Knob Recreation Area on VSR 720, the AT wound it way along that secondary road, passing what is now the FloydFest entrance road at approximately MP 5-6.07 and noting a store (no longer in existence) to the left at MP 5-6.17. It then crossed and recrossed the Parkway and then followed a secondary road (since rebuilt to eliminate a "hairpin" curve) to pass, at MP 5-9.22 what was noted as a ". . . rock church on a hill." That church is the Slate Mountain Presbyterian Church, one of 6 rock churches along the Blue Ridge constructed at the direction and by the inspiration of Presbyterian Minister Robert Childress during the first half of the 20th Century.

The 1950 AT then reached, at MP 5-9.27, what was noted as a "gasoline filling station and crossroad at the headwaters of Rock Castle River." That point, with filling station no longer present, is now a parking area for access to the Rock Castle Gorge area of the Rocky Knob Recreation Area.

The 1950 AT Guide side trail to Buffalo Mt. left the AT at this point, and its route is displayed on Map 2.. Data for that 6.5 mile trail was presented in the AT Guide in a separate "Side Trails" section.

While Buffalo Mt. (often referred to as "The Buffalo:" because of the buffalo-like shape that is visible from great distances along the Blue Ridge) was privately owned, but publicly accessible, during the AT period, it came into public ownership in 1992 and is now protected as within the

Buffalo Mountain Natural Area Preserve and recognized as one of the most significant natural areas in Virginia. In addition to the rare plant and animal occurrences as well as significant natural communities, the exposed high-elevation (3,971') summit offers extraordinarily wide-ranging views in all directions. The description of Buffalo Mt. in the 1950 AT Guide(at page 14-361) reads:

> This isolated peak (3,971 ft.) is one of the most conspicuous features of this section of the Appalachian Trail. Rising abruptly from the Blue Ridge plateau, it affords a widespread view. It is a landmark for many miles , the focal point around which the main Trail route leads along the curving rim of the Blue Ridge.

Continuing on the Old AT south from the head of Rock Castle River, and entering the Dan River watershed,[7] the 1950 AT followed secondary roads bearing east, following and paralleling the crest of the Blue Ridge with the Parkway route distant to the west, to reach US 58 and the end of AT Section 5 at 5-17.02. The 1950 Guide noted that accommodations were available at this point.

3. AT Sections 6 and 7: U.S. 58 to Groundhog Mt.

It was at U.S. 58, and extending for 11.67 miles south through the Dan River Gorge section of the AT, that the Old AT entered the assigned maintenance area of John R. Barnard, one of the few individuals listed in 1950 ATC literature as a "Trail Maintaining Organization." Barnard's section of the 1950 AT followed what was then a primitive secondary road to the eastern rim of the Dan River Gorge (AT MP 6-8.06), then plunged 0.6 miles down the steep side of that 1,000' deep gorge on a well-blazed, but primitive, trail, forded the Dan River (MP 6-8.6), then climbed precipitously up the 1,000' + face of the Pinnacles of Dan to reach its summit at MP 9.31 (2655') before finally reaching the western rim and resuming travel on secondary roads at MP 6-9.91. Barnard, whose home was 0.6 miles from the AT (at MP 10.98), offered lodging to AT hikers.

The Pinnacles of Dan section of the Old AT was in its time on the AT was known as perhaps one of the most scenic, and the most difficult, section of the AT along the Blue Ridge — or, for that matter, along the entire AT. The Pinnacles of Dan emerge in a spectacular fashion from the Dan

---

[7] Although the Old AT strayed far out of the New River and into the Dan River Watershed in AT Section 6, the geological history of the Dan River indicates that it "captured" the the upper basin of Reed Island Creek from the New River (see "Physiographic Divisions and Differential Uplift in the Piedmont and Blue Ridge," Geological Survey Professional Paper 1265 (1982) by John T. Hack and published by the U. S. Department of the Interior). One might therefore say that the Old AT continued in the "former" New River Watershed in its travel through the Dan River area.

River Gorge, and the AT was apparently a very difficult journey through that area. As noted in the 1950 AT Guide (at page 14-339), "The 1.8 m. from the east rim to the west rim of the Canyon is perhaps, for the distance, the most difficult section of The Appalachian Trail."

The Pinnacles of Dan section of the Old AT remains a topic of occasional discussion even in the modern AT community. One common impression is that the original routing of the AT was the Pinnacles of Dan route. In fact, that route was a 1939 relocation caused by the original AT route being disrupted by construction of two hydroelectric dams in the Dan River Gorge. The original AT route followed Cockram's Ridge to the Dan River, crossed the river at the mouth of Round Meadow Creek (at or near the current location of Townes Dam), and then traveled alongside the Dan River before ascending to Low Gap, west of the summit of (and not ascending) The Pinnacles of Dan.

Another well-circulated report is that the route over the Pinnacles was chosen as a more-or-less joke by trail markers working under the direction of ATC Chairman Myron Avery, and that Avery nevertheless accepted the route for the AT. That story may have begun with Earl Shaffer, who stated in "Walking With Spring," at page 57, that "Charlie Thomas," a longtime ATC member, told him that he (Thomas" was scouting Trail in the Dan River area and was involved in "playing a joke" on Avery by pretending to route the AT over the Pinnacles. Shaffer reported that Thomas told hm that Avery climbed the Pinnacles, "was impressed with the view, and approved the route." Eugene Espy repeats Shaffer's story in "The Trail Of My Life," at page 91.

Although a good story, and perhaps true, it is more likely somewhat of an AT legend. As noted above, any scouting for the original AT route would not have involved the Pinnacles (except for development of the side trail to the peak from Low Gap, to the west). Since the Pinnacles were accessible by a side trail from the original 1931 AT route, Avery would have already been familiar with the peak and its view, so any suggestion he would have been first introduced to that peak in the late 1930's by a "joke" trail would be incorrect.

What is much more likely is that when it became necessary to relocate the AT in the late 1930's, Avery relied on John H. Barnard, the local expert on the Dan River area and the AT maintainer for the section, to select the "next best route" after the initial Cockram Ridge Route was closed by Dan River dam construction. It is also likely, and a review of old AT Guides suggests, that the AT routes in the Dan River area were not constructed as new trail but instead followed existing foot trails used by local residents to access or cross the Dan River. And for all its difficulty, the

Pinnacles route did offer a ridgecrest route on the western rim of the gorge that avoided the cliffs encountered in any direct ascent/descent of the gorge wall, and that route allowed the existing Pinnacles side trail to be incorporate into the new AT route. Moreover, the topographical problem with suggesting the Pinnacles route was a "joke" is that in order to support that story one must identify a more suitable, "non-joke," route across the Dan River Gorge that would have been easier ---- and map study as well as my actual experience in exploring the Dan River Gorge area leads me to the conclusion that with the original AT route unavailable, no better route across the Dan River Gorge than the Pinnacles route was available to the AT in the late 1930's. So it is likely that Shaffer's oft-repeated story of the Pinnacles route being a "joke taken seriously" doesn't fit the actual reality of the late 30's relocation of the AT across the Pinnacles of Dan.

Beyond the Dan River Gorge section of the 1950 AT, and leaving John Barnard's maintenance section (and resuming the "Unassigned" category for maintenance), the 1950 AT returned to the secondary road network and reached the end of Section 6 at a crossing of the Blue Ridge Parkway at AT MP 6-11.67. Beyond that point the 1950 AT traveled secondary roads parallel to the Parkway to the Groundhog Mt. Recreation Area, and the end of Section 7, at AT MP 7-5.87.

4. AT Section 8: Groundhog Mt. To Fancy Gap (U.S. 52)

The 1950 AT route from Groundhog Mt. To Fancy Gap (Section 8) reflects AT relocation to gain distance from the Parkway. While the original AT route followed the old "Ridge Road" south of Groundhog Mt., and while that old road still existed as a secondary road parallel to the Parkway (bearing VSR 608), the AT route was relocated west onto secondary roads away from the Parkway corridor from Groundhog Mt. to the vicinity of Ward's Gap (MP 8-8.04). Regaining the old "Ridge Road" (VSR 608), the 1950 AT reached US 52 and the end of AT Section 8 at Fancy Gap.

5. AT Sections 9, 10 and 11: Fancy Gap to Galax

It is not difficult to find the Old AT route south of Fancy Gap, since the old "Ridge Road" followed by the 1950 AT is still numbered VSR 608 ---- and bears the name "Old Appalachian Trail." At MP 9-1.33, VSR 608 (which had ben somewhat relocated by Parkway and I-77 construction), the Old AT route passes what was the privately owned "Devil Den" cave on a private farm in 1950 but is now the 250 acre Devil's Den Nature Preserve. Beyond that point, the Old AT route crosses over I-77 (obviously not a 1950 feature) and crossed the Parkway at MP 9-3.01 to continue on VSR 608 (now absent its Old Appalachian Trail name) to the west of, and parallel with, the Parkway.

Continuing on VSR 608, and with a 0.8 mile stretch on the Parkway as a result of Parkway disruption of the continuity of VSR 608, the Old AT reached Pipers Gap at AT MP 9-6.96 (leaving the Parkway as it approached Pipers Gap on a now abandoned section of VSR 608 that then intersected the Parkway north of the Pipers Gap overpass on the Parkway).

South of Pipers Gap, the 1950 AT again crossed the Parkway, passed Mt. Carroll Church on the left at MP 9-7.87, recrossed the Parkway and then reached the community of Max (MP 9-9.54), where a post office at formerly served AT hikers. Beyond Max, the 1950 AT traveled a now abandoned section of VSR 608 to reach current VSR 608 at its intersection with VSR 715 at MP 9-10.4. This point was the end of AT Section 9 and the beginning of Section 10, the Fisher Peak section of the 1950 AT.

The route of the 1950 AT through the Fisher Peak area was fairly straightforward. The route followed VSR 715 (current name End of the Line Rd.) for 2.2 miles, then left secondary road travel to follow a woods road to the summit of Rich Mt. (MP 10-3.17) and beyond to near the summit of Horse Knob (MP 10-3.92) before reaching an intersection with a blue-blazed trail that turned left to access the summit of Fisher Peak while the AT route turned right to descend the mountain (MP 10-4.49). In 1950, the summit of Fisher Peak (3565') featured a fire tower (erected in 1948) and the large rock slabs on the south side of the summit offering views to the south.

At Fisher Peak began the bold move to the north of the 1950 AT to transition from a westerly direction of travel along the Blue Ridge to a westerly direction of travel along the Iron Mt. ridges. The end of the Iron Mt. Ridges at the New River was Farmer Mt., about 17 air miles (and 25.55 AT miles) to the north on the other side of the New River. So as the 1950 AT turned north at Fisher Peak, its destination was Farmer Mt. in that northerly "offset" of the AT route.

From Fisher Peak, the 1950 AT followed what was then a relatively new fire-road (now Fisher Peak Rd.) that had replaced the former woods road descending the mountain. Briefly entering North Carolina in the course of the descent (Fisher Peak is on the NC/VA line), the 1950 AT route passed at MP 10-5.18 the 1934/'38 AT Norvale Crags route that was abandoned in 1940. Beyond that point, the 1950 AT continued to follow the fire road down the north side of Fisher Peak to reach an intersection with the Blue Ridge Parkway, and the end of Section 10, at MP 10-7.34, with VSR 609 intersecting the Parkway directly across from the fire road intersection. That Old AT route along the ridge leading to Fisher Peak (although not making a public lands connection with VSR 715) and descending north to the Parkway is now on the property of the Blue Ridge Music Center, which is indicated by "BRMC" on Map 3.

Beyond that intersection with the Parkway the 1950 AT entered AT Section 11, following VSR 609 (Peaks Mountain Rd.) north to join VSR 608 (Coal Creek Rd.) At MP 11-5.53 and then following VSR 608 to an intersection with Va. 97 at MP 11-7.51 and then turning left on that highway to reach Va. 89, and Galax, at MP 8.65. Beyond that point the 1950 AT followed Va. 89 (South, then North Main Street) into downtown Galax and to the end of Section 11 at the intersection of N. Main Street and W. Center Street where the 1950 AT Guide noted the presence of the Hotel Blumont and the Galax Post Office.

While the 1950 AT Route in the Fisher Peak area is not complex, the history of the AT in the Fisher Peak area is one of complexity. From a review of the 1931 AT Guide description of that Trail, it is apparent that the 1931 AT did not cross over Fisher Peak. That 1931 Guide details a 2.4 mile side trail to that peak. Instead, the 1931 AT turned north at some point, toward Galax, after passing through Pipers Gap, and followed Coal Creek toward Galax. It was apparently a convoluted route, seemingly bound southwest toward Fisher Peak before reversing itself back to the northeast before moving toward Galax. That route does not appear on Map 3 because of both the difficulty in determining an accurate location from the 1931 description and the confusion in other routes that would result from its inclusion on the map.

What is most interesting about the 1931 Guide is the mention therein (at page 100) that the side trail to Fisher Peak was, in fact, intended to become a side trail to Grandfather Mountain and that it was then complete as far as Norvale Crags (noted as being 5.9 miles beyond Fisher Peak), which was a pre-Parkway private recreational development on the crest of the Blue Ridge just south of Low Gap (north of present-day Va/NC 89). The '31 Guide noted that hikers using that side trail could extend it into a longer route to Galax by use of Va, 117 (now Va. 89) from Norvale Crags to Galax. This suggests that as of 1931, there was serious consideration of a Grandfather Mt. route.

There was no further mention of a Grandfather Mt. route in the AT Guides, but the 1934 AT was rerouted to follow the 1931 Fisher Peak/Norvale Crags side trail, and to then turn north to Galax on then VA 96 (now VA 89 in a substantially rerouted location) (see Map 3). That route continued in the '38 Guide, but the Norvale Crags section was abandoned with the 1941 Guide and the AT routed directly from Fisher Peak to Galax via VSR 609 and VSR 608. It was that route that the 1950

AT followed and was the final AT route through that area. The Norvale Crags route, and the 1931 AT Guide mention of an intended side trail to Grandfather Mt., nevertheless present interesting subjects for additional research.

6. AT Section 12: Galax to Dixons Ferry

From downtown Galax, the 1950 AT followed a series of city streets, then rural secondary roads, 5.5 miles to the AT crossing of the New River at Dixons Ferry and the end of AT Section 12 as well as Chapter VII, "Southern Virginia," of the 1950 AT Guide. By the 1950 AT Guide, that ferry had ceased to operate, but the Guide listed a local resident who would take hikers across the New River at the former ferry crossing.[8]

7. Wythe/Holston District, Jefferson National Forest, Section 1: Dixons Ferry to Byllesby

At Dixons Ferry, the 1950 AT entered Section 1 of Chapter VIII, "Wythe and Holston District of the Jefferson National Forest," of the 1950 AT Guide.

Beyond the New River crossing, the 1950 AT followed a farm lane to the tracks of the Norfolk and Western Railroad , then turned right (downstream) along the left (west) bank of the New River (MP 1-0.1). For the first mile or so the 1950 AT followed the railroad tracks, or a path beside the tracks (the remains of a former road paralleling the railroad that had been washed out by flooding in the 1940's and abandoned). The 1950 AT then followed a road parallel to the tracks, first to the west side of the railroad, then crossing to the east side at Fries Junction (MP 1-3.45), which was then a small railroad station. Continuing on that road, the 1950 AT crossed a bridge over Brush Creek (MP 1-4.0), then crossed to the west side of the tracks and continued on that road (now above and to the west of the railroad) to the community of Byllesby where the Guide reported the presence of a train station and post office.[9]

---

8 In his book "The Trail of My Life," Espy reported the New River hiker ferry arrangement was available when he crossed the New River on his 1951 AT hike. Shaffer missed the turn on the AT route to the ferry when he passed that point during his 1948 AT hike, followed the railroad into Fries, and then traveled by automobile from Fries to Galax to rejoin the AT.

9 The community of Byllesby was located near the site of the Byllesby Hydroelectric Dam on the New River, and provided housing for power company employees who operated and maintained Byllesby Dam and Buck Dam, located downstream on the New River. It no longer has any residents or services, but power company activity continues and it is a public access point to the New River and for the New River Trail State Park.

The former N & W railroad bed, with branches from Fries Junction into Fries and Galax, is now a recreation rail-trail of the New River Trail State Park.

8. Wythe/Holston Section 2: Byllesby to US 21 (Dry Run Gap)

The 1950 AT left Byllesby by a secondary road that crossed the N & W tracks, then followed the left bank of the New River, downstream. At MP 2-0.12, the AT turned left from that road, away from the river, and followed a road (now gated and posted) that again crossed the railroad, passed through what was then a number of summer cottages (none of which now exist), and then ascended to the crest of the Farmer Mt. ridge (MP 2-1.05). At that point the 1950 AT completed its "northerly offset" from the western end of the Blue Ridge route at Fisher Peak, and turned west toward Damascus, Virginia, following a route along the ridges of the Iron Mountains[10] through the Jefferson National Forest.

From the crest of Farmers Mt., overlooking Byllesby, the dam, and the New River, the AT followed the ridge of Farmer Mt. (MP 2-1.05) to VSR 602 (Byllesby Rd.) (MP 2-2.33). That trail still exists on the crest of that ridge, although its intersection with VSR 602 has been disturbed by subsequent road construction creating a steep embankment between the road and the old trail.

After turning right on VSR 602, the 1950 AT followed that road to VA 94, then VA 94 to VSR 602 (Brush Creek Rd.), and followed VSR 602 to a right turn on a private drive (which was the Old Brush Creek Rd.) at MP 2-7.47.[11] The 1950 AT then passed through a private farm to reach a Forest Service trail (MP 2-7.93),[12] which it followed over a ridge to Bournes Branch (MP 2-9.11). From that point, the Trail followed a " wood road" up Bournes Branch and ascended to the summit of Jones Knob (3833'), where there was then a fire tower offering wide-ranging views (MP 2-11.5). The 1950 AT route is an early predecessor of current Forest Service trails in that area, with the

---

[10] The Iron Mountains is a ridge complex extending from the New River in Virginia to the Doe River near Hampton, TN. While a single ridge in some areas bearing the name "Iron Mountain," in other areas it consists of multiple ridges bearing different names. That is the case along the section of the Iron Mountains traveled by the 1950 AT between Farmer Mt. and VA 16, with Farmer Mt. being the first of the Iron Mountains ridges traveled by the 1950 AT.

[11] Often confusing the tracing of Old AT routes is the relocation/reconstruction of the old roads and trails followed by Old AT routes. That is the case with Brush Creek road, since the former Brush Creek Road was the route for the 1930's AT routes.

[12] Now part of the Mount Rodgers National Recreation Area.

current trails frequently in different locations than the Old AT route.

Beyond Jones Knob, the 1950 AT continued to follow the crest of the Iron Mountains on a Forest Service trail in a generally westerly direction and reached Dry Run Gap and US 52 at MP 2-18.12. Like in the case of Byllesby Road, highway reconstruction had created a deep cut in the ridge that disrupted the older AT route (first noted in the 1938 Guide) through that gap.

The route of the western portion of the 1950 AT between Jones Knob and Dry Run Gap is now part of the Forest Service Iron Mountain Trail, with the eastern portion still in existence but now inaccessible on private land. While the FS trail has been relocated just east of Dry Run Gap to avoid the steep descent at the highway embankment, the Old AT route is still apparent and can be traveled.

9. Wythe/Holston Section 3: US 21 (Dry Run Gap) to Houndshell Gap

The history of the Old AT route west of Dry Run Gap is an all-too-common account of a 1930's Forest Service Trail being converted to, or replaced by, a fire road. The 1934 AT Guide describes a Forest Service Trail along the crest of the ridge leading 3.95 miles to the summit of Comers Rock (4035'), where there was a fire tower[13] (MP 3-3.95). The 1938 Guide notes that the former graded trail had been replaced by a road built by the CCC, with only a short section of trail remaining to access the Comers Rock summit. The 1941 Guide notes the appearance of the Forest Service Comers Rock Camp at MP 3-3.7, but also notes that the AT was by then on a fire road through the entire area. That was essentially the situation described in the 1950 AT Guide, with the AT following automobile roads for the first 6.5 miles of the section. That kind of conversion of early=era trails followed by the Old AT to fire roads was a common result of CCC and Forest Service construction activity.[14] Following, therefore, both automobile and woods roads from Dry Run Gap, the 1950 AT reached VSR 601 (Flat Ridge Rd.) just north of Houndshell Gap at MP 3-13.56.

10. Wythe/Holston Section 4: Houndshell Gap to Va. 16

From Houndshell Gap, the 1950 AT followed woods roads and a steep trail section to reach the crest of Straight Mt. (of the Iron Mountains range) at MP 4-1.27. From that point the 1950 AT

---

[13] The 1950 AT guide indicated that the view from Comers Rock included the summit of Buffalo Mt., some 41 air miles away.

[14] More recent decades have seen, encouragingly, the development of a more extensive Forest Service trail network, including in the Comers Rock/Iron Mt. area.

traveled west along the extensively clear crest of that mountain and reached the highway across Iron Mt. (MP 4-6.35) that is now Va. 16. It was, according to the 1950 AT Guide, then U. S. 58. And, just as in the case of Dry Run Gap, highway construction had created a deep cut in the crest of the ridge that had disrupted the former AT route. The AT Guide noted the presence of a filling station in the gap where "Lunches and canned goods" could be purchased.

This point was the southern end of the 1955 relocation, with the relocated AT reaching that same gap by a road walk up the highway from Dickies Gap. The ANST has been subsequently relocated and no longer passes through that gap.

III. Conclusion

What I have described in this Presentation is that "lost" Appalachian Trail through southern Virginia, and particularly the New River watershed, that I heard about as a youth while on that 1962 AT hike on the then "new" Appalachian Trail through southwestern Virginia. This Presentation has therefore been both an opportunity for me to travel, in some "virtual" fashion, the length of that Old AT route while introducing Symposium participants to some general impression of its location, history and features. If for no other reason than to give recognition to the quality of that Old AT route and to the many dedicated individuals who labored to bring that Trail into existence and maintain it for nearly a quarter-century as The Appalachian Trail, it is a Trail worthy of description.

I note that on the agenda of this Symposium my Presentation is included in the "Partnerships" Session. Although that may well have been because it is hard to categorize a presentation about a long-ago abandoned Appalachian Trail route when what seems more current, and perhaps more relevant, topics demand our attention. But I suggest that inclusion in this "Partnerships" session is, in fact, right on the mark as to my intent and goals for this Presentation.

In fact, I suggest that an introduction to and description of the Old AT through southern Virginia is about development of a potentially useful partnership ---- a partnership of what the Old AT was in southern Virginia from 1931 through 1955 and what that AT history and that Old AT route as it exists in the modern era can contribute to the recreational, cultural and economic development of the New River Valley of Southwestern Virginia today. For while the organizations managing the Appalachian Trail could "abandon" that Appalachian Trail route, such an action could not deprive the region of the existence of the Old AT route, its features and its history.

That layer of Appalachian Trail history in southern Virginia from 1931 to 1955 rightfully belongs to that region and its people. It therefore ought to be more researched, better understood, and more extensively documented so as to be effectively incorporated into the recreational and cultural life, and the economy, of the region.

Examples that come to mind as to how the Old AT might fit into current activities in the region include designated bicycle routes on secondary roads that were once the Old AT route, markers or maps identifying existing or new hiking trails or routes that were once part of the AT, and development of new or enhancement of existing motor vehicle tour routes by features of Old AT history. Communities along the current ANST certainly incorporate that Trail, with its strong cultural identity in our society, in their community development activities. Southern Virginia could similarly adopt and promote its own, and unique, history of the Old AT along the Virginia Blue Ridge to support its community development goals.

I hope by this Presentation to facilitate and encourage both recognition of the importance of Old AT history in the New River Valley and throughout southern Virginia, and consideration of incorporation of that history and the Old AT route into the recreational and cultural life, and the economy, of that region.

I would welcome any comments or questions, with communication by USPS or email preferred, about this Presentation.

I appreciate the opportunity to make this Presentation to the 2017 New River Symposium.

Thank you.

Jim McNeely
P. O. Box 667
Peterstown, WV 24963
(304) 753-9904
thepathsproject@hotmail.com
May 16, 2017

Appendix 1: Map Legend

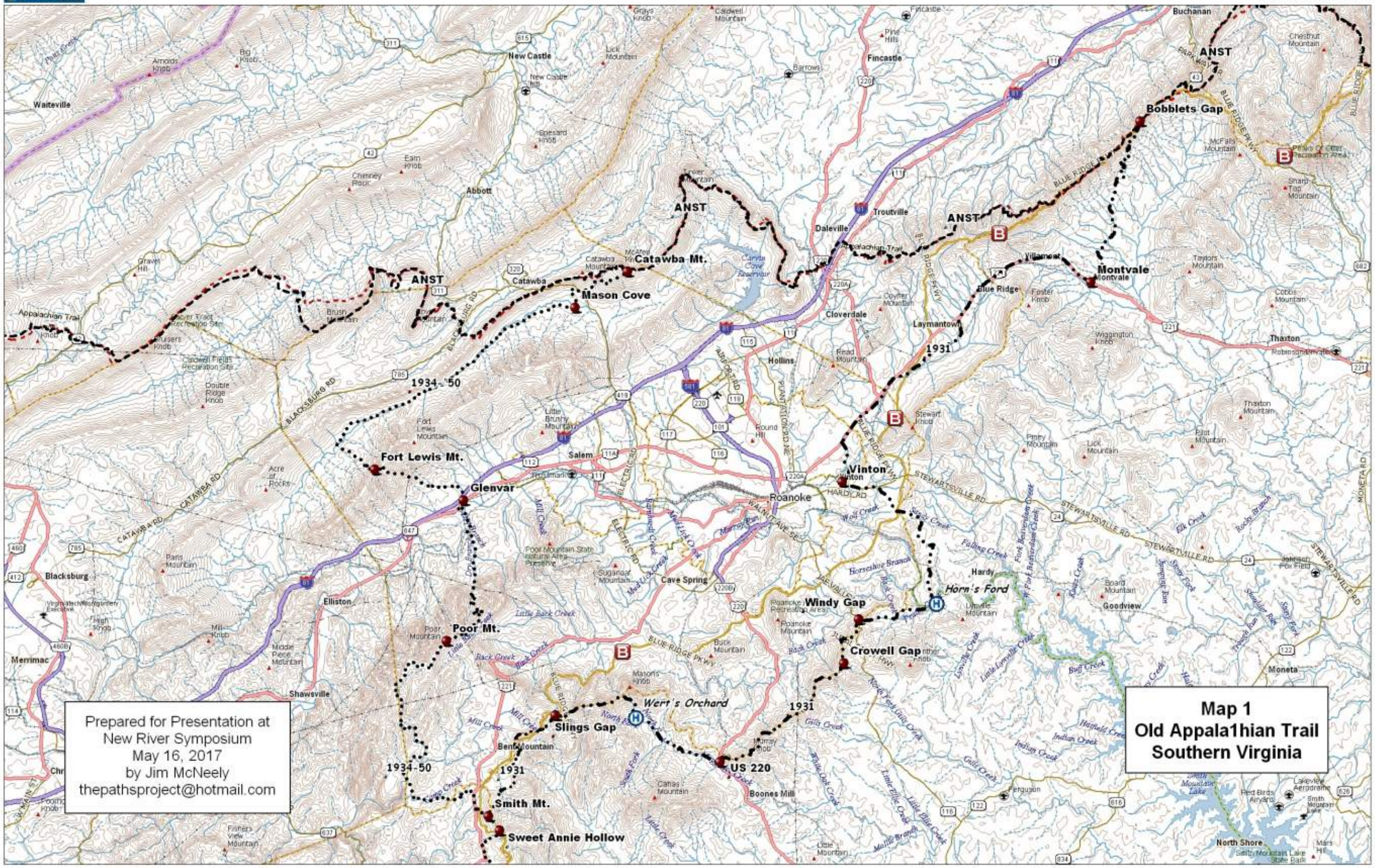
The locations of various trails and other features of interest are indicated on the three Presentation maps as follows:

1950 AT	• • • • • • •
Featured other AT routes	• • — • • — • •
Current Appalachian National Scenic Trail route (ANST)	– – – – – –
Other noted recreation trails	
New River Trail State Park (NRT)	• — • — •
Blue Ridge Parkway	Block **B**
Selected currently existing point of interest	●
Selected historic point of interest	Circled **H**

Appendix 2: Maps 1 - 3

DELORME

Topo North America™ 9



MN (8.7° W)

0 1 2 3 4 5 mi

Data Zoom 10-0

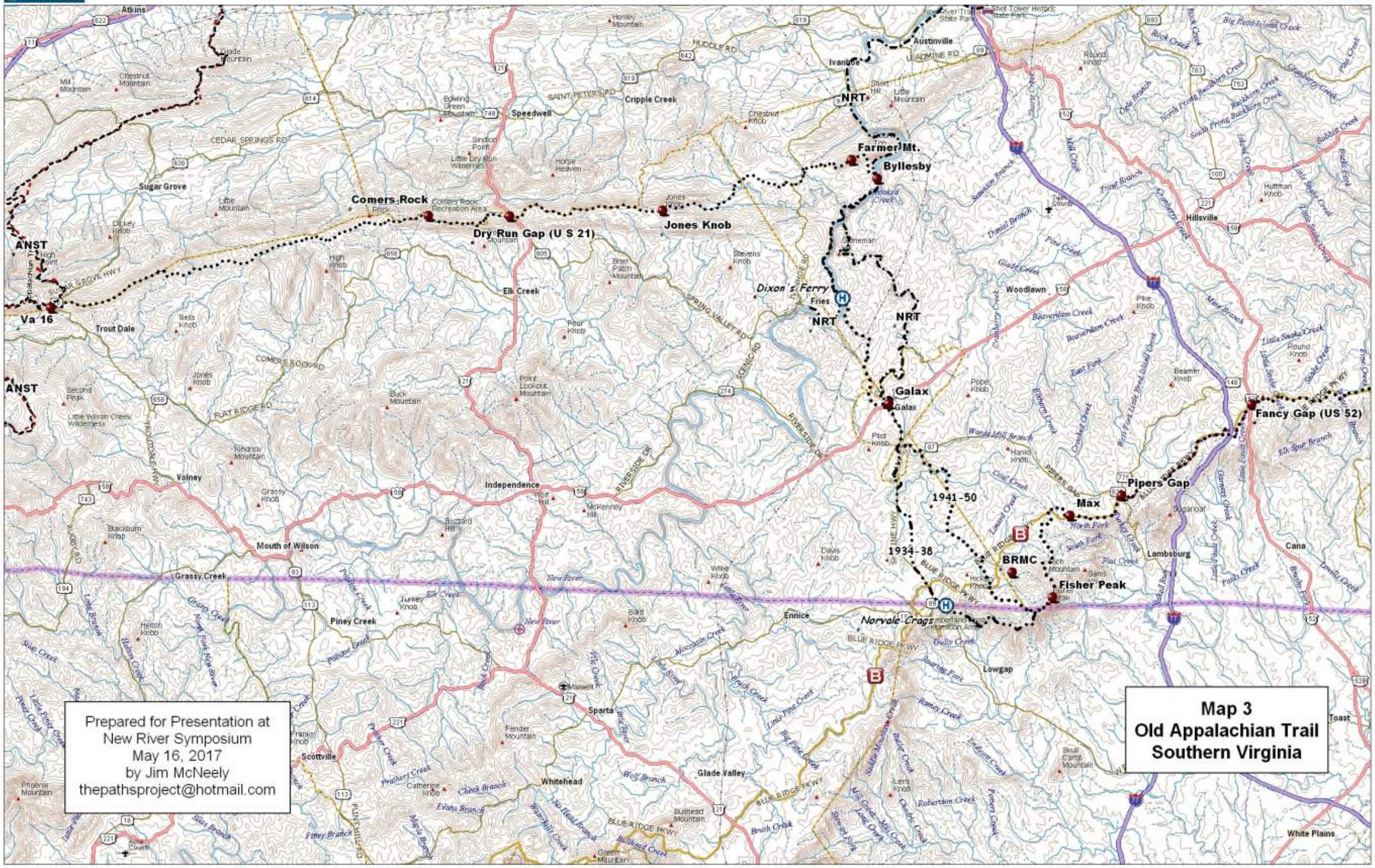
MN (8.4° W)

0 1 2 3 4 5 mi

Data Zoom 10-0

DeLorme

Topo North America™ 9



MN (7.9° W)

0 1 2 3 4 5 mi

Data Zoom 10-0

Subject: FW: Byllesby/Buck PAD information call summary
Attachments: 20171024 Byllesby Buck PAD info_AEP VDGIF call summary.docx

From: Kulpa, Sarah
Sent: Monday, November 6, 2017 10:12 AM
To: 'Copeland, John (DGIF)' <John.Copeland@dgif.virginia.gov>; 'Kittrell, Bill (DGIF)' <Bill.Kittrell@dgif.virginia.gov>; 'Watson, Brian (DGIF)' <Brian.Watson@dgif.virginia.gov>
Cc: 'Elizabeth B Parcell' <ebparcell@aep.com>; MacVane, Kelly <Kelly.MacVane@hdrinc.com>; jmmagalski@aep.com
Subject: Byllesby/Buck PAD information call summary

Good morning,

We have drafted a summary of our call on Oct. 24th. We plan to include this summary in the consultation appendix of this PAD, in lieu of PAD questionnaire response from VDGIF. A copy of the summary is attached for your courtesy review; please provide any edits or clarifications if needed.

Thank you again for your time and participation in this process, and thanks in advance for any additional information VDGIF is able to send in support of the development of this PAD.

Have a good week,

Sarah Kulpa
D 704.248.3620 **M** 315.415.8703

ONEHDRED
1917-2017

hdrinc.com/follow-us

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
April 25, 2018

OFFICE OF ENERGY PROJECTS

Project No. 2514-000 – Virginia
Byllesby & Buck Hydroelectric Project
Appalachian Power Company

Chief Bill Harris Catawba Indian Nation 996 Avenue of the Nations Rock Hill, SC 29730	Chief Richard Sneed Eastern Band of Cherokee Indians P.O. Box 455 Cherokee, NC 28719
Deborah Dotson, President Delaware Nation P.O. Box 825 Anadarko, OK 73005	Chief Dean Branham Monacan Indian Nation P.O. Bo 1136 Madison Heights, VA 24572

Reference: Tribal Consultation for the Byllesby & Buck Hydroelectric Project No. 2514

To the Tribal Leaders Addressed:

The Federal Energy Regulatory Commission (Commission) invites your participation in the relicensing process for the existing Byllesby & Buck Hydroelectric Project No. 2514 (Byllesby & Buck Project). The Commission's relicensing process is an opportunity for both the licensee and interested agencies, tribes, and other stakeholders to consider the project's existing operation and protection, mitigation, and enhancement measures, and evaluate the need for any changes or additional measures to be implemented over the term of any new license issued for the project. The 30.1-megawatt Byllesby & Buck Project is located on the New River in Carroll County, Virginia. We anticipate that Appalachian Power Company, the licensee for the project, will file a notice of intent and a Pre-Application Document by February 28, 2019, and an application for a new license must be filed by February 28, 2022.

It is very important that a Tribe whose interests could be affected by the Byllesby & Buck Project participate early in the process so that tribal concerns are addressed. For this reason, please inform us if you have an interest in participating in the relicensing process for the project. In addition, please indicate if you would like to meet with Commission staff to discuss the Commission's licensing process, how your Tribe can participate to the fullest extent possible, your interests and concerns in the affected area, and how to establish procedures to ensure appropriate communication between

Commission and Tribal staffs. The meeting can be limited to Commission and your Tribal staff, or can be open to other Tribes or Appalachian Power Company.

If at all possible, we would appreciate your response by May 25, 2018. The Commission strongly encourages electronic filing. Please file your response using the Commission's eFiling system at http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov, (866) 208-3676 (toll free), or (202) 502-8659 (TTY). In lieu of electronic filing, please send a paper copy to: Secretary, Federal Energy Regulatory Commission, 888 First Street N.E., Washington, D.C. 20426. The first page of any filing should include docket number P-2514.

If you have any questions or comments, please contact Allyson Conner at (202) 502-6082, or at allyson.conner@ferc.gov. Ms. Conner will contact you shortly to follow-up on this letter.

Sincerely,

John B. Smith, Chief
Mid-Atlantic Branch
Division of Hydropower Licensing

cc: Harold Peterson
Bureau of Indian Affairs – Eastern Region
545 Marriott Drive, Suite 700
Nashville, TN 37214

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
April 25, 2018

OFFICE OF ENERGY PROJECTS

Project No. 2514-000 – Virginia
Byllesby & Buck Hydroelectric Project
Appalachian Power Company

Chief Bill Harris Catawba Indian Nation 996 Avenue of the Nations Rock Hill, SC 29730	Chief Richard Sneed Eastern Band of Cherokee Indians P.O. Box 455 Cherokee, NC 28719
Deborah Dotson, President Delaware Nation P.O. Box 825 Anadarko, OK 73005	Chief Dean Branham Monacan Indian Nation P.O. Bo 1136 Madison Heights, VA 24572

Reference: Tribal Consultation for the Byllesby & Buck Hydroelectric Project No. 2514

To the Tribal Leaders Addressed:

The Federal Energy Regulatory Commission (Commission) invites your participation in the relicensing process for the existing Byllesby & Buck Hydroelectric Project No. 2514 (Byllesby & Buck Project). The Commission's relicensing process is an opportunity for both the licensee and interested agencies, tribes, and other stakeholders to consider the project's existing operation and protection, mitigation, and enhancement measures, and evaluate the need for any changes or additional measures to be implemented over the term of any new license issued for the project. The 30.1-megawatt Byllesby & Buck Project is located on the New River in Carroll County, Virginia. We anticipate that Appalachian Power Company, the licensee for the project, will file a notice of intent and a Pre-Application Document by February 28, 2019, and an application for a new license must be filed by February 28, 2022.

It is very important that a Tribe whose interests could be affected by the Byllesby & Buck Project participate early in the process so that tribal concerns are addressed. For this reason, please inform us if you have an interest in participating in the relicensing process for the project. In addition, please indicate if you would like to meet with Commission staff to discuss the Commission's licensing process, how your Tribe can participate to the fullest extent possible, your interests and concerns in the affected area, and how to establish procedures to ensure appropriate communication between

Commission and Tribal staffs. The meeting can be limited to Commission and your Tribal staff, or can be open to other Tribes or Appalachian Power Company.

If at all possible, we would appreciate your response by May 25, 2018. The Commission strongly encourages electronic filing. Please file your response using the Commission's eFiling system at http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov, (866) 208-3676 (toll free), or (202) 502-8659 (TTY). In lieu of electronic filing, please send a paper copy to: Secretary, Federal Energy Regulatory Commission, 888 First Street N.E., Washington, D.C. 20426. The first page of any filing should include docket number P-2514.

If you have any questions or comments, please contact Allyson Conner at (202) 502-6082, or at allyson.conner@ferc.gov. Ms. Conner will contact you shortly to follow-up on this letter.

Sincerely,

John B. Smith, Chief
Mid-Atlantic Branch
Division of Hydropower Licensing

cc: Harold Peterson
Bureau of Indian Affairs – Eastern Region
545 Marriott Drive, Suite 700
Nashville, TN 37214

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
May 10, 2018

OFFICE OF ENERGY PROJECTS

Project No. 2514-000 – Virginia
Byllesby & Buck Hydroelectric Project
Appalachian Power Company

Chief Bill John Baker Cherokee Nation P.O. Box 948 Tahlequah, OK 74465	Chief Joe Bunch United Keetoowah Band of Cherokee Indians in Oklahoma P.O Box 746 Tahlequah, OK 74465

Reference: Tribal Consultation for the Byllesby & Buck Hydroelectric Project No. 2514

To the Tribal Leaders Addressed:

The Federal Energy Regulatory Commission (Commission) invites your participation in the relicensing process for the existing Byllesby & Buck Hydroelectric Project No. 2514 (Byllesby & Buck Project). The Commission's relicensing process is an opportunity for both the licensee and interested agencies, tribes, and other stakeholders to consider the project's existing operation and protection, mitigation, and enhancement measures, and evaluate the need for any changes or additional measures to be implemented over the term of any new license issued for the project. The 30.1-megawatt Byllesby & Buck Project is located on the New River in Carroll County, Virginia. We anticipate that Appalachian Power Company, the licensee for the project, will file a notice of intent and a Pre-Application Document by February 28, 2019, and an application for a new license must be filed by February 28, 2022.

It is very important that a Tribe whose interests could be affected by the Byllesby & Buck Project participate early in the process so that tribal concerns are addressed.[1] For this reason, please inform us if you have an interest in participating in the relicensing process for the project. In addition, please indicate if you would like to meet with Commission staff to discuss the Commission's licensing process, how your Tribe can participate to the fullest extent possible, your interests and concerns in the affected area,

[1] In a letter dated April 25, 2018, the Catawba Indian Nation, Delaware Nation, Eastern Band of Cherokee Indians, and the Monacan Indian Nation were invited to participate in tribal consultation for this project.

and how to establish procedures to ensure appropriate communication between Commission and Tribal staffs. The meeting can be limited to Commission and your Tribal staff, or can be open to other Tribes or Appalachian Power Company.

If at all possible, we would appreciate your response by June 9, 2018. The Commission strongly encourages electronic filing. Please file your response using the Commission's eFiling system at http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov, (866) 208-3676 (toll free), or (202) 502-8659 (TTY). In lieu of electronic filing, please send a paper copy to: Secretary, Federal Energy Regulatory Commission, 888 First Street N.E., Washington, D.C. 20426. The first page of any filing should include docket number P-2514.

If you have any questions or comments, please contact Allyson Conner at (202) 502-6082, or at allyson.conner@ferc.gov. Ms. Conner will contact you shortly to follow-up on this letter.

Sincerely,

John B. Smith, Chief
Mid-Atlantic Branch
Division of Hydropower Licensing

cc: Harold Peterson
Bureau of Indian Affairs – Eastern Region
545 Marriott Drive, Suite 700
Nashville, TN 37214

ORIGINAL

ᏣᏔᎩ ᎠᏰᎵ
CHEROKEE NATION®
P.O. Box 948 • Tahlequah, OK 74465-0948 • 918-453-5000 • cherokee.org

Office of the Chief

Bill John Baker
Principal Chief
ᏫᎵ ᏣᏂ ᏗᏍᏚᏢᏍᎩ
ᎤᎬᏫᏳᎯ

S. Joe Crittenden
Deputy Principal Chief
Ꮝ. ᏦᏩ ᏗᎬᏘᏍᎩ
ᏔᎵᏁ ᎠᏓᏅᏁ ᎤᎬᏫᏳᎯ

FILED
SECRETARY OF THE COMMISSION
2018 AUG 15 P 2:53
REGULATORY COMMISSION

August 1, 2018

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, D.C. 20426

Re: P-2514, Byllesby & Buck Hydroelectric Project

Secretary Kimberly D. Bose:

The Cherokee Nation (Nation) is in receipt of your correspondence about **P-2514, Byllesby & Buck Hydroelectric Project**, and appreciates the opportunity to provide comment upon this project.

The Byllesby & Buck Project lies within the Nation's aboriginal homelands. Thus, please allow this letter to serve as the Nation's interest in acting as a consulting party to this proposed undertaking.

Additionally, the Nation requests that the Federal Energy Regulatory Commission conduct appropriate inquiries with other pertinent Tribal and Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation's databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,

Elizabeth Toombs

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office
elizabeth-toombs@cherokee.org
918.453.5389

CC: Allyson Conner

TELEPHONE MEMO

To: Public Files
From: Allyson Conner
Date: September 20, 2018
Docket: P-2514-000
Project: Byllesby & Buck Hydroelectric Project

Subject: Consultation with Tribes for the Byllesby & Buck Hydroelectric Project No. 2514

On April 25, 2018, Allyson Conner, staff of the Division of Hydropower Licensing with the Federal Energy Regulatory Commission (Commission), issued a letter initiating tribal consultation for the relicensing process of the existing Byllesby & Buck Hydroelectric Project 2514-000.

On August 2, 2018, Ms. Conner spoke with Elizabeth Toombs, Tribal Historic Preservation Officer, Cherokee Nation. Ms. Toombs indicated that she wants to be notified of all communication with the State Historic Preservation Office regarding cultural resources, she wants to receive any cultural reports that Appalachian Power Company (licensee) knows about, and she would like to be added to the mailing list. Ms. Toombs also indicated that the Delaware Tribe of Indians should be consulted regarding this project.

On August 2, 2018, Ms. Conner received an email from Sheila Bird, United Keetowah Band of Cherokee Indians in Oklahoma, indicating that she would like to have a tribal consultation phone conversation. On August 8 and September 9, 2018, Ms. Conner emailed Ms. Bird to set up the meeting but has received no further response.

On August 3, 2018, Ms. Conner received an email from Karenne Wood, Department of Cultural Preservation, Monacan Indian Nation, indicating that the tribe is not opposed to the relicensing of the project nor does the tribe intend to initiate formal consultation at this time.

On September 4, 2018, Ms. Conner received an email from Kimberly Penrod, Director of Cultural Resources, Delaware Nation, indicating that the Nation concurs with the proceeding and would like to be consulted on the project. Ms. Penrod stated that the Nation would like to be kept up to date on the progress of the project and should be contacted immediately if any discoveries arise.

On July 17, August 1, and September 7, 2018, Ms. Conner called the Catawba Indian Nation and the Eastern Band of Cherokee Indians and left a voicemail each time. No calls were returned.

From: Kulpa, Sarah
Sent: Tuesday, January 8, 2019 2:25 PM
To: ACHP - John Eddins; American Whitewater - Kevin Colburn; Appalachian Trail Conservancy - Andrew Downs; Caroll County Administrator - Steve Truitt; Cherokee Nation - Elizabeth Toombs; Fish and Wildlife Conservation - Caitlin Carey; Fish and Wildlife Conservation - Donald J. Orth; Harold Peterson; New River Conservancy - George Santucci; New River Conservancy - Laura Walters; New River Outdoor Adventures - Tim Dixon; New River Trail State Park - Sam Sweeney; Town of Fries - Scott McCoy; USFWS Chesapeake Bay Field Office - Janet Norman; USGS - Mark Bennett; VADCR - Lynn Crump; VADCR - Robbie Ruhr; VADEQ - Bettina Rayfield; VADEQ - Matthew Link; VADEQ - Scott Kudlas; VADEQ - Tony Cario; Virginia Council on Indians - Benjamin Hermerding; Virginia Department of Conservation and Recreation - Rene Hypes; Virginia Department of Game and Inland Fisheries - John Copeland; Virginia Department of Game and Inland Fisheries - William Kittrell
Cc: Jonathan M Magalski; Elizabeth B Parcell; MacVane, Kelly; Yayac, Maggie; Quiggle, Robert
Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514) -- Filing of Notice of Intent and Pre-Application Document
Attachments: Byllesby-Buck Project NOI_PAD Transmittal Letter 20190107.pdf

Byllesby-Buck Hydroelectric Project Stakeholders:

Appalachian Power Company (Appalachian), a unit of American Electric Power (AEP), is the licensee, owner and operator of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project) located on the upper New River in Carroll County, Virginia. The Project is operated under a license issued by the Federal Energy Regulatory Commission (FERC). The existing FERC license for the Project expires on February 29, 2024. On January 7, 2019, Appalachian filed the Pre-Application Document (PAD) and Notice of Intent (NOI) to relicense the Project with FERC. The filing of the NOI and PAD mark the formal start of the FERC relicensing process for the Project.

On behalf of Appalachian, we are notifying stakeholders of the availability of the NOI and PAD. For your convenience, a copy of the cover letter filed with these documents is attached. Please note that, due to file size restrictions, the NOI and PAD have not been included in this email. Appalachian encourages stakeholders to view the filings online at FERC's eLibrary at http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20190107-5203. Appalachian will also be adding the NOI and PAD to the Project's public relicensing website (http://www.aephydro.com/HydroPlant/ByllesbyBuck) in the coming days.

Should you have any questions regarding these filings, please contact Liz Parcell with AEP at (540) 985-2441 or ebparcell@aep.com.

Thank you,

Sarah Kulpa
Senior Regulatory Specialist

HDR
440 S. Church Street, Suite 900
Charlotte, NC 28202-2075
D 704.248.3620 **M** 315.415.8703
sarah.kulpa@hdrinc.com

APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY

Appalachian Power
Hydro Generation
P O Box 2021
Roanoke, VA 24022-2121
appalachianpower.com

Via Electronic Filing

January 7, 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514)
Notice of Intent and Pre-Application Document

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Applicant), a unit of American Electric Power (AEP) is submitting to the Federal Energy Regulatory Commission (FERC or Commission) the Notice of Intent (NOI) to file an application for a subsequent license and Pre-Application Document (PAD) for the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project) located on the upper New River in Carroll County, Virginia. The existing FERC license for the Project expires on February 29, 2024.

The Applicant is distributing this letter to the stakeholders listed on the distribution list in Appendix A of the PAD. For stakeholders listed in Appendix A who have provided an email address, the Applicant is distributing this letter via e-mail; otherwise, the Applicant is distributing this letter via U.S. mail. Stakeholders interested in the relicensing process may obtain a copy of the NOI and PAD electronically through FERC's eLibrary at https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2514 or on the Applicant's website http://www.aephydro.com/HydroPlant/ByllesbyBuck. If any stakeholder would like to request a CD containing an electronic copy of the NOI and PAD, please contact the undersigned at the information listed below. In addition, the Applicant is providing two courtesy paper copies of the NOI and PAD to Commission Staff in the Office of Energy Projects and Office of General Counsel – Energy Projects, as required by the Commission's filing guidelines. The NOI and PAD are available for review at the Applicant's business office during regular business hours located at 40 Franklin Road SW Roanoke, VA 24011.

Appendix D of the PAD includes a single-line electrical diagram of the Project and an existing Exhibit F Project drawing, as required by the Commission's PAD content requirements under 18 CFR § 5.6(d)(2)(iii)(D). The information contained in these drawings are deemed as Critical Energy Infrastructure Information (CEII) under 18 CFR §388.113, thus Appendix D of the PAD is not being distributed to the public. The Applicant is filing Appendix D under the Commission's eFiling guidelines for filing CEII. Appendix I of the PAD includes cultural resources study reports and therefore is being filed as Privileged (non-public) to protect the location of resources listed on or eligible for the National Register of Historic Places.

In accordance with 18 CFR §5.5(e) of the Commission's regulations, the Applicant requests that the Commission designate Appalachian as the Commission's non-federal representative for purposes of consultation under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470f and the NHPA implementing regulations at 36 CFR Part 800.
In addition, the Applicant requests that FERC designate Appalachian as the non-federal representative for the Project for the purpose of consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service, pursuant to Section 7 of the Endangered Species Act (ESA) and the joint agency ESA implementing regulations at 50 CFR Part 402.

We look forward to working with the Commission's staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, members of the public, toward developing a license application for this renewable energy facility. If there are any questions regarding this letter or the NOI or PAD, please contact me at ebparcell@aep.com or via phone at (540) 985-2441.

Sincerely,

Elizabeth B. Parcell
Process Supervisor

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Federal Agencies

Mr. John Eddins
Archaeologist/Program Analyst
Advisory Council on Historic Preservation
401 F Street NW, Suite 308
Washington, DC 20001-2637
jeddins@achp.gov

Ms. Kimberly Bose
Secretary
Federal Energy Regulatory Commission
888 1st St NE
Washington, DC 20426

FEMA Region 3
615 Chestnut Street
One Independence Mall, Sixth Floor
Philadelphia, PA 19106-4404

Mr. John Bullard
Regional Administrator
NOAA Fisheries Service
Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930-2276

Mr. John A. Bricker
State Conservationist
US Department of Agriculture
Natural Resources Conservation Service
1606 Santa Rosa Road, Suite 209
Richmond, VA 23229-5014

Mr. Harold Peterson
Bureau of Indian Affairs
US Department of the Interior
545 Marriott Dr, Suite 700
Nashville, TN 37214
Harold.Peterson@bia.gov

Office of the Solicitor
US Department of the Interior
1849 C Street, NW
Washington, DC 20240

Ms. Lindy Nelson
Regional Environmental Officer, Office of Environmental Policy & Compliance
US Department of the Interior, Philadelphia Region
Custom House, Room 244
200 Chestnut Street
Philadelphia, PA 19106

Ms. Barbara Rudnick
NEPA Team Leader - Region 3
US Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

Mr. Martin Miller
Chief, Endangered Species - Northeast Region (Region 5)
US Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035

Ms. Cindy Schulz
Field Supervisor, Virginia Field Office
US Fish and Wildlife Service
6669 Short Lane
Gloucester, VA 23061

Ms. Janet Norman
Chesapeake Bay Field Office
US Fish and Wildlife Service
177 Admiral Cochrane Drive
Annapolis, MD 21401
janet_norman@fws.gov

Ms. Elizabeth Merz
US Forest Service
3714 Highway 16
Marion, VA 24354

Mr. Mark Bennett
Center Director of VA and WV Water Science Center
US Geological Survey
John W. Powell Building
12201 Sunrise Valley Drive
Reston, VA 20192
mrbennet@usgs.gov

Hon. Morgan Griffith
US Congressman, 9th District
US House of Representatives
Christiansburg District Office
17 West Main Street
Christiansburg, VA 24073

Mr. Michael Reynolds
Acting Director, Headquarters
US National Park Service
1849 C Street, NW
Washington, DC 20240

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Ms. Catherine Turton
Architectural Historian, Northeast Region
US National Park Service
US Custom House, 3rd Floor
200 Chestnut Street
Philadelphia, PA 19106

Hon. Tim Kaine
US Senate
231 Russell Senate Office Building
Washington, DC 20510

Hon. Mark Warner
US Senate
703 Hart Senate Office Building
Washington, DC 20510

State Agencies

Dr. Elizabeth Moore
President
Archaeological Society of Virginia
PO Box 70395
Richmond, VA 23255

Mr. Donald J. Orth
Certified Fisheries Professional
Department of Fish and Wildlife Conservation
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061
dorth@vt.edu

Ms. Caitlin Carey
Research Associate
Department of Fish and Wildlife Conservation
1900 Kraft Drive, Ste 105
Blacksburg, VA 24061
cscarey@vt.edu

Mr. Jess Jones
Freshwater Mollusk Conservation Center
Virginia Tech
1B Plantation Road
Blacksburg, VA 24061

Tracy Goodson
District Manager
New River Soil and Water Conservation District
968 East Stuart Drive
Galax, VA 24333

Mr. Ralph Northam
Governor
Office of the Governor
PO Box 1475
Richmond, VA 23218

Mr. Benjamin Hermerding
Office of the Secretary of the Commonwealth
Virginia Council on Indians
PO Box 2454
Richmond, VA 23218
benjamin.hermerding@governor.virginia.gov

Ms. Robbie Ruhr
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219
Robbie.Rhur@dcr.virginia.gov

Ms. Rene Hypes
Natural Heritage Program
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219
rene.hypes@dcr.virginia.gov

Mr. Clyde Cristman
Division Director
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219

Mr. Sam Sweeney
Natural Resource Manager II
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Max Meadows, VA 24360
sam.sweeney@dcr.virginia.gov

Ms. Lynn Crump
Environmental Programs Planner
Virginia Department of Conservation and Recreation
600 East Main Street, 24th floor
Richmonda, VA 23219
lynn.crump@dcr.virginia.gov

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Mr. Matthew Link
Water Withdrawal Permit Writer, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
matthew.link@deq.virginia.gov

Mr. Scott Kudlas
Director, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
scott.kudlas@deq.virginia.gov

Mr. Kelly Miller
Southwest Regional Office
Virginia Department of Environmental Quality
355-A Deadmore Street
Abingdon, VA 24210

Ms. Bettina Rayfield
Environmental Impact Review and Long Range Priorities Program
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
Bettina.rayfield@deq.virginia.gov

Mr. Tony Cario
Water Withdrawal Permit Writer, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
anthony.cario@deq.virginia.gov

Mr. Chris Sullivan
Senior Area Forester
Virginia Department of Forestry
900 Natural Resources Drive
Charlottesville, VA 22903

Mr. William Kittrell
Manager, Marion Office - Region 3 Office
Virginia Department of Game and Inland Fisheries
1796 Highway Sixteen
Marion, VA 24354
Bill.Kittrell@dgif.virginia.gov

Mr. John Copeland
Fisheries Biologist
Virginia Department of Game and Inland Fisheries
2206 South Main Street, Suite C
Blacksburg, VA 24060
John.Copeland@dgif.virginia.gov

Ms. Julie Langan
Director and State Historic Preservation Officer
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221

Local Governments

Mr. Steve Truitt
Carroll County Administrator
Carroll County
605-1 Pine Street
Hillsville, VA 24343
Steve.Truitt@carrollcountyva.gov

Mr. Scott McCoy
Town Manager
Town of Fries
PO Box 452
Fries, VA 24330
townoffries@friesva.com

Mr. C. M. Mitchell
Mayor
Town of Galax
111 East Grayson Street
Galax, VA 24333

Tribes

Chief Bill Harris
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
P.O. Box 948
Tahlequah, OH 74465
elizabeth-toombs@cherokee.org

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Deborah Dotson
President
Delaware Nation
PO Box 825
Anadarko, OK 73005

Administration
Delaware Tribe of Indians
5100 Tuxedo Blvd
Bartlesville, OK 74006

Chief Richard Sneed
Eastern Band of Cherokee Indians
PO Box 455
Cherokee, NC 28719

Chief Dean Branham
Monacan Indian Nation
PO Box 1136
Madison Heights, VA 24572

Administration
United Keetoowah Band of Cherokee Indians
PO Box 746
Tahlequah, OK 74465

<u>Non-governmental Organizations</u>

American Canoe Association
503 Sophia Street, Suite 100
Fredericksburg, VA 22401

Mr. Kevin Richard Colburn
National Stewardship Director
American Whitewater
PO Box 1540
Cullowhee, NC 28779
kevin@americanwhitewater.org

Mr. Andrew Downs
Regional Director
Appalachian Trail Conservancy
799 Washington Street
PO Box 807
Harpers Ferry, WV 25425-0807
adowns@appalachiantrail.org

Mr. Rick Roth
Treasurer
Friends of the New River
1000 Highland Circle
Blacksburg, VA 24060

Ms. Locke Ogens
Virginia Field Office
Nature Conservancy- Virginia Field Office
490 Westfield Road
Charlottesville, VA 22901-1633

Mr. George Santucci
President
New River Conservancy
PO Box 1480
1 N Jefferson Avenue, Suite D
West Jefferson, NC 28694
george@newriverconservancy.org

Ms. Laura Walters
Board Chair
New River Conservancy
6718 Dunkard Road
Dublin, VA 24084
claytorlakegirl@gmail.com

Ms. Andrea Langston
New River Land Trust
PO Box 11057
Blacksburg, VA 24062

Mr. Tim Dixon
Owner
New River Outdoor Adventures
5785 Fries Road
Galax, VA 24333
newriveroutdooradventures@yahoo.com

Mr. Steve Moyer
Vice President for Government Affairs
Trout Unlimited
1777 N. Kent Street, Suite 100
Arlington, VA 22209

GWY₰ DᏍᎵ
CHEROKEE NATION®
P.O. Box 948 • Tahlequah, OK 74465-0948 • 918-453-5000 • cherokee.org

Office of the Chief

Bill John Baker
Principal Chief
ᎣᏛ Ꮆh ᏧᏍᏓᏍᏗ
ᎣᏏᏍᎦᎨ

S. Joe Crittenden
Deputy Principal Chief
Ꮝ. ᏦᏍ ᏗᎬᏍᏗ
ᏔᏢᎢ ᎠᏂᎩᏍᎢ ᎣᏏᏍᎦᎨ

ORIGINAL

January 18, 2019

Kimberly Bose
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Project 2514-186, Byllesby-Buck Hydroelectric Project

Dear Secretary Kimberly Bose:

The Cherokee Nation (Nation) is in receipt of your correspondence about **Project 2514-186, Byllesby-Buck Hydroelectric Project**, and appreciates the opportunity to provide comment upon this project. Please allow this letter to serve as the Nation's interest in acting as a consulting party to this proposed project.

In accordance with the National Historic Preservation Act (NHPA, 54 U.S.C. § 300101 et seq), and its implementing regulations (36 CFR part 800), undertakings subject to the review process are referred to in 54 U.S.C. § 306108, which clarifies that historic properties may have religious and cultural significance to Indian tribes. Additionally, Section 106 of NHPA requires federal agencies to consider the effects of their action on historic properties as does the National Environmental Policy Act (NEPA) (42 U.S.C. §4321 and §§4331-35 and 40 CFR 1501.7(a) of 1969).

To facilitate Section 106 review, the Nation requests a copy of the related cultural resources survey report. The Nation requires that cultural resources survey personnel and reports meet the Secretary of Interior's standards and guidelines. Additionally, the Nation requests a copy of the related Cultural Resources Management Plan approved on July 18, 1996 and written consultation records with the Virginia State Historic Preservation Office under such plan.

Additionally, the Nation requests that the Federal Energy Regulatory Commission conduct appropriate inquiries with other pertinent Tribal and Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation's databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,

Elizabeth Toombs

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office
elizabeth-toombs@cherokee.org
918.453.5389

CC: Elizabeth B. Parcell, Appalachian Power

Molly Joseph Ward
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of Administration and Finance

David C. Dowling
Deputy Director of Soil and Water Conservation and Dam Safety

Thomas L. Smith
Deputy Director of Operations

MEMORANDUM

DATE: February 11, 2019

TO: Sarah Kulpa, HDR

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: DCR 19-002, Byllesby-Buck Dam relicensing

Division of Planning and Recreation Resources

The Department of Conservation and Recreation (DCR), Division of Planning and Recreation Resources (PRR), develops the *Virginia Outdoors Plan* and coordinates a broad range of recreational and environmental programs throughout Virginia. These include the Virginia Scenic Rivers program; Trails, Greenways, and Blueways; Virginia State Park Master Planning and State Park Design and Construction.
The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

This is, in part, a repeat of comments we made in September 2017. The Byllesby-Buck Dams impounds the New River, which is an established water trail and is a potential scenic river. There are multiple water access points along the project limits, all of which are DCR and DGIF sites and the dams are adjacent to segments of New River Trail State Park. Given these factors, DCR recommends serious consideration for safe portage around the dams for the boating/paddling community, this includes improving existing portage and looking on both side of the river for better portage access. We also recommend improving parking in the project area to accommodate river users. Please be sure that safety measures are in place to allow a safe boating experience. We recommend coordination with the New River Tail State Park Manager, Sam Sweeney. He can be reached at sam.sweeney@dcr.virginia.gov. Further we recommend a recreation plan be created or updated by applicant, the Appalachian Power Company. If a recreation plan has been created, we request a copy.

We recommend coordination with the Division of Natural Heritage regarding potential impacts to their resources. You can find an on-line project review information at http://www.dcr.virginia.gov/natural-heritage/infoservices.

Thank you for the opportunity to comment.

Cc Sam Sweeney, DCR
Lynn Crump, DCR

The Delaware Nation
Cultural Resources /106 Department
31064 State Highway 281
Anadarko, OK 73005
Phone (405)247-2448 Fax (405) 247-8905

1 March 2019

To Whom It May Concern:

The Delaware Nation Cultural Preservation Department received correspondence regarding the following referenced project(s).

> **Project: Byllesby-Buck Hydroelectric Project (FERC No. 2514) Notice of Intent and Pre-Application Document**

Our office is committed to protecting tribal heritage, culture and religion with particular concern for archaeological sites potentially containing burials and associated funerary objects.

The Lenape people occupied the area indicated in your letter during prior to European contact until their eventual removal to our present locations. According to our files, the location of the proposed project does not endanger cultural, or religious sites of interest to the Delaware Nation. **Please continue with the project as planned** keeping in mind during construction should an archaeological site or artifacts inadvertently be uncovered, all construction and ground disturbing activities should immediately be halted until the appropriate state agencies, as well as this office, are notified (within 24 hours), and a proper archaeological assessment can be made.

Please note the Delaware Nation, the Delaware Tribe of Indians, and the Stockbridge Munsee Band of Mohican Indians are the only Federally Recognized Delaware/Lenape entities in the United States and consultation must be made only with designated staff of these three tribes. We appreciate your cooperation in contacting the Delaware Nation Cultural Preservation Office to conduct proper Section 106 consultation. Should you have any questions, feel free to contact our offices at 405/247-2448.

Dana Kelly

Dana Kelly
Historic Preservation/106 Asst.
Delaware Nation
31064 State Highway 281
Anadarko, OK 73005
Ph. 405-247-2448
dkelly@delawarenation.com

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
March 6, 2019

OFFICE OF ENERGY PROJECTS

Project No. 2514-186 – Virginia
Byllesby-Buck Hydroelectric Project
Appalachian Power Company

Chester Brooks, Chief
Delaware Tribe of Indians
5100 Tuxedo Boulevard
Bartlesville, OK 74006

Reference: Tribal Consultation for the Byllesby-Buck Hydroelectric Project No. 2514

To the Tribal Leader Addressed:

The Federal Energy Regulatory Commission (Commission) invites your participation in the relicensing process for the existing Byllesby-Buck Hydroelectric Project No. 2514 (Byllesby-Buck Project). The Commission's relicensing process is an opportunity for both the licensee and interested agencies, tribes, and other stakeholders to consider the project's existing operation and protection, mitigation, and enhancement measures, and evaluate the need for any changes or additional measures to be implemented over the term of any new license issued for the project. The 30.1-megawatt Byllesby-Buck Project is located on the New River in Carroll County, Virginia. Appalachian Power Company, the licensee for the project, filed a notice of intent and a Pre-Application Document on January 7, 2019, and an application for a new license must be filed by February 28, 2022.

It is very important that a Tribe whose interests could be affected by the Byllesby-Buck Project participate early in the process so that tribal concerns are addressed.[1] For this reason, please inform us if you have an interest in participating in the relicensing process for the project. In addition, please indicate if you would like to meet with Commission staff to discuss the Commission's licensing process, how your Tribe can

[1] In a letter dated April 25, 2018, the Catawba Indian Nation, Delaware Nation, Eastern Band of Cherokee Indians, and the Monacan Indian Nation were invited to participate in tribal consultation for this project. In a letter dated May 10, 2018, the Cherokee Nation and the United Keetoowah Band of Cherokee Indians in Oklahoma were invited to participate in tribal consultation for this project.

participate to the fullest extent possible, your interests and concerns in the affected area, and how to establish procedures to ensure appropriate communication between Commission and Tribal staffs. The meeting can be limited to Commission and your Tribal staff, or can be open to other Tribes or Appalachian Power Company.

If at all possible, we would appreciate your response by April 5, 2019. The Commission strongly encourages electronic filing. Please file your response using the Commission's eFiling system at http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov, (866) 208-3676 (toll free), or (202) 502-8659 (TTY). In lieu of electronic filing, please send a paper copy to: Secretary, Federal Energy Regulatory Commission, 888 First Street N.E., Washington, D.C. 20426. The first page of any filing should include docket number P-2514.

If you have any questions or comments, please contact Allyson Conner at (202) 502-6082, or at allyson.conner@ferc.gov. Ms. Conner will contact you shortly to follow-up on this letter.

Sincerely,

John B. Smith, Chief
Mid-Atlantic Branch
Division of Hydropower Licensing

cc: Harold Peterson
Bureau of Indian Affairs – Eastern Region
545 Marriott Drive, Suite 700
Nashville, TN 37214

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Appalachian Power Company Project No. 2514-186

NOTICE OF INTENT TO FILE LICENSE APPLICATION, FILING OF PRE-APPLICATION DOCUMENT (PAD), COMMENCEMENT OF PRE-FILING PROCESS, AND SCOPING; REQUEST FOR COMMENTS ON THE PAD AND SCOPING DOCUMENT, AND IDENTIFICATION OF ISSUES AND ASSOCIATED STUDY REQUESTS

(March 8, 2019)

a. Type of Filing: Notice of Intent to File License Application for a New License and Commencing Pre-filing Process

b. Project No.: 2514-186

c. Dated Filed: January 7, 2019

d. Submitted By: Appalachian Power Company (Appalachian)

e. Name of Project: Byllesby-Buck Hydroelectric Project

f. Location: On the New River near the City of Galax, Carroll County, Virginia. The project does not occupy federal lands.

g. Filed Pursuant to: 18 CFR Part 5 of the Commission's Regulations

h. Potential Applicant Contact: Elizabeth B. Parcell, Process Supervisor, Appalachian Power Company, 40 Franklin Road SW, Roanoke, VA, (540) 985-2441, ebparcell@aep.com.

i. FERC Contact: Brandi Sangunett at (202) 502-8393 or e-mail at brandi.sangunett@ferc.gov.

j. Cooperating agencies: Federal, state, local, and tribal agencies with jurisdiction and/or special expertise with respect to environmental issues that wish to cooperate in the preparation of the environmental document should follow the instructions for filing such requests described in item o below. Cooperating agencies should note the Commission's policy that agencies that cooperate in the preparation of the environmental document cannot also intervene. *See* 94 FERC ¶ 61,076 (2001).

k. With this notice, we are initiating informal consultation with: (a) the U.S. Fish and Wildlife Service and/or NOAA Fisheries under section 7 of the Endangered Species Act and the joint agency regulations thereunder at 50 CFR, Part 402, and (b) the State Historic Preservation Officer, as required by section 106, National Historic Preservation Act, and the implementing regulations of the Advisory Council on Historic Preservation at 36 CFR 800.2.

l. With this notice, we are designating Appalachian as the Commission's non-federal representative for carrying out informal consultation, pursuant to section 7 of the Endangered Species Act and section 106 of the National Historic Preservation Act.

m. On January 7, 2019, Appalachian filed with the Commission a Pre-Application Document (PAD; including a proposed process plan and schedule), pursuant to 18 CFR 5.6 of the Commission's regulations.

n. A copy of the PAD is available for review at the Commission in the Public Reference Room or may be viewed on the Commission's website (http://www.ferc.gov), using the "eLibrary" link. Enter the docket number, excluding the last three digits in the docket number field to access the document. For assistance, contact FERC Online Support at FERCOnlineSupport@ferc.gov, (866) 208-3676 (toll free), or (202) 502-8659 (TTY). A copy is also available for inspection and reproduction at the address in paragraph h.

Register online at http://www.ferc.gov/docs-filing/esubscription.asp to be notified via e-mail of new filing and issuances related to this or other pending projects. For assistance, contact FERC Online Support.

o. With this notice, we are soliciting comments on the PAD and Commission's staff Scoping Document 1 (SD1), as well as study requests. All comments on the PAD and SD1, and study requests should be sent to the address above in paragraph h. In addition, all comments on the PAD and SD1, study requests, requests for cooperating agency status, and all communications to and from Commission staff related to the merits of the potential application must be filed with the Commission.

The Commission strongly encourages electronic filing. Please file all documents using the Commission's eFiling system at http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov. In lieu of electronic filing, please send a paper copy to: Secretary, Federal Energy Regulatory Commission, 888 First Street, NE, Washington, DC 20426. The first page of any filing should include docket number P-2514-186.

All filings with the Commission must bear the appropriate heading: "Comments on Pre-Application Document," "Study Requests," "Comments on Scoping Document 1," "Request for Cooperating Agency Status," or "Communications to and from Commission Staff." Any individual or entity interested in submitting study requests, commenting on the PAD or SD1, and any agency requesting cooperating status must do so by **May 7, 2019**.

p. Although our current intent is to prepare an environmental assessment (EA), there is the possibility that an Environmental Impact Statement (EIS) will be required. Nevertheless, this meeting will satisfy the NEPA scoping requirements, irrespective of whether an EA or EIS is issued by the Commission.

Scoping Meetings

Commission staff will hold two scoping meetings in the vicinity of the project at the time and place noted below. The daytime meeting will focus on resource agency, Indian tribes, and non-governmental organization concerns, while the evening meeting is primarily for receiving input from the public. We invite all interested individuals, organizations, and agencies to attend one or both of the meetings, and to assist staff in identifying particular study needs, as well as the scope of environmental issues to be addressed in the environmental document. The times and location of these meetings are as follows:

Evening Scoping Meeting

Date and Time:	Wednesday, April 10, 2019 at 7:00 p.m.
Location:	Hampton Inn-Galax 205 Cranberry Road Galax, VA 24333 Phone: (276) 238-4605

Daytime Scoping Meeting
Date and Time: Thursday, April 11, 2019 at 9:00 a.m.
Location: Hampton Inn-Galax
205 Cranberry Road
Galax, VA 24333
Phone: (276) 238-4605

SD1, which outlines the subject areas to be addressed in the environmental document, was mailed to the individuals and entities on the Commission's mailing list. Copies of SD1 will be available at the scoping meetings, or may be viewed on the web at http://www.ferc.gov, using the "eLibrary" link. Follow the directions for accessing information in paragraph n. Based on all oral and written comments, a Scoping Document 2 (SD2) may be issued. SD2 may include a revised process plan and schedule, as well as a list of issues, identified through the scoping process.

Environmental Site Review

The applicant and Commission staff will conduct an environmental site review of the project on Wednesday, April 10, 2019 at 10:00 a.m. All participants should meet at Byllesby Dam located at the intersection of Byllesby Road and the New River Trail near Ivanhoe, VA 24350; thereafter participants should be prepared to drive or carpool to other locations within the project boundary. To attend the environmental site review, please RSVP via email to Elizabeth B. Parcell at ebparcell@aep.com. Persons not providing an RSVP by April 3, 2019, will not be allowed on the environmental site review.

Meeting Objectives

At the scoping meetings, staff will: (1) initiate scoping of the issues; (2) review and discuss existing conditions and resource management objectives; (3) review and discuss existing information and identify preliminary information and study needs; (4) review and discuss the process plan and schedule for pre-filing activity that incorporates the time frames provided for in Part 5 of the Commission's regulations and, to the extent possible, maximizes coordination of federal, state, and tribal permitting and certification processes; and (5) discuss the appropriateness of any federal or state agency or Indian tribe acting as a cooperating agency for development of an environmental document.

Meeting participants should come prepared to discuss their issues and/or concerns. Please review the PAD in preparation for the scoping meetings. Directions on how to obtain a copy of the PAD and SD1 are included in item n. of this document.

Meeting Procedures

The meetings will be recorded by a stenographer and will be placed in the public record of the project.

Kimberly D. Bose,
Secretary.

FEDERAL ENERGY REGULATORY COMMISSION
Washington, DC 20426
March 8, 2019

OFFICE OF ENERGY PROJECTS

Project No. P-2514-186 – Virginia
Byllesby-Buck Hydroelectric Project
Appalachian Power Company

Subject: Scoping Document 1 for the Byllesby-Buck Hydroelectric Project, P-2514-186

To the Party Addressed:

The Federal Energy Regulatory Commission (Commission) is currently reviewing the Pre-Application Document submitted by Appalachian Power Company (Appalachian) for relicensing the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Byllesby-Buck Project). The project consists of two developments, Byllesby and Buck, and is located on the New River in Carroll County, Virginia.

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, Commission staff intends to prepare an environmental assessment (EA), which will be used by the Commission to determine whether, and under what conditions, to issue a new license for the project. To support and assist our environmental review, we are beginning the public scoping process to ensure that all pertinent issues are identified and analyzed, and that the EA is thorough and balanced.

We invite your participation in the scoping process, and are circulating the attached Scoping Document 1 (SD1) to provide you with information on the Byllesby-Buck Project. We also are soliciting your comments and suggestions on our preliminary list of issues and alternatives to be addressed in the EA, and requesting that you identify any studies that would help provide a framework for collecting pertinent information on the resource areas under consideration necessary for the Commission to prepare the EA for the project.

We will hold two scoping meetings for the Byllesby-Buck Project to receive input on the scope of the EA. An evening meeting will be held at 7:00 p.m. on Wednesday, April 10, 2019, at the Hampton Inn-Galax. A daytime meeting will be held at 9:00 a.m. on Thursday, April 11, 2019 at the same location. We will also visit the project facilities on Wednesday, April 10, 2019, starting at 10:00 a.m.

We invite all interested agencies, Indian tribes, non-governmental organizations, and individuals to attend one or all of these meetings. Further information on our environmental site review and scoping meetings is available in the enclosed SD1.

SD1 is being distributed to both Appalachian's distribution list and the Commission's official mailing list (see section 10.0 of the attached SD1). If you wish to be added to or removed from the Commission's official mailing list, please send your request by email to ferconlinesupport@ferc.gov or by mail to: Secretary, Federal Energy Regulatory Commission, 888 First Street, N.E., Room 1A, Washington, DC 20426. All written or emailed requests must specify your wish to be removed from or added to the mailing list and must clearly identify the following on the first page: **Byllesby-Buck Hydroelectric Project No. 2514-186**.

Please review the SD1 and, if you wish to provide comments, follow the instructions in section 6.0, *Request for Information and Studies*. If you have any questions about SD1, the scoping process, or how Commission staff will develop the EA for this project, please contact Brandi Sangunett at (202) 502-8393 or brandi.sangunet@ferc.gov. Additional information about the Commission's licensing process and the Byllesby-Buck Project may be obtained from our website (www.ferc.gov) or Appalachian's licensing website, www.aephydro.com. The deadline for filing comments and study requests is **May 7, 2019.** The Commission strongly encourages electronic filings.

Enclosure: Scoping Document 1

SCOPING DOCUMENT 1

BYLLESBY-BUCK HYDROELECTRIC PROJECT

VIRGINIA

PROJECT NO. 2514-186

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, DC

MARCH 2019

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SCOPING DOCUMENT 1

Byllesby-Buck Hydroelectric Project, No. 2514-186

1.0 INTRODUCTION

The Federal Energy Regulatory Commission (Commission or FERC), under the authority of the Federal Power Act (FPA),[1] may issue licenses for terms ranging from 30 to 50 years for the construction, operation, and maintenance of non-federal hydroelectric projects. On January 7, 2019, Appalachian Power Company (Appalachian) filed a Pre-Application Document (PAD) and Notice of Intent to seek a new license for the Byllesby-Buck Hydroelectric Project, FERC Project No. 2514 (Byllesby-Buck Project or project).[2]

The Byllesby-Buck Project consists of two developments, Byllesby and Buck, and is located on the New River in Carroll County, Virginia. The average annual generation from 2012 to 2016 of the Byllesby Development was 36,906 megawatt-hours (MWh) and of the Buck Development was 30,874 MWh.

A detailed description of the project is provided in section 3.0. The location of the project is shown on figure 1. The Byllesby-Buck Project does not occupy federal lands.

The National Environmental Policy Act (NEPA) of 1969,[3] the Commission's regulations, and other applicable laws require that we independently evaluate the environmental effects of relicensing the Byllesby-Buck Project as proposed, and also consider reasonable alternatives to the licensee's proposed action. At this time, we intend to prepare an environmental assessment (EA) that describes and evaluates the probable effects, including an assessment of the site-specific and cumulative effects, if any, of the proposed action and alternatives. The EA preparation will be supported by a scoping process to ensure identification and analysis of all pertinent issues. Although our current intent is to prepare an EA, there is a possibility that an environmental impact statement (EIS) will be required. The scoping process will satisfy the NEPA scoping requirements, irrespective of whether the Commission issues an EA or an EIS.

---

[1] 16 U.S.C. § 791(a)-825(r) (2012).

[2] The current license for the Byllesby-Buck Project was issued on March 28, 1994, and expires on February 29, 2024.

[3] National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-4370(f) (2012).

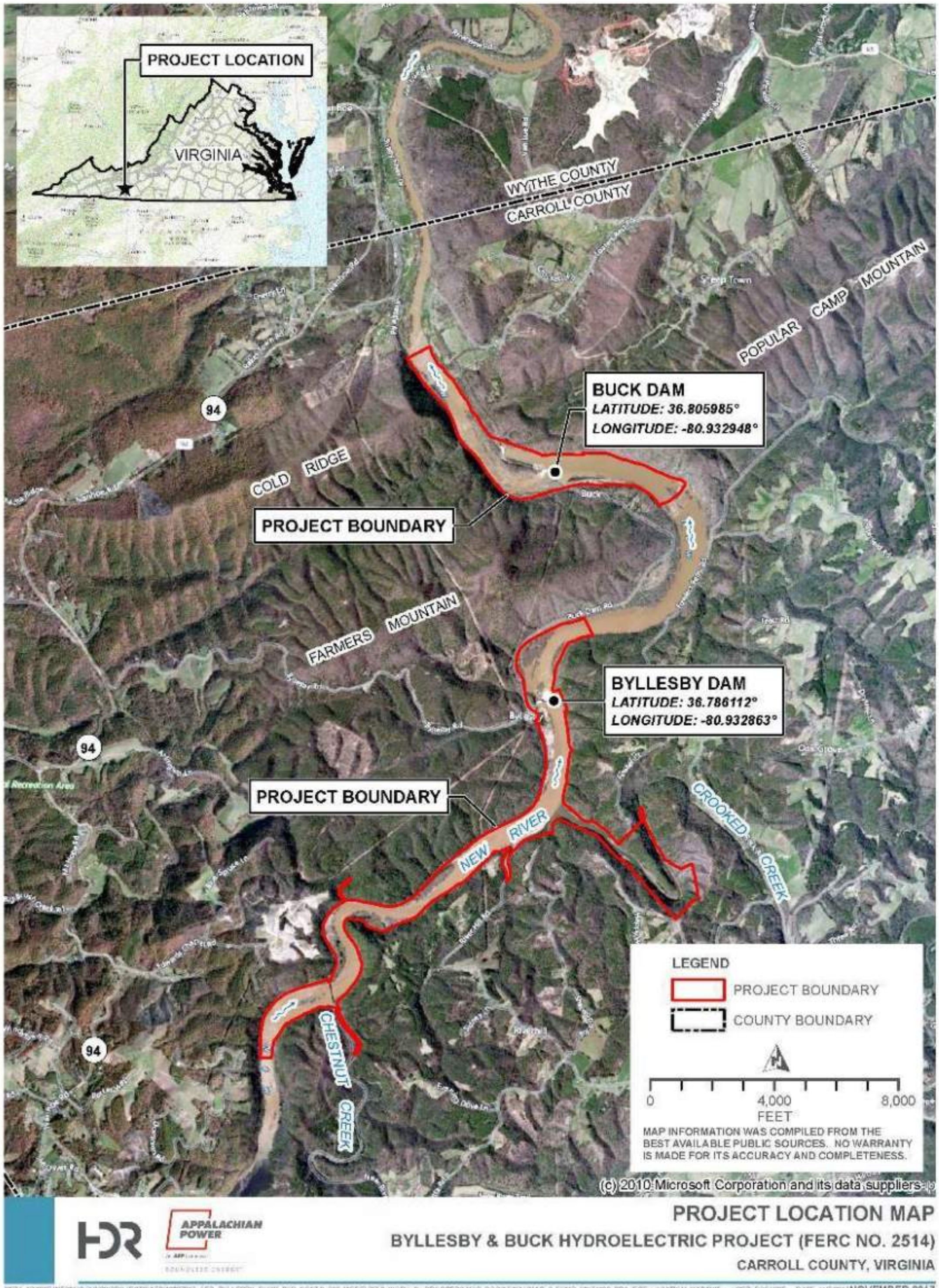


Figure 1. Location of the project. (Source: Appalachian).

2.0 SCOPING

Scoping Document 1 (SD1) is intended to advise all participants as to the proposed scope of the EA and to seek additional information pertinent to this analysis. This document contains: (1) a description of the scoping process and schedule for the development of the EA; (2) a description of the proposed action and alternatives; (3) a preliminary identification of environmental issues and proposed studies; (4) a request for comments and information; (5) a proposed EA outline; and (6) a preliminary list of comprehensive plans that are applicable to the project.

2.1 PURPOSES OF SCOPING

Scoping is the process used to identify issues, concerns, and opportunities for enhancement or mitigation associated with a proposed action. In general, scoping should be conducted during the early planning stages of a project. The purposes of the scoping process are as follows:

- invite participation of federal, state, and local resource agencies, Indian tribes, non-governmental organizations (NGOs), and the public to identify significant environmental and socioeconomic issues related to the proposed project;

- determine the resource issues, depth of analysis, and significance of issues to be addressed in the EA;

- identify how the project would or would not contribute to cumulative effects in the project area;

- identify reasonable alternatives to the proposed action that should be evaluated in the EA;

- solicit, from participants, available information on the resources at issue, including existing information and study needs; and

- determine the resource areas and potential issues that do not require detailed analysis during review of the project.

2.2 COMMENTS, SCOPING MEETINGS, AND ENVIRONMENTAL SITE REVIEW

During preparation of the EA, there will be several opportunities for the resource agencies, Indian tribes, NGOs, and the public to provide input. These opportunities occur:

- during the public scoping process and study plan meetings, when we solicit oral and written comments regarding the scope of issues and analysis for the EA;
- in response to the Commission's notice that the project is ready for environmental analysis; and
- after issuance of the EA when we solicit written comments on the EA.

In addition to written comments solicited by this SD1, we will hold two public scoping meetings and an environmental site review in the vicinity of the project. A daytime meeting will focus on concerns of the resource agencies, NGOs, and Indian tribes, and an evening meeting will focus on receiving input from the public. We invite all interested agencies, Indian tribes, NGOs, and individuals to attend one or both of the meetings to assist us in identifying the scope of environmental issues that should be analyzed in the EA. All interested parties are also invited to participate in the environmental site review. The times and locations of the meetings and environmental site review are as follows:

<u>Evening Scoping Meeting</u>

Date and Time:	**Wednesday, April 10, 2019 at 7:00 p.m.**
Location:	Hampton Inn-Galax 205 Cranberry Road Galax, VA 24333 Phone: (276) 238-4605

<u>Daytime Scoping Meeting</u>

Date and Time:	**Thursday, April 11, 2019 at 9:00 a.m.**
Location:	Hampton Inn-Galax 205 Cranberry Road Galax, VA 24333 Phone: (276) 238-4605

Environmental Site Review

Date and Time: **Wednesday, April 10, 2019 at 10:00 a.m.**

Location: Participants will meet at Byllesby Dam located at the intersection of Byllesby Road and the New River Trail near Ivanhoe, VA 24350; thereafter, participants should be prepared to drive or carpool to other locations within the project boundary.

Please RSVP via email to Elizabeth B. Parcell at ebparcell@aep.com **on or before April 3, 2019** if you plan to attend the environmental site review. Persons not providing an RSVP by April 3, 2019, will not be allowed on the environmental site review. Individuals may not access the site without escort of the facility owner, Appalachian Power Company. Also, persons attending the environmental site review must adhere to the following requirements: (1) persons must be 18 years or older; (2) persons must have a current, valid, government-issued or school photo identification (i.e., driver's license, etc.); (3) persons with open-toed shoes/sandals/flip flops/high heels, etc. will not be allowed on the environmental site review; (4) no photography will be allowed inside the powerhouses; (5) small bags containing personal items for the site visit (i.e., notebooks, maps, water, etc.) will be allowed, but are subject to search; (6) no weapons are allowed on-site; (7) no alcohol/drugs are allowed on-site (or persons exhibiting the effects thereof); (8) hard hats and safety glasses (PPE) will be required while on-site, please bring personal PPE if available, otherwise PPE will be provided; (9) no animals (except for service animals) are allowed on the environmental site review; and (10) individuals participating in the environmental site review will be required to sign a waiver of liability.

The scoping meetings will be recorded by a court reporter, and all statements (verbal and written) will become part of the Commission's public record for the project. Before each meeting, all individuals who attend, especially those who intend to make statements, will be asked to sign in and clearly identify themselves for the record. Interested parties who choose not to speak or who are unable to attend the scoping meetings may provide written comments and information to the Commission as described in section 6.0. These meetings are posted on the Commission's calendar located on the internet at www.ferc.gov/EventCalendar/EventsList.aspx, along with other related information.

Meeting participants should come prepared to discuss their issues and/or concerns as they pertain to the relicensing of the Byllesby-Buck Project. It is advised that participants review the PAD in preparation for the scoping meetings. Copies of the PAD are available for review at the Commission in the Public Reference Room or may be viewed on the Commission's website (www.ferc.gov), using the "eLibrary" link. Enter the docket number, P-2514, to access the documents. For assistance, contact FERC

Online Support at FERCOnlineSupport@ferc.gov or toll free at 1-866-208-3676, or for TTY, (202) 502-8659. A copy of the PAD also can be obtained from Appalachian's licensing website (http://www.aephydro.com) or be available for inspection and reproduction at the following address: Appalachian Power Company, 40 Franklin Road SW, Roanoke, Virginia, 24011.

Following the scoping meetings and comment period, all issues raised will be reviewed and decisions made as to the level of analysis needed. If preliminary analysis indicates that any issues presented in this scoping document have little potential for causing significant effects, the issue(s) will be identified and the reasons for not providing a more detailed analysis will be given in the EA.

If we receive no substantive comments on SD1, then we will not prepare a Scoping Document 2 (SD2). Otherwise, we will issue SD2 to address any substantive comments received. The SD2 will be issued for informational purposes only; no response will be required. The EA will address recommendations and input received during the scoping process.

3.0 PROPOSED ACTION AND ALTERNATIVES

In accordance with NEPA, the environmental analysis will consider the following alternatives, at a minimum: (1) the no-action alternative, (2) the applicant's proposed action, and (3) alternatives to the proposed action.

3.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Byllesby-Buck Project would continue to operate as required by the current project license (i.e., there would be no change to the existing environment). No new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

3.1.1 Existing Project Facilities

The Byllesby Development consists of : (1) a 64-foot-high, 528-foot-long concrete dam and main spillway section topped with four sections of 9-foot-high flashboards, five sections of 9-foot-high inflatable Obermeyer crest gates, and six bays of 10-foot-high Tainter gates; (2) an auxiliary spillway including six sections of 9-foot-high flashboards; (3) a 239-acre impoundment with a gross storage capacity of 2,000 acre-feet; (4) a powerhouse containing four generating units with a total authorized installed capacity of 21.6 megawatts (MW); and (5) appurtenant facilities.

The Buck Development consists of : (1) a 42-foot-high, 353-foot-long concrete dam; (2) a 1,005-foot-long, 19-foot-high spillway section topped with 20 sections of 9-foot-high flashboards, four sections of 9-foot-high inflatable Obermeyer crest gates, and six bays of 10-foot-high Tainter gates; (3) a 66-acre impoundment with a gross storage capacity of 661 acre-feet; (4) a powerhouse containing three generating units with a total authorized installed capacity of 8.5 MW; and (5) appurtenant facilities

Each development is undergoing modification, as approved by an order amending license issued by the Commission on May 18, 2017,[4] to replace several sections of existing wooden flashboards with inflatable Obermeyer crest gates. Once installed and operational, the available Obermeyer crest gates will serve to smooth project operation by reducing impoundment water level fluctuations and instances of inadvertent flow to the bypassed reaches and reducing the frequency of maintenance drawdowns associated with wooden flashboard failure and replacement.

[4] 159 FERC ¶ 62,187.

3.1.2 Existing Project Operations

The Byllesby-Buck Project operates in a run-of-river mode under all flow conditions. Because the Buck Development is only about 3 miles downstream from the Byllesby Development, the operation of the two developments is closely coordinated. Buck Development operation is dependent on flows through the Byllesby Development. Under normal operating conditions, Appalachian operates the project to use available flows for powerhouse generation, and maintains the elevation of the Byllesby impoundment between 2,078.2 feet and 2,079.2 feet[5] and the Buck impoundment between 2,002.4 feet and 2,003.4 feet. Under article 403 of the current license, Appalachian is also required to release a minimum flow of 360 cubic feet per second (cfs) or inflow to the project, whichever is less, downstream of the project powerhouses.

When inflow to either development exceeds the maximum hydraulic capacity of the turbines (5,868 cfs for Byllesby and 3,540 cfs for Buck), the Tainter gates are opened to pass the excess flow. Gate openings are planned and based on monitoring of the upstream U.S. Geological Survey (USGS) gage at Galax (#03164000) and Byllesby and Buck forebay elevations. If inflows exceed the capacity of the Tainter gates, the inflatable Obermeyer crest gates are operated to pass additional flow, followed by manual tripping of the wooden flashboards, if required. The wooden flashboards must be subsequently re-installed during a period when the impoundment is drawn down to the spillway crest elevation. During flood-stage flows, all generating units at the powerhouse may need to be shut down due to the loss of operating head. The Byllesby auxiliary spillway is operated after release of all available inflatable crest gate and wooden flashboard sections, typically at flows in excess of 46,690 cfs.

Ramping rates are required under Article 406 of the current license for the protection of fish resources downstream of the Buck spillway. The gradual reduction of flow allows fish to progressively leave the bypassed reach, versus possible stranding at sudden flow discontinuation. Following periods of spill from the Buck spillway when a spillway gate has been opened 2 feet or more, Appalachian is required to discharge flows through a 2-foot-wide gate opening for at least 3 hours. Appalachian is then required to reduce the opening to 1 foot for at least an additional 3 hours, after which Appalachian may close the gate.

Tainter gate operation and electricity generation at both Byllesby and Buck is remotely controlled from Appalachian's 24-hour control center located in Columbus, Ohio. Operators are stationed at the control center 24 hours per day, 7 days per week.

[5] All elevations refer to National Geodetic Vertical Datum of 1929 (NGVD 29).

Plant personnel are present at the Byllesby-Buck Project during normal working hours (8 hours per day during weekday mornings and afternoons) to perform routine maintenance.

3.2 APPLICANT'S PROPOSAL

The proposed action is to continue the existing operation and maintenance of the Byllesby-Buck Project. The current license for the project expires on February 29, 2024.

3.2.1 Proposed Project Facilities and Operation

Appalachian is presently evaluating the feasibility and benefits of operating the developments with 1-foot-lower impoundment levels (i.e., still a 1-foot operating band, but with 1-foot lower normal maximum and minimum impoundment elevations) during the winter months (e.g., December through March). The purpose of the lower winter impoundment level would be to reduce the risk of overtopping project structures (and the resultant risks to the project, downstream areas, and personnel and public safety) due to ice jams on the New River, such as those that occurred at the project in January 2010. Should Appalachian propose this modification in its license application it is not expected to significantly affect project generation. No other changes to project operation or facilities are proposed at this time.

3.2.2 Proposed Environmental Measures

Appalachian proposes to continue the existing operation and maintenance of the Byllesby-Buck Project which includes the protection, mitigation, and enhancement (PM&E) measures required by the current license and subsequent amendments. These measures are described below.

<u>Geologic and Soil Resources</u>

- There are no existing or proposed PM&E measures related to geology and soils for the Byllesby-Buck Project. The potential need for PM&E measures will be evaluated during the relicensing process.

<u>Aquatic Resources</u>

- Continue operating the project in a run-of-river mode, maintaining elevation of the Byllesby impoundment between 2,078.2 feet and 2,079.2

feet and the elevation of the Buck impoundment between 2,002.4 feet and 2,003.4 feet (Article 401).

- Continue providing a minimum flow of 360 cfs, or inflow to the project, whichever is less, to the New River downstream of each powerhouse (Buck and Byllesby) to protect aquatic resources (Article 403).

- Continue implementing the existing ramping rate[6] for the Buck bypassed reach; whereby, following periods of spill when a spillway gate has been opened 2 feet or more, water will continue to be released into the bypassed reach through a 2-foot-gate opening for at least 3 hours, then the gate opening will be reduced to 1 foot for 3 hours before closing the gate.

Terrestrial Resources

- Continue to follow a Commission-approved Wildlife Management Plan that includes provisions to annually inspect undeveloped land within the project boundary for evidence of increased human disturbance, consult with Virginia Department of Game and Inland Fisheries (Virginia DGIF) about activities that affect these lands and notify Virginia DGIF of any unanticipated impacts within these lands, and monitor bank erosion (Article 408).

Threatened and Endangered Species

- There are no existing or proposed PM&E measures related to threatened and endangered species for the Byllesby-Buck Project. The potential need for PM&E measures will be evaluated during the relicensing process.

Recreation and Land Use

- Continue to follow a Commission-approved recreation plan and continue to provide project recreation access, monitor recreation use and demand, consult with interested stakeholders on potential recreation enhancement measures, and update the recreation plan as needed (Article 411).

[6] 70 FERC ¶ 62,130 (1995). Order Modifying and Approving Ramping Rate Assessment Plan.

Aesthetic Resources

- There are no existing or proposed PM&E measures related to aesthetic resources for the Byllesby-Buck Project. The potential need for PM&E measures will be evaluated during the relicensing process.

Cultural Resources

- Continue to follow a Commission-approved cultural resources management plan (CRMP) and to update the CRMP with the filing of its final license application. Appalachian does not anticipate any adverse effects to cultural resources (Article 409).

3.3 DAM SAFETY

It is important to note that dam safety constraints may exist and should be taken into consideration in the development of proposals and alternatives considered in the pending proceeding. For example, proposed modifications such as the potential 1-foot-lower impoundment levels during winter, could impact the integrity of the dam structure. As the proposal and alternatives are developed, the applicant must evaluate the effects and ensure that the project would meet the Commission's dam safety criteria found in Part 12 of the Commission's regulations and the Engineering Guidelines (http://www.ferc.gov/industries/hydropower/safety/guidelines/eng-guide.asp).

3.4 ALTERNATIVES TO THE PROPOSED ACTION

Commission staff will consider and assess all alternative recommendations for operational or facility modifications, as well as PM&E measures identified by the Commission, the agencies, Indian tribes, NGOs, and the public.

3.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

At present, we propose to eliminate the following alternatives from detailed study in the EA.

3.5.1 Federal Government Takeover

In accordance with § 16.14 of the Commission's regulations, a federal department or agency may file a recommendation that the United States exercise its right to take over a hydroelectric power project with a license that is subject to sections 14 and 15 of the

FPA.[7] We do not consider federal takeover to be a reasonable alternative. Federal takeover of the project would require congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence showing that federal takeover should be recommended to Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed interest in operating the project.

3.5.2 Non-power License

A non-power license is a temporary license the Commission would terminate whenever it determines that another governmental agency is authorized and willing to assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this time, no governmental agency has suggested a willingness or ability to take over the project. No party has sought a non-power license, and we have no basis for concluding that the Byllesby-Buck Project should no longer be used to produce power. Thus, we do not consider a non-power license a reasonable alternative to relicensing the project.

3.5.3 Project Decommissioning

Decommissioning of the project could be accomplished with or without dam removal. Either alternative would require denying the relicense application and surrender or termination of the existing license with appropriate conditions. There would be significant costs involved with decommissioning the project and/or removing any project facilities. The project provides a viable, safe, and clean renewable source of power to the region. With decommissioning, the project would no longer be authorized to generate power.

No party has suggested project decommissioning would be appropriate in this case, and we have no basis for recommending it. Thus, we do not consider project decommissioning a reasonable alternative to relicensing the project with appropriate environmental measures.

[7] 16 U.S.C. §§ 791(a)-825(r).

4.0 SCOPE OF CUMULATIVE EFFECTS AND SITE-SPECIFIC RESOURCE ISSUES

4.1 CUMULATIVE EFFECTS

According to the Council on Environmental Quality's regulations for implementing NEPA (40 C.F.R. 1508.7), a cumulative effect is the effect on the environment that results from the incremental effect of the action when added to other past, present and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

4.1.1 Resources that could be Cumulatively Affected

Based on information in the PAD for the Byllesby-Buck Project, and preliminary staff analysis, we have not identified any resources that could be cumulatively affected by the proposed continued operation and maintenance of the Byllesby-Buck Project in combination with other hydroelectric projects and other activities in the New River Basin.

4.2 RESOURCE ISSUES

In this section, we present a preliminary list of environmental issues to be addressed in the EA. We identified these issues, which are listed by resource area, by reviewing the PAD and the Commission’s record for the Byllesby-Buck Project. This list is not intended to be exhaustive or final, but contains the issues raised to date. After the scoping process is complete, we will review the list and determine the appropriate level of analysis needed to address each issue in the EA.

4.2.1 Geologic and Soils Resources

- Effects of continued project operation and maintenance on shoreline erosion in the impoundments at each development (Buck and Byllesby).

4.2.2 Aquatic Resources

- Effects of continued project operation and maintenance on water quality, including dissolved oxygen (DO) and water temperature, upstream and downstream of each development, including the Buck bypassed reach.

- Adequacy of the existing 360-cfs minimum flow for aquatic resources, including resident fish species, downstream of each development (Buck and Byllesby).

- Whether there is a need for a minimum flow (beyond leakage) in the Buck bypassed reach.

- Effects of continued project maintenance (periodic impoundment drawdowns to replace flashboards and periodic dredging to remove sediments from the impoundments) on aquatic resources, particularly freshwater mussels and fish spawning habitat in the impoundments of each development.

- Effects of continued project operation on aquatic resources, including entrainment and impingement mortality of resident fishes, such as walleye, smallmouth bass, and spotted bass at each development.

- Effects of continued project operation and maintenance on species of special concern such as the Eastern hellbender.

- Adequacy of the existing ramping rate to prevent fish stranding in the Buck bypassed reach.

4.2.3 Terrestrial Resources

- Effects of continued project operation, including impoundment fluctuations, on riparian and wetland habitat and associated wildlife.

- Effects of continued project operation and maintenance on upland wildlife habitat and associated wildlife such as bald eagles.

4.2.4 Threatened and Endangered Species

- Effects of continued project operation and maintenance on the federally listed Indiana bat, northern long-eared bat, and Virginia spiraea.

4.2.5 Recreation, Land Use, and Aesthetic Resources

- Effects of continued project operation and maintenance on recreation, land use, and aesthetics within the project area.

- Adequacy of existing recreational facilities and public access to the project to meet current and future recreational demand.

4.2.6 Cultural Resources

- Effects of project operation and maintenance on historic properties and archeological resources that are included in, eligible for listing in, or potentially eligible for inclusion in the National Register of Historic Places.

- Effects of project operation and maintenance on any previously unidentified historic or archeological resources or traditional cultural properties that may be eligible for inclusion in the National Register of Historical Places.

4.2.7 Developmental Resources

- Economics of the project and the effects of any recommended environmental measures on the project's economics.

5.0 PROPOSED STUDIES

Depending upon the findings of studies completed by Appalachian and the recommendations of the consulted entities, Appalachian will consider, and may propose certain other measures to enhance environmental resources affected by the project as part of the proposed action. Appalachian's initial study proposals are identified by resource area in table 1. Detailed information on Appalachian's initial study proposals can be found in the PAD. Further studies may need to be added to this list based on comments provided to the Commission and Appalachian from interested participants, including Indian tribes.

Table 1. Appalachian's initial study proposals. (Source: Appalachian)

Resource Area and Study Name	**Proposed Study**
Geology and Soils	
Shoreline Stability Assessment	To provide updated information about existing project conditions, as well as to evaluate the need for any additional erosion control measures at specific areas of concern, Appalachian proposes to conduct a Shoreline Stability Assessment for both the Byllesby and Buck developments. Appalachian anticipates that this assessment will consist of a survey of the project impoundments to locate any sites of erosion or shoreline instability. Appalachian proposes to inventory, map, and photograph any such areas, using a scoring or ranking system (e.g., Bank Erosion Hazard Index) to try to identify areas that have the potential to erode at unnaturally high rates and to prioritize any areas where remedial action may be needed.
Aquatic Resources	
Water Quality Study	Appalachian proposes to conduct a single season water quality study by continuously monitoring (at 15-minute

Resource Area and Study Name	Proposed Study
	intervals) water temperature, DO, and water levels from June through October at three locations: (1) upstream of the Byllesby impoundment, (2) downstream of the Byllesby powerhouse, and (3) downstream of the Buck powerhouse. In addition, once per month from June through October, depth profiles of water temperature, DO, pH, and specific conductance will be collected at three locations within each impoundment (Buck and Byllesby). This survey would be used to gather baseline water quality data to determine consistency with applicable water quality standards and designated uses.
Bypass Reach Aquatic Habitat and Flow Assessment	Appalachian proposes to perform a desktop aquatic habitat assessment of each project bypassed reach, utilizing high resolution aerial imagery and/or Light Detection and Ranging (LiDAR) data to: (1) delineate the reach into pool, riffle, run, and shoal habitats; (2) characterize dominant substrate types; and (3) identify instream habitat types (e.g., littoral zones, hard structure, woody debris, vegetative cover). Appalachian proposes to supplement the desktop habitat assessment described above, with limited field reconnaissance to confirm site conditions. In addition, Appalachian would collect water level logger and discharge measurements during controlled test gate openings at the spillway to develop a stage-discharge rating curve for a select location.

Resource Area and Study Name	**Proposed Study**
Inflatable Obermeyer Crest Gate Operational Effectiveness Evaluation	Appalachian proposes to conduct a study to confirm that operation of the project dams with the inflatable Obermeyer crest gates has the desired effects of minimizing impoundment fluctuations and instances of inadvertent spill to the bypassed reaches (especially at the Buck Development). Appalachian proposes to conduct this evaluation utilizing an operations model that has been developed for the project. Using this model, Appalachian will be able to simulate project operation with the Obermeyer crest gates installed, including instances of spills to the bypassed reach(es), impoundment level changes, and powerhouse generation for a hypothetical period of time. The level loggers to be installed in the bypassed reach(es) as part of the Bypass Reach Aquatic Habitat and Flow Assessment described above will serve to collect data about water level changes due to spillway operations. These data can be used to validate the operations model.
Recreation Resources	
Recreational Needs Assessment	Appalachian proposes to conduct a recreational assessment of the project to assess existing recreational opportunities and potential improvements to facilities. Appalachian will incorporate existing monitoring information into the study report and recommendations.

6.0 REQUEST FOR INFORMATION AND STUDIES

We are asking federal, state, and local resource agencies, Indian tribes, NGOs, and the public to forward to the Commission any information that will assist us in conducting an accurate and thorough analysis of the project-specific and cumulative effects associated with relicensing the Byllesby-Buck Project. The types of information requested include, but are not limited to:

- information, quantitative data, or professional opinions that may help define the geographic and temporal scope of the analysis (both site-specific and cumulative effects), and that helps identify significant environmental issues;

- identification of, and information from, any other EA, EIS, or similar environmental study (previous, on-going, or planned) relevant to the proposed relicensing of the Byllesby-Buck Project;

- existing information and any data that would help to describe the past and present actions and effects of the project and other developmental activities on environmental and socioeconomic resources;

- information that would help characterize the existing environmental conditions and habitats;

- the identification of any federal, state, or local resource plans, and any future project proposals in the affected resource area (e.g., proposals to construct or operate water treatment facilities, recreation areas, water diversions, timber harvest activities, or fish management programs, along with any implementation schedules);

- documentation that the proposed project would or would not contribute to cumulative adverse or beneficial effects on any resources. Documentation can include, but need not be limited to, how the project would interact with other projects in the area and other developmental activities; study results; resource management policies; and reports from federal and state agencies, local agencies, Indian tribes, NGOs, and the public;

- documentation showing why any resources should be excluded from further study or consideration; and

- study requests by federal and state agencies, local agencies, Indian tribes, NGOs, and the public that would help provide a framework for collecting pertinent information on the resource areas under consideration necessary for the Commission to prepare the EA/EIS for the project.

All requests for studies filed with the Commission must meet the criteria found in Appendix A, *Study Plan Criteria*.

The requested information, comments, and study requests should be submitted to the Commission no later than **May 7, 2019**. All filings must clearly identify the following on the first page: **Byllesby-Buck Project (P-2514-186)**. Scoping comments may be filed electronically via the Internet. See 18 C.F.R. 385.2001(a)(1)(iii) and the instructions on the Commission's website http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll free at 1-866-208-3676, or for TTY, (202) 502-8659. Although the Commission strongly encourages electronic filing, documents may also be paper-filed. To paper-file, please send a paper copy to: Secretary, Federal Energy Regulatory Commission, 888 First Street, NE, Washington, D.C. 20426.

Register online at http://www.ferc.gov/esubscription.asp to be notified via email of new filings and issuances related to this or other pending projects. For assistance, please contact FERC Online Support at ferconlinesupport@ferc.gov.

Any questions concerning the scoping meetings, site visits, or how to file written comments with the Commission should be directed to Brandi Sangunett at (202) 502-8393 or brandi.sangunett@ferc.gov. Additional information about the Commission's licensing process and the Byllesby-Buck Project may be obtained from the Commission's website, www.ferc.gov.

7.0 EA PREPARATION SCHEDULE

At this time, we anticipate the need to prepare an EA. The EA will be sent to all persons and entities on the Commission's service and mailing lists for the Byllesby-Buck Project. The EA will include our recommendations for operating procedures, as well as PM&E measures that should be part of any license issued by the Commission. All recipients will then have 30 days to review the EA and file written comments with the Commission. All comments on the EA filed with the Commission will be considered in preparation of any license order. A schedule for the EA preparation will be provided after a license application is filed.

The major milestones, with pre-filing target dates are as follows:

Major Milestone	Target Date
Scoping Meetings	April 2019
License Application Filed	February 2022
Ready for Environmental Analysis Notice Issued	
Deadline for Filing Comments, Recommendations, and Agency Terms and Conditions/Prescriptions	
Single EA Issued	
Comments on EA Due	
Deadline for Filing Modified Agency Recommendations	
Order Issued	

A copy of Appalachian's process plan, which has a complete list of relicensing milestones for the Byllesby-Buck Project, including those for developing the license application, is attached as Appendix B to this SD1.

8.0 PROPOSED EA OUTLINE

The preliminary outline for the Byllesby-Buck Project EA is as follows:

TABLE OF CONTENTS
LIST OF FIGURES
LIST OF TABLES
ACRONYMS AND ABBREVIATIONS
EXECUTIVE SUMMARY

1.0 INTRODUCTION
- 1.1 Application
- 1.2 Purpose of Action and Need for Power
- 1.3 Statutory and Regulatory Requirements
  - 1.3.1 Federal Power Act
    - 1.3.1.1 Section 18 Fishway Prescriptions
    - 1.3.1.2 Section 10(j) Recommendations
  - 1.3.2 Clean Water Act
  - 1.3.3 Endangered Species Act
  - 1.3.4 Coastal Zone Management Act
  - 1.3.5 National Historic Preservation Act
  - Other statutes as applicable
- 1.4 Public Review and Comment
  - 1.4.1 Scoping
  - 1.4.2 Interventions
  - 1.4.3 Comments on the Application

2.0 PROPOSED ACTION AND ALTERNATIVES
- 2.1 No-action Alternative
  - 2.1.1 Existing Project Facilities
  - 2.1.2 Project Safety
  - 2.1.3 Existing Project Operation
  - 2.1.4 Existing Environmental Measures
- 2.2 Applicant's Proposal
  - 2.2.1 Proposed Project Facilities
  - 2.2.2 Proposed Project Operation
  - 2.2.3 Proposed Environmental Measures
  - 2.2.4 Modifications to Applicant's Proposal—Mandatory Conditions
- 2.3 Staff Alternative
- 2.4 Staff Alternative with Mandatory Conditions
- 2.5 Other Alternatives (as appropriate)
- 2.6 Alternatives Considered but Eliminated from Detailed Study

9.0 COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C. section 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by a project. The staff has preliminarily identified and reviewed the plans listed below that may be relevant to the Byllesby-Buck Project. Agencies are requested to review this list and inform the Commission staff of any changes. If there are other comprehensive plans that should be considered for this list that are not on file with the Commission, or if there are more recent versions of the plans already listed, they can be filed for consideration with the Commission according to 18 CFR 2.19 of the Commission's regulations. Please follow the instructions for filing a plan at http://www.ferc.gov/industries/hydropower/gen-info/licensing/complan.pdf.

The following is a list of comprehensive plans currently on file with the Commission that may be relevant to the Byllesby-Buck Project.

National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.

Ohio River Basin Commission. 1977. Kanawha River Basin comprehensive coordinated joint plan. Cincinnati, Ohio. July 1977.

U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.

U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.

U.S. Forest Service. 1978. Mount Rogers National Recreation Area final management plan. Department of Agriculture. Roanoke, Virginia.

U.S. Forest Service. 2004. Revised Land and Resource Management Plan for the Jefferson National Forest. Management Bulletin R8-MB 115A. Department of Agriculture. Roanoke, Virginia.

U.S. Forest Service. 1993. George Washington National Forest revised land and resource management plan. Department of Agriculture, Harrisonburg, Virginia.

Virginia Department of Conservation and Recreation. The 2007 Virginia outdoors plan (SCORP). Richmond, Virginia.

Virginia Department of Environmental Quality. 2015. Commonwealth of Virginia State Water Resources Plan. Richmond, Virginia. October 2015.

Virginia State Water Control Board. 1986. Minimum instream flow study – final report. Annadale, Virginia. February 1986.

10.0 MAILING LIST

The list below is the Commission's official mailing list for the Byllesby-Buck Project (FERC No. 2514). If you want to receive future mailings for the Byllesby-Buck Project and are not included in the list below, please send your request by email to efiling@ferc.gov or by mail to: Secretary, Federal Energy Regulatory Commission, 888 First Street, N.E., Room 1A, Washington, DC 20426. All written and emailed requests to be added to the mailing list must clearly identify the following on the first page: Byllesby-Buck Project No.2514-186. You may use the same method if requesting removal from the mailing list below.

Register online at http://www.ferc.gov/esubscribenow.htm to be notified via email of new filings and issuances related to this or other pending projects. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll free at 1-866-208-3676, or for TTY, (202) 502-8659.

Official Mailing List for the Byllesby-Buck Project

Appalachian Power Company
Kenneth E. McDonough, Esq
Assistant General Counsel
1 Riverside Plaza
Columbus, OH 43081

Appalachian Power Company
Frank Michael Simms
Hydro Support Manager
40 Franklin Road
Roanoke, VA 24013

Advisory Council on Historic Preservation
John T Eddins
401 F Street N.W., Suite 308
Washington, DC 20001-2637

American Canal Society, Inc.
William E. Trout, III, Director
3806 S. Amherst Hwy
Madison Heights, VA 24572

American Whitewater
Kevin Richard Colburn
National Stewardship Director
1035 Van Buren Street
Missoula, MT 59802

Coastal Canoeists
Charles Ware, Conservation Chair
PO Box 566
Richmond, VA 23218-0566

Appalachian Power Company
David Mark Shirley
Energy Production Supervisor
1 Riverside Plaza, 24rd Floor
Columbus, OH 43215

Winston & Strawn LLP
John A Whittaker
1700 K St. N.W.
Washington, DC 20006-3817

Appalachian Power Company
Thomas St. Pierre
Associate General Counsel
1 Riverside Plaza, 29th Floor
Columbus, OH 43215

Appalachian Power Company
David M Shirley
PO Box 2021
Roanoke, VA 24022-2121

American Electric Power Service Corporation
Douglas Rosenberger
Plant Manager Hydro
40 Franklin Road SW
Roanoke, VA 24011

Appalachian Power Company
Legal Department
PO Box 16631
Columbus, OH 43216-6631

Dickenson County Board of Supervisor
Mark Vanover, County Administrator
PO Box 1098
Clintwood, VA 24228-1098

Federal Emergency Management Agency
Regional Office
3003 Chamblee Tucker Rd
Atlanta, GA 30341

U.S. Fish & Wildlife Service
Region 1
David W. Sutherland, Sr
177 Admiral Cochrane Dr.
Annapolis, MD 21401

Flannagan Water Authority
William Stokes, Executive Director
52 Flannagan Dam Road
Haysi, VA 24256

Town of Fries
PO Box 452
Fries, VA 24330-0452

County of Grayson
PO Box 217
Independence, VA 24348-0217

Town of Hillsville
PO Box 545
Hillsville, VA 24343-0545

Historic Landmarks Commission
2801 Kensington Ave
Richmond, VA 23221-2470

Jonnie B. Deel Memorial Library
Shelia Phipps, Librarian
PO Box 650
Clintwood, VA 24228-0650

Mt. Rogers Planning District Commission
1021 Terrace Dr
Marion, VA 24354-4137

NOAA National Marine Fisheries Service
Office of Program Planning & Integration
NEPA Coordinator
1315 East-West Highway
Silver Spring, MD 20910

Northern Virginia Region Parks Authority
5400 Ox Rd
Fairfax Station, VA 22039-1022

Town of Pulaski
PO Box 660
Pulaski, VA 24301-0660

Region 2000 Regional Commission
Executive Director
828 Main St, Fl 18
Lynchburg, VA 24504

Town of Clintwood
Donald Baker
PO Box 456
Clintwood, VA 24228-0456

U.S. Army Corps of Engineers
District Office
803 Front St
Norfolk, VA 23510-1011

US Army Corps of Engineers
Louisville District
PO Box 59
Louisville, KY 40201-0059

U.S. Army Corps of Engineers
Divisional Office
Regulatory Branch
550 Main St; Rm 10524
Cincinnati, OH 45202-3222

U.S.Army Corps of Engineers
550 Main Street
Cincinnati, OH 45202

U.S. Bureau of Indian Affairs
Office of the Solicitor
1849 C Street, NW, MS 6557
Washington, DC 20240

U.S. Bureau of Indian Affairs
Director, Trust Services
1849 C St NW, MS-4637
Washington, DC 20240-0001

U.S. Bureau of Land Management
Land & Renewable Resources
FERC Contact
1849 C St NW
Washington, DC 20240

U.S. Department of Interior
Office of Environmental Policy and
Compliance
Director
1849 C Street, N.W., MS 2430
Washington, DC 20240

U.S. Department of Interior
U.S. Bureau Reclamation
Michael C. Connor Esq
1849 C Street NW
Washington, DC 20240-0001

U.S. Department of Interior
Anthony R. Conte
300 Westgate Center Dr
Hadley, MA 01035-9587

U.S. Department of Interior
James Epstein
300 Westgate Center Dr
Hadley, MA 01035-9587

U.S. Environmental Protection Agency
Region III
1650 Arch St
Philadelphia, PA 19103-2029

U.S. Environmental Protection Agency
Heinz Mueller
Region IV
61 Forsyth St SW
Atlanta, GA 30303-8931

U.S. Fish & Wildlife Service
Regional Director
300 Westgate Center Dr
Northeast Regional Office
Hadley, MA 01035-9587

U.S. National Park Service
FERC Contact
1924 Building
100 Alabama St SW
Atlanta, GA 30303-8701

U.S. National Park Service
Kevin Mendik, ESQ
NPS Hydro Prgm Coord
15 State Street, 10th floor
Boston, MA 02109

U.S. Senate
Honorable Mark Warner
475 Russell Senate Office Bldg
Washington, DC 20510

U.S. Senate
Honorable Tim Kaine
231 Russell Senate Office Bldg
Washington, DC 20510

USDA Forest Service
Ron Bush
1700 Park Ave SW
Norton, VA 24273-1618

USDA Forest Service
David Purser
NEPA Coordinator
1720 Peachtree St NW
Atlanta, GA 30309

Virginia Dept of Conservation and Recreation
Division of Planning and Recreation
600 E. Main St., 24th Floor
Richmond, VA 23219

Virginia Dept of Conservation and Recreation
Robbie Rhur, Enviro. Program Planner
600 East Main Street, Floor 17
Richmond, VA 23219-2094

Virginia Dept of Environmental Quality
Bettina Sullivan, Manager
PO Box 1105
Richmond, VA 23218

Virginia Dept of Environmental Quality
Director
PO Box 1105
Richmond, VA 23218-1105

Virginia Dept of Environmental Quality
Southwest Regional Office
Jeffrey Hurst, Regional Director
355-A Deadmore St
Abingdon, VA 24210

Virginia Dept of Agriculture and Consumer Services
PO Box 1163
Richmond, VA 23218-1163

Virginia Department of Health
Director
PO Box 2448
Richmond, VA 23218-2448

Virginia Department of Historical Resources
2801 Kensington Ave
Richmond, VA 23221-2470

Virginia Department of Mines, Minerals, and Energy
Director, Div. of Energy
1100 Bank St, 11th Flr
Richmond, VA 23219

Virginia Division of Mined Land Reclamation
Randy Casey, Division Director
PO Box 900
Big Stone Gap, VA 24219-0900

Virginia Marine Resources Commission
Ben McGinnis
2600 Washington Ave Fl 3
Newport News, VA 23607

Virginia Office of Attorney General
Attorney General
900 E Main St
Richmond, VA 23219-3513

Virginia Soil and Water Conservation Commission
Director
600 E. Main St., 24th Floor
Richmond, VA 23219

Virginia State Corporation Commission
Sherry H Bridewell, Senior Counsel
1300 East Main St, 10 Fl
Richmond, VA 23219

Virginia Wildlife Federation
Neal D Emerald, Vice President
21851 Locomotive Ter Ste 303
Sterling, VA 20166-6836

County of Wythe
275 S 4th Street
108 Country Ln Office Building
Wytheville, VA 24382-4900

Town of Wytheville
PO Box 533
Wytheville, VA 24382-0533

APPENDIX A
STUDY PLAN CRITERIA
18 CFR Section 5.9(b)

Any information or study request must contain the following:

1. Describe the goals and objectives of each study proposal and the information to be obtained;

2. If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;

3. If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

4. Describe existing information concerning the subject of the study proposal, and the need for additional information;

5. Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;

6. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

7. Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.

APPENDIX B
BYLLESBY-BUCK PROJECT PROCESS PLAN AND SCHEDULE

Shaded milestones are unnecessary if there are no study disputes. If the due date falls on a weekend or holiday, the due date is the following business day. Early filings or issuances will not result in changes to these deadlines.

Responsible Party	Pre-Filing Milestone	Date	FERC Regulation
Appalachian	Issue Public Notice for NOI/PAD	1/7/2019	5.3(d)(2)
Appalachian	File NOI/PAD	1/7/2019	5.5, 5.6
FERC	Tribal Meetings	2/6/2019	5.7
FERC	Issue Notice of Commencement of Proceeding and Scoping Document 1	3/8/2019	5.8
FERC	Scoping Meetings and Project Site Visit	4/10/2019, 4/11/2019	5.8(b)(viii)
All Stakeholders	File Comments on PAD/Scoping Document 1 and Study Requests	5/7/2019	5.9
FERC	Issue Scoping Document 2 (if necessary)	6/21/2019	5.10
Appalachian	File Proposed Study Plan	6/21/2019	5.11(a)
All Stakeholders	Proposed Study Plan Meeting	7/21/2019	5.11(e)
All Stakeholders	File Comments on Proposed Study Plan	9/19/2019	5.12
Appalachian	File Revised Study Plan	10/19/2019	5.13(a)
All Stakeholders	File Comments on Revised Study Plan	11/3/2019	5.13(b)
FERC	Issue Director's Study Plan Determination	11/18/2019	5.13(c)
Mandatory Conditioning Agencies	File Any Study Disputes	12/8/2019	5.14(a)
Dispute Panel	Select Third Dispute Resolution Panel Member	12/23/2019	5.14(d)

Responsible Party	Pre-Filing Milestone	Date	FERC Regulation
Dispute Panel	Convene Dispute Resolution Panel	12/28/2019	5.14(d)(3)
Appalachian	File Comments on Study Disputes	1/2/2020	5.14(i)
Dispute Panel	Dispute Resolution Panel Technical Conference	1/7/2020	5.14(j)
Dispute Panel	Issue Dispute Resolution Panel Findings	1/27/2020	5.14(k)
FERC	Issue Director's Study Dispute Determination	2/16/2020	5.14(l)
Appalachian	First Study Season	Spring - Fall 2020	5.15(a)
Appalachian	File Initial Study Report	11/17/2020	5.15(c)(1)
All Stakeholders	Initial Study Report Meeting	12/2/2020	5.15(c)(2)
Appalachian	File Initial Study Report Meeting Summary	12/17/2020	5.15(c)(3)
All Stakeholders	File Disagreements/Requests to Amend Study Plan	1/16/2021	5.15(c)(4)
All Stakeholders	File Responses to Disagreements/Amendment Requests	2/15/2021	5.15(c)(5)
FERC	Issue Director's Determination on Disagreements/Amendments	3/17/2021	5.15(c)(6)
Appalachian	Second Study Season	Spring - Fall 2021	5.15(a)
Appalachian	File Preliminary Licensing Proposal (or Draft License Application)	10/1/2021	5.16(a)-(c)
All Stakeholders	File Comments on Preliminary Licensing Proposal (or Draft License Application)	12/30/2021	5.16(e)
Appalachian	File Updated Study Report	11/17/2021	5.15(f)
All Stakeholders	Updated Study Report Meeting	12/2/2021	5.15(f)

Responsible Party	Pre-Filing Milestone	Date	FERC Regulation
Appalachian	File Updated Study Report Meeting Summary	12/17/2021	5.15(f)
Appalachian	File Final License Application	2/28/2022	5.17
All Stakeholders	File Disagreements/Requests to Amend Study Plan	1/16/2022	5.15(f)
Appalachian	Issue Public Notice of Final License Application Filing	3/14/2022	5.17(d)(2)
All Stakeholders	File Responses to Disagreements/Amendment Requests	2/15/2022	5.15(f)
FERC	Issue Director's Determination on Disagreements/Amendments	3/17/2022	5.15(f)

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

March 14, 2019

Secretary Kimberly Bose
Federal Energy Regulatory Commission
888 First Street, NE, Room 1A
Washington, DC 20426

RE: Scoping Document 1 – Byllesby-Buck Hydroelectric Project, P-2514-186, New River in Carroll County, Virginia

Dear Secretary Bose:

This letter is in response to the scoping request for the above-referenced project.

As you may know, the Department of Environmental Quality, through its Office of Environmental Impact Review (DEQ-OEIR), is responsible for coordinating Virginia's review of federal environmental documents prepared pursuant to the National Environmental Policy Act (NEPA) and responding to appropriate federal officials on behalf of the Commonwealth.

DOCUMENT SUBMISSIONS

In order to ensure an effective coordinated review of the NEPA document, notification of the NEPA document and federal consistency documentation should be sent directly to OEIR. We request that you submit one electronic to eir@deq.virginia.gov (25 MB maximum) or make the documents available for download at a website, file transfer protocol (ftp) site or the VITA LFT file share system (Requires an "invitation" for access. An invitation request should be sent to eir@deq.virginia.gov.).

The NEPA document should include U.S. Geological Survey topographic. We strongly encourage you to issue shape files with the NEPA document. In addition, project details should be adequately described for the benefit of the reviewers.

ENVIRONMENTAL REVIEW UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT: PROJECT SCOPING AND AGENCY INVOLVEMENT

As you may know, NEPA (PL 91-190, 1969) and its implementing regulations (Title 40, *Code of Federal Regulations*, Parts 1500-1508) requires a draft and final Environmental Impact Statement (EIS) for federal activities or undertakings that are federally licensed or federally funded which will or may give rise to significant impacts upon the human environment. An EIS carries more stringent public participation requirements than an Environmental Assessment (EA) and provides more time and detail for comments and public decision-making. The possibility that an EIS may be required for the proposed project should not be overlooked in your planning for this project. Accordingly, we refer to "NEPA document" in the remainder of this letter.

While this Office does not participate in scoping efforts beyond the advice given herein, other agencies are free to provide scoping comments concerning the preparation of the NEPA document. Accordingly, we are providing notice of your scoping request to several state agencies and those localities and Planning District Commissions, including but not limited to:

Department of Environmental Quality:
- DEQ Regional Office
- Air Division
- Office of Wetlands and Stream Protection
- Office of Local Government Programs
- Division of Land Protection and Revitalization
- Office of Stormwater Management

Department of Conservation and Recreation
Department of Health
Department of Agriculture and Consumer Services
Department of Game and Inland Fisheries
Virginia Marine Resources Commission
Department of Historic Resources
Department of Mines, Minerals, and Energy
Department of Forestry
Department of Transportation

DATA BASE ASSISTANCE

Below is a list of databases that may assist you in the preparation of a NEPA document:

- DEQ Online Database: Virginia Environmental Geographic Information Systems

  Information on Permitted Solid Waste Management Facilities, Impaired Waters, Petroleum Releases, Registered Petroleum Facilities, Permitted Discharge (Virginia Pollution Discharge Elimination System Permits) Facilities, Resource Conservation and Recovery Act (RCRA) Sites, Water Monitoring Stations, National Wetlands Inventory:
    - www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx

- DEQ Virginia Coastal Geospatial and Educational Mapping System (GEMS)

  Virginia's coastal resource data and maps; coastal laws and policies; facts on coastal resource values; and direct links to collaborating agencies responsible for current data:
    - http://128.172.160.131/gems2/

- MARCO Mid-Atlantic Ocean Data Portal

  The Mid-Atlantic Ocean Data Portal is a publicly available online toolkit and resource center that consolidates available data and enables users to visualize and analyze ocean resources and human use information such as fishing grounds, recreational areas, shipping lanes, habitat areas, and energy sites, among others.

http://portal.midatlanticocean.org/visualize/#x=-73.24&y=38.93&z=7&logo=true&controls=true&basemap=Ocean&tab=data&legends=false&layers=true

- DHR Data Sharing System

  Survey records in the DHR inventory:
  - www.dhr.virginia.gov/archives/data_sharing_sys.htm

- DCR Natural Heritage Search

  Produces lists of resources that occur in specific counties, watersheds or physiographic regions:
  - www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml

- DGIF Fish and Wildlife Information Service

  Information about Virginia's Wildlife resources:
  - http://vafwis.org/fwis/

- Total Maximum Daily Loads Approved Reports
  - https://www.deq.virginia.gov/programs/water/waterqualityinformationtmdls/tmdl/tmdldevelopment/approvedtmdlreports.aspx

- Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Database: Superfund Information Systems

  Information on hazardous waste sites, potentially hazardous waste sites and remedial activities across the nation, including sites that are on the National Priorities List (NPL) or being considered for the NPL:
  - www.epa.gov/superfund/sites/cursites/index.htm

- EPA RCRAInfo Search

  Information on hazardous waste facilities:
  - www.epa.gov/enviro/facts/rcrainfo/search.html

- EPA Envirofacts Database

  EPA Environmental Information, including EPA-Regulated Facilities and Toxics Release Inventory Reports:
  - www.epa.gov/enviro/index.html

- EPA NEPAssist Database

  Facilitates the environmental review process and project planning:

  http://nepaassisttool.epa.gov/nepaassist/entry.aspx

If you have questions about the environmental review process, please feel free to contact me (telephone (804) 698-4204 or e-mail bettina.rayfield@deq.virginia.gov).

I hope this information is helpful to you.

Sincerely,

Bettina Rayfield, Program Manager
Environmental Impact Review and
Long-Range Priorities

COLLEGE OF NATURAL RESOURCES AND ENVIRONMENT
FISH & WILDLIFE CONSERVATION
VIRGINIA TECH.

310 West Campus Drive
Cheatham Hall, Room 101
Blacksburg, Virginia 24061
P: (540) 231-5919 F: (540) 231-7580
Don_Orth@vt.edu

March 15, 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Comments and Study Requests for Byllesby-Buck Dam Hydroproject Pre-Application Document (FERC NO. 2514).

Dear Ms. Bose:

The following is a brief numbered summary of comments on the Pre-Application Document for FERC No. 2514, Byllesby-Buck Dam project.

1. The effects of the Byllesby-Buck hydro project extend beyond the project boundary due to sediment storage, backwater effects, and barrier effects.

2. Little dredging has been done in the impoundments in recent times, which limits the project life and ecological and recreational values of the impounded section. Major concern about impoundments as source of continued PCB contamination and impairment was not addressed.

3. Water spilled over dams during higher flows is often heavily laden with fine sediments due to the shallow nature of the impoundment and lack of shoreline vegetation management.

4. The bypassed reaches receive no minimum instream flow and there are no gages available to measure the duration of bypass effects.

5. The bypassed reaches are sediment-starved and deficient in sand, gravel, and cobbles, essential components of habitats to support local fauna. There is no mention of existence of the foundational plant, the hornleaf riverweed *Podostemum ceratophyllum* in the PAD.

6. The unique biological resources in this reach are not adequately considered in the PAD. In particular these include the pygmy snaketail dragonfly (*Ophiogomphus howei*), Allegheny river cruiser (*Macromia alleghanensis*), spine-crowned clubtail (*Gomphus abbreviatus*), and green-faced clubtail (*Gomphus viridifrons*).

7. The project dam blocks the passage and, therefore, natural recovery of the river spawning Walleye *Sander vitreus* in the upper New River.

8. Cool water endemic fishes influenced by the Byllesby-Buck hydroelectric project are largely ignored in this document.

9. Appalachian Power Co. does not proposed to conduct aquatic surveys for odonates, crayfishes, or eastern hellbender within the Project boundary (PAD 6-5).

10. The project diminishes habitat for freshwater mussels due to a complete lack of sand and gravel immediately downstream of the dams and the heavy sedimentation in the impoundment. Yet, these impacts and proposed mitigation efforts were not mentioned in the PAD.

11. The impounded reaches buried much of the suitable gravel substrate that would provide habitat for insects, crayfish, mussels, hellbender, fish and spawning by numerous fish, including the native strain of Walleye.

12. The PAD does not recognize effects of project operations on the impoverishment of the local community and economy.

13. Rehabilitation of a fishable walleye population in this reach of the New River would have substantial economic benefits to the impoverished local economy and is a high priority of the Department of Game and Inland Fisheries.

14. PAD recommends studies to address Geology and Soils, Water Resources, Fish and Wildlife, Wildlife and Botanical Resources, Wetlands and riparian habitat, recreational land use, aesthetic resources, and cultural and tribal resources and Socioeconomic Resources (Section 6). Specifically, the PAD recommends a series of vaguely described studies that do not seem to recognize FERC's "clear mandate to balance both power interests and environmental considerations." In particular, the following study needs are requested and defined later in this letter:

    a. PCB contamination and pollution minimization plan

    b. Water Willow propagation, rehabilitation, and water level plan

    c. Define the target biological community in the two bypass reaches and determine minimum instream flow.

d. Enhancement plan for sport fish in project area

e. Survey of rare dragonflies or multi taxa survey. Haag et al. 2013

f. Feasibility of fish passage or enhanced Walleye stocking

g. Recreational value lost due to Project.

Detailed Comments

1. The effects of the Byllesby-Buck hydro project extend beyond the project boundary due to sediment storage, backwater effects, and barrier effects. Figure 4.20-1 (PAD p 4-2, and Exhibit G drawings in Appendix C) ignores much of the river between Buck Dam and Lake and Byllesby Dam. In fact, the river ecosystem in this section of river is highly modified due to the fluctuating flow created by operations of the two hydroelectric dams. The omitted segment of the New River includes Buck Falls and island habitats that are no longer accessible to upstream migrating suckers and walleyes. This section of the New River should be included in the area affected by project operations in all future efforts to develop study plans, determine what the project impacts are, and how to mitigate them through protection, mitigation, and enhancement measures.

2. Little dredging has been done in the two impoundments in recent times, which limits the project life and ecological and recreational values of the impounded section. "Significant maintenance dredging was performed at the Project in 1997 (p 5-9)." Furthermore, there is major concern from the Virginia Department of Environmental Quality about these and other New River impoundments as sources of continued PCB contamination. This nexus between the project operations and river impairment was not addressed in the PAD. In fact, nowhere in the PAD are PCBs even mentioned. This is a serious oversight on the part of the applicant. New River is impaired due to polychlorinated biphenyl (PCB) contamination; however, this was not included in section "5.3.7.1 Impaired Waters." Although banned since the 1970's PCBs persist in the environment and cause endocrine disruption and are suspected carcinogens. PCBs are hydrophobic and associate with soil and sediments which continue to contribute to PCB resuspension and desorption. The Virginia Department of Environmental Quality draft TMDL for PCBs states that "To address

contaminated bed sediments where localized hot spots exist (e.g., depositional area behind a dam), mechanical or vacuum dredging could be explored as an option to permanently remove PCBs from the system." (Department of Biological Systems Engineering, Virginia Tech 2018. p. 106). Therefore, the nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource (fishing for subsistence) and human health has clearly been shown by a stakeholder agency. Dredging and flushing sediments were among the effective mitigation measures to prevent reservoir sedimentation in a review of hydropower projects (Trussart et al. 2002).

3. Water spilled over dams during higher flows is often heavily laden with fine sediments due to the shallow nature of the impoundments and lack of any shoreline vegetation and erosion management plan. This is a direct influence of project operations and the impacts on aquatic flora and fauna should be mitigated in future project licensing conditions. The PAD states that "most of the sediment load that enters the Byllesby and Buck developments is expected to pass through the Project and be deposited downstream." (p. 5-9). In most other reaches of the New River, the American Water Willow *Justicia americana* (hereafter water willow) traps and consolidates sediments as it builds limited floodplain habitats and reduces erosion of stream banks. These shoreline zones are important shallow habitats for many fish and invertebrates (Fritz and Feminella 2003; Lobb and Orth 1991). Furthermore, the water willow beds provide for carbon sequestration. The elimination has increased the carbon footprint of the Project. Water willow flowers also attract pollinators and the plant is host for caterpillars, such as Hydrangea Sphinx moth (*Darapsa versicolor*).

   The project has operated for its duration with no restrictions on water level fluctuation. Consequently, the Project impoundments lack aquatic macrophytes and stable, vegetated shorelines. Water willow is resistant to these disturbances and has been planted in other reservoirs for erosion control. Native aquatic macrophyte establishment can benefit fish and a variety of other aquatic organisms by providing refugia from predation and abundant food resources. Stems and leaves provide increased surface areas for colonization by epiphytic bacteria and algae. The decomposition of macrophytes stimulates instream productivity by numerous filtering organisms. Water willow mortality increases during long periods of inundation, which can lead to eventual elimination with repeated water level fluctuations (Strakosh et al 2005).   Shorelines with abundant water willow cover had higher abundance of young fishes (Strakosh 2006; Stahr and Shoup 2015; Stahr and Kaemingk 2017). Consequently, water willow re-establishment and a water level fluctuation plan are needed as there is a clear nexus between Project operations and effects (direct, indirect, and/or cumulative) on the biota in the Project impoundments.

4. The two by-passed reaches receive no minimum instream flow and there are no estimates in the PAD of the duration of bypass dewatering. These river reaches have been dewatered for much of the year for each of the past 107 years, resulting in an impoverished biotic community and minimum fish and wildlife benefits. The bypass reaches are in a section of the New River that is a very wide, shallow channel of resistant bedrock ledges. As such, they are unique geomorphic and biological resources. The applicant has written off these bypass reaches based on lack of concern expressed in previous licensing, which is not acceptable logic. Nowhere in the PAD could I find mention of a minimum instream flow study. Precedent exists for minimum flows in long-dewatered reaches of the New River. This is a requirement of 401 certification by the Virginia Department of Environmental Quality. The Hawks Nest Dam in West Virginia was completed in 1933; it created a 250-acre lake and a dewatered downstream reach, "the dries." The dries is 5.5 miles reach of New River that is bypassed to provide water to the powerhouse. Part of the FERC relicensing agreement of 2018 requires put-in and take-out facilities, a portage trail, changing rooms and other amenities to accommodate paddlers and anglers taking advantage of recreational releases from Hawks Nest Dam. License conditions require seasonally variable minimum instream flow in the formerly dewatered bypass. Furthermore, new requirements include nine annual pulsed releases of 2,200 to 2,500 cfs from the dam to accommodate whitewater rafting and kayaking. The releases will be made on to-be-announced weekend days, starting with two dates in late March, with the rest occurring sometime from late June through early August. (Colburn 2018: Steelhammer 2019).   It is in keeping with the FERC mandate to balance power production with environmental protection that the applicant with local stakeholders define a target biotic community to be rehabilitated in the bypass reaches of the Project. Flow management is an effective mitigation in hydropower projects

(Trussart et al. 2002) and a bypass minimum instream flow should be established as part of the new license conditions.

5. The Project has left the bypassed reaches sediment-starved and deficient in sand, gravel, and cobble size particles, essential components to support the local flora and fauna. There is no mention of the unique channel geomorphology and loss of foundational plant, the hornleaf riverweed *Podostemum ceratophyllum,* within the project area. The New River basin was not covered by ice during the last glaciations, but would have experienced periglacial conditions during glacial maxima. This geologic history resulted in unique river morphology and unique endemic fauna, many of which reside in the reach near the Byllesby-Buck hydroelectric project. The channel profile of the New River in Virginia is punctuated with distinct segments with high slope and many river segments are dominated by resistant bedrock that results in a narrow deeper channel while other river segments are dominated by resistant sandstones formations that run perpendicular to water flow (Spotila et al. 2015). In these sections the New River erodes via plucking and abrasion creating in many reaches a very wide shallow incision plain. Channels are wider where bedrock is highly jointed and proficient plucking transforms the channel into an incision plain, which widens via quarrying at the margins.

   The unshaded bedrock channel morphology of the New River supports distinctive riverine flora. Three common and widespread plants serve as foundational species, those that play a strong role in structuring the community. These include the Hornleaf Riverweed *Podostemum ceratophyllum* (hereafter riverweed), American Water Willow *Justicia* americana (hereafter water willow), and American Water Celery *Vallisneria americana* (hereafter water celery). In the two Project bypass reaches, which are dominated by bedrock, the Hornleaf Riverweed *Podostemum ceratophyllum* would typically attach to bedrock in these fast, shallow rapids. Most of the macrophyte production in New River is riverweed (Hill and Webster 1983, 1984). Because of its abundance, the productivity of riverweed dominated both the primary productivity and the particulate organic matter input via decay to the New River. However, the species is declining across much of its range and stressors include flow alteration, sedimentation, and altered water quality (Connelly et al. 1999; Wood and Freeman 2017; Davis et al. 2018). Coarse sediment abrades riverweed during storm flows, but the stems and roots may regenerate in four days (Philbrick et al. 2015) and high turbidity limits plant growth. Riverweed is a foundational plant in rivers of the region and supports exceptionally high levels of macroinvertebrate production (Nelson and Scott 1962; Voshell et al. 1992; Grubaugh and Wallace 1995). Removal of riverweed reduced macroinvertebrate biomass by over 90% (Hutchens et al. 2004) and reduced benthic fish abundance (Argentina et al 2010). Biomass of riverweed was related to variation in duration of low flow events (Pahl 2009) and effects of hydrological alteration is likely expansive.

The riverweed is abundant in the New River and supports high productivity of macroinvertebrates and crayfishes and many crayfish are also harvested locally as bait (Roell and Orth 1992). The high productivity of crayfish and macroinvertebrates directly influences higher trophic levels, including sport fishes such as Rock Bass, Smallmouth Bass, and Flathead Catfish (Roell and Orth 1993, 1998; Orth 1995). Consequently, the altered conditions due to the operations of the Byllesby-Buck hydroelectric plants have eliminated the energy base and productivity for higher trophic levels and sport fishes of the New River.

Smallmouth Bass and Walleye are dominant preferred game fish in the New River upstream from Claytor Lake, but not within the project area. There is a close interaction between Byllesby-Buck hydroelectric plant operations and loss of habitat for foundational vegetation, crayfish, and a diverse macroinvertebrate fauna that should be mitigated in future license conditions. Across the US, it is estimated that 25% of sediment typically transported in streams is captured in impoundments (Renwick et al. 2005). In the Project impoundments, sediment does not create habitat – rather it smothers habitats. Fish species richness was positively related to river fragment length (McManamay et al. 2015) and many native fish species were absent in surveys of the nearby Fries dam impoundment (Carey et al. 2018). The dominant fish in the Byllesby and Buck pools was made up of Common Carp; the fish biomass was 32.4% common carp; Appalachian Power Company 1991, p 14). Therefore, there is strong evidence for the nexus between Project operations and effects (direct, indirect, and/or cumulative) on biotic productivity in the dewatered bypass reached. Little work has been done on methods for rehabilitation of lost riverweed beds; however, root fragments readily attach to substrates and could be propagated for introduction to the New River (Philbrick et al. 2015). Habitat rehabilitation is an effective mitigation in hydropower projects (Trussart et al. 2002).

6. The unique biological resources in the Project boundaries are not adequately considered in the PAD. In particular these include the pygmy snaketail dragonfly (*Ophiogomphus howei*), Allegheny river cruiser (M*acromia alleghanensis*), spine-crowned clubtail (*Gomphus abbreviatus*), and green-faced clubtail (*Gomphus viridifrons*). Carey et al. (2017) recently identified all four species on Virginia's State Wildlife Action Plan (VDGIF 2015) in New River surveys near Fries, Virginia. The pygmy snaketail dragonfly nymph was described from the New River near Galax (Kennedy and White 1979). Dragonflies are predators in their aquatic nymph and adult phases; they are also prey for bass, rock bass, and sunfishes. Dragonflies are sensitive to sediment, water quality, climatic factors, making this group a potential useful indicator (Bush et al. 2013). Dragonflies have been referred to as climate canaries for river management. Adults are highly mobile and can relocate to more favorable regions. Four rare dragonflies of the new River are listed in Virginia's wildlife action plan; yet no studies are planned for these rare dragonflies. Here there appears to be a clear nexus between Project operations and effects (direct, indirect, and/or cumulative) on the dragonfly assemblage of the New River. Doing specific inventories and acquiring better knowledge of the fauna, flora, and specific habitats is one of the most effective steps to avoid loss of biological diversity (Trussart et al. 20002).

7. A unique river-spawning strain of Walleye *Sander vitreus* is blocked from upstream migration by Buck and Byllesby Dams. Walleye is increasing in popularity among anglers in Virginia and elsewhere (Quinn 1992) and stocking is an important management tool. The New River Walleye demands special management upstream from Claytor Lake (Palmer et al. 2007; Copeland 2017) and provides the brood stock for statewide stocking.

   The assumption of the New River walleye management plan is that the unique walleye strain is a river-spawning Walleye and may have adaptive traits that permit it to survive better in the New River. For example, this unique genetic strain of Walleye has eggs with 65% larger volume, an adaptive trait for living in less productive waters

(Hopkins et al. in review). The yolk is the main source of energy and nutrients for the developing embryo and newly hatched larva and larger eggs would be correlated with larger fry (Kamler et al. 2005). This egg size may have little influence on hatchery production; however, it may play a larger role in the reproductive success of the Walleye spawning and rearing in New River.

However, management questions remain as first-year survival of stocked fingerlings is highly variable in other populations and presumable in the New River as well (Johnson et al. 1996; Jennings et al. 2005). The fisheries management target (15-25 walleye per hour electrofishing) is rarely achieved (Copeland 2017). Unanswered questions include the following: How much suitable habitat is there? What is an appropriate stocking rate? Can we restore a river-resident river spawning Walleye population above Buck and Byllesby dams (Ney et al. 1993). What is limiting natural reproduction? What predators contribute most to post-stocking mortality? What would Walleye population levels be in the absence of the Byllesby-Buck Project?

Today, sustained efforts to select and stock only New River strain Walleye have restored genetic integrity, but the population still requires annual stocking. Elsewhere, Fayram et al. (2005) recommended a stocking rate for walleye fingerlings of 75 fish/ha even though prevailing stocking rate was 125 fish/ha. Yet stocking rates for New River Walleye have never approached 10/ha due largely to limited size of the brood stock, which is likely limited by Byllesby-Buck hydroelectric project location and operations. Characterization of habitat quality and quantity for demersal stage fingerling walleye has not been done and effects of fluctuating flows below Buck Dam remains unresolved.

Studies on factors that limit recruitment in river spawning walleye suggest that temperature and flow may drive recruitment success (Mion et al. 1998; Gillenwater et al. 2006; Rutherford et al. 2016). In the Maumee River, as river discharge increased, the amount of suspended sediments increased, likely directly increasing larval mortality (Mion et al. 1998).

The unknown is the effect of altered habitat and warmer temperature conditions in the New River due to operation of Byllesby-Buck hydroelectric plant represents a clear nexus with Project operations. Freeman et al. (2001) discovered that summer-spawning fish species numerically dominated the fish assemblage at the flow-regulated site in the Tallapoosa River. With warming river temperature, coupled with non-native centrarchids, the New River may provide unsuitable habitats for fingerling stages of the walleye (Bozek et al. 2011). The New River has an abundance of centrarchids, many of which are large enough to be predators on fingerling walleye. Furthermore, the cover provided by instream vegetation (i.e., riverweed *Podostemum* and water celery *Valesneria*), two foundational species may be reduced in the New River due to high turbidity and water level fluctuations (Kimber et al. 1995; Wood and Freeman 2017).

Here there appears to be a clear nexus between Project operations and effects (direct, indirect, and/or cumulative) on the aquatic community in general and foundation plants and the unique Walleye population, in particular. Fish population enhancement and habitat rehabilitation are effective mitigation strategies in hydropower projects (Trussart et al. 2002).

8. A number of coolwater endemic fishes are likely influenced by the Byllesby-Buck hydroelectric project, although no pre-project data exists on these fishes. The New River was a refugium for flora and fauna during the last glacial period. Today it supports a relatively high number of endemic fishes due to (1) the presence of natural barriers and (2) the immobility of a species. Glaciers did not reach Virginia though the climatic and barrier effect was a strong influence in the New River fish fauna. During the Pleistocene, the climate cooled and for fish in the New River, it was "no way out and no way in." because of a large ice dam. New River animals had to stay, adapt, or die. The mainstem falls, cascades, rapids prevented upstream dispersal after the Pleistocene glaciation. Therefore many native New River fishes as cool-adapted. This New River above Claytor Lake supports 46 native fishes, 8 of which are endemic species. Multi-species surveys have suggested habitat limitations may exist for Walleye immediately post stocking (Carey et al. 2018). The 8 endemic fishes are coolwater specialists, preferring temperatures about 19 C or 66 F (Shingleton et al. 1981). Byllesby and Buck impoundments warm surface waters and limit potential of the New River to provide habitat for these coolwater endemic fishes (Figure 5.3-1). The Appalachia Darter is not

common at the few locations where they do exist. They occur most frequently in the Blue Ridge province and mainstem New River, where five dams block their movements through the mainstem (Frimpong et al. 2014).

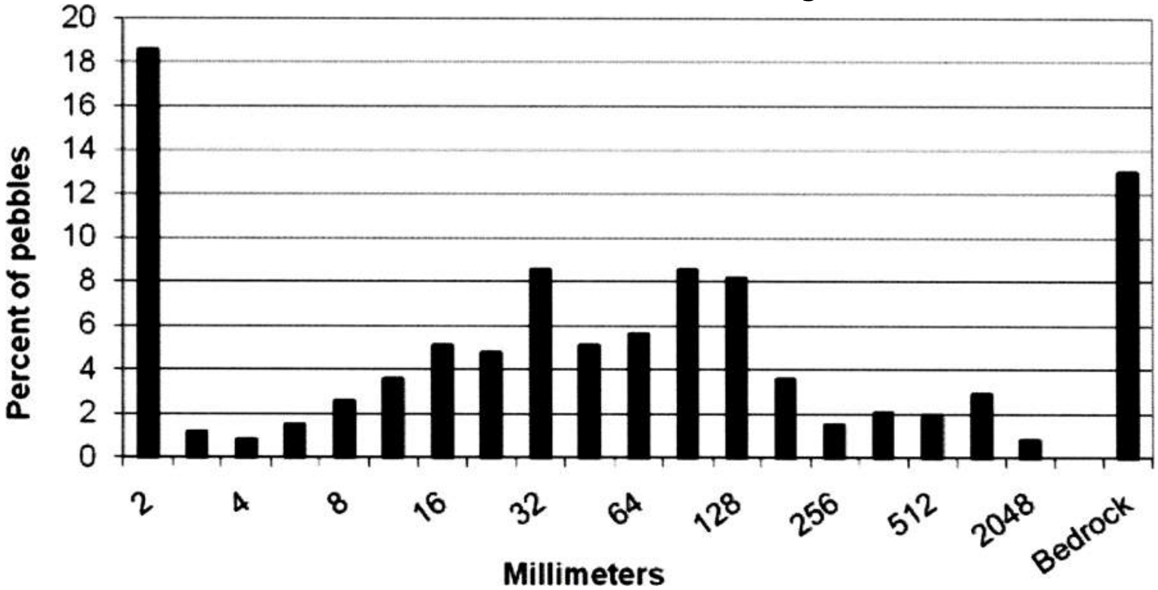
Candy Darter is an endangered species (FR 2018) that inhabits swift, shallow areas with little fine sediment and complex substrate (Dunn and Angermeier 2016). Candy darters were extirpated from at least seven streams in southern extent of range (Dunn and Angermeier 2018) and is threated with hybridization with the introduced Variegate Darter (Gibson et al. 2018). The project may influence population of Candy Darter in the Cripple Creek drainage (Wythe County).

There appears to be a clear nexus between Project operations and effects (direct, indirect, and/or cumulative) on the Walleye and the coolwater fish assemblage of the New River. Creation of spawning and rearing habitats and diversification of aquatic habitats were among the successful measures of mitigation that emerged in a review of hydropower projects (Trussart et al. 2002).

9. Appalachian does not proposed to conduct aquatic surveys for odonates, crayfishes, or eastern hellbender within the Project boundary (PAD 6-5). These types of surveys are more efficiently conducted via multi-taxa study designs and there is no compelling reason in the PAD not to do aquatic surveys. New River supports a unique fauna of coolwater specialists, including the New River crayfish (*Cambarus chasmodactylus*, Russ et al. 2016) and new species are still being identified (Loughman et al 20170 In a recent range-wide conservation status assessment of the New River crayfish, Russ et al. (2016) concluded that although the species is stable at this time, its geographical range is restricted—making them more vulnerable to threats. The New River crayfish is currently under federal review for listing under the Endangered Species Act (76 FR 59835). Furthermore, this assessment noted that data on New River crayfish distributions in Virginia were limited and recommended additional surveys in the state to fill these gaps in knowledge. Virile crayfish (*Orconectes virilis syn. Faxonius virilis*) were introduced in the New River in Virginia (Pinder and Garriock 1998) in the late 1990s and surveys are needed to document current distributions. Based on the absence of suitable crayfish habitat (i.e., gravel and cobble substrates) in the Byllesby and

Buck bypass reaches, Appalachian does not expect crayfish to be present in these Reaches (PAD p. 5-39). This stated rationale suggests the need for mitigation and habitat rehabilitation and repatriation of the species lost from the project area. The endemic fishes of the New River are unique and their limited distribution means many anthropogenic activities may have a disproportionate influence on species viability. The construction of dams on the mainstem and its tributaries fragmented populations and reduced coolwater habitats. In addition to hydropower dams, emerging threats to the restoration of walleye include introduction of nonnative species and climate change (Angermeier and Pinder 2015; Buckwalter et al. 2017), the same threats to indigenous fauna and flora in the upper New River and the upper Clinch River.

And eastern hellbender is a species of special concern in Virginia and under review by the U.S. Fish and Wildlife Service. The PAD also has no mention of the Eastern Hellbender *Cryptobranchus alleganiensis*. The Eastern Hellbender is are large, fully aquatic salamanders that occur in parts of the eastern United States; in Virginia it is a species of state concern. This species is near threatened (Hammerson and Phillips 2004) and occurs in the New River (Jachowski and Hopkins 2014). They require cool, rocky, swift-flowing streams and rivers with high levels of dissolved oxygen. Eastern Hellbender presence was documented in the New River in the vicinity of Fries, Virginia (Carey et al. 2018). Recent sampling by Catherine Jachowski (Virginia Tech Fish and Wildlife Conservation, personal communication) confirms their existence in the New River at two locations in vicinity of Independence, Virginia. Juvenile and adult Eastern Hellbenders eat crayfish. Eastern Hellbenders appear to move little throughout the year and remain close to shelter rocks (Burgmeier et al. 2011). In the Blue River of southern Indiana, Burgmeier et al. (2011) found that 79.5% of Eastern Hellbender locations were found on a gravel substrate (Figure below). In a recent study of the population genetics, Unger et al. (2013) found that greatest partitioning of genetic variation of Eastern Hellbender was within streams (~94–98) though they recognized genetic differences between Ohio and Tennessee drainages and differentiation in populations at the edges of the range. The Unger et al. study, however, did not sample Eastern Hellbenders from the New River drainage. Due to multiple dams that limit gene flow in the upper New River, isolated demes of hellbenders may be susceptible to the Allee effect. Crayfish, Hellbenders, gravel substrates, and population fragmentation are certainly at the nexus of biological resources and power production in this hydropower case and the absence of attention in the PAD is disturbing.



From Burgmeier et al. 2011.

10. The project diminishes habitat for freshwater mussels due to a complete lack of sand and gravel immediately downstream of the dams and the heavy sedimentation in the impoundment. Yet, these impacts and proposed mitigation efforts were not mentioned in the PAD. A marked loss of mussels was evident in contemporary surveys (Jirka and Neves 1990; Pinder et al. 2002) compared with surveys done by Arnold Ortmann one hundred years ago. Five mussel species have historical records above Claytor Lake. This includes two state threatened mussels, green floater (*Lasmigona subviridis*, under federal review) and pistolgrip (*Tritogonia verrucosa*). Others include the rare elktoe (*Alasmidonta marginata*), spike (*Elliptio dilitata*), pocketbook (Lampsilis ovata), and purple wartyback (*Cyclonaias tuberculata*; Pinder et al. 2002; Carey et al. 2018). These freshwater mussels depend on a host fish to complete the larval phase of its life history. Fish are essential to permit colonization of mussels after dieoffs (Hove et al. 2011). Creation of aquatic habitats were among the successful measures of mitigation that emerged in a review of hydropower projects (Trussart et al. 2002) and introduction and monitoring of rare mussels should be discussed as mitigation efforts.

11. The impounded reaches buried much of the suitable gravel substrate that would provide habitat for insects, crayfish, mussels,

hellbender, fish and spawning by numerous fish, including the native strain of Walleye. Furthermore, the depositional filling has substantially reduced depth and surface area, caused backwater isolation and habitat fragmentation. Eroding shorelines continue to add to sediment loads and fluctuating water levels due to project operations limits to colonization of foundational plants, such as the water willow. In general, fishing quality declines with functional age of impoundments (Miranda and Krogman 2015) and neither Buck nor Byllesby impoundments have had a comprehensive fish or fishing or aquatic macrophyte surveys conducted since the Appalachian Power Company (1991) to compare conditions with upstream and downstream reference conditions. Water celery (*Vallisneria americana*) provides oxygen and supports distinct invertebrate communities and waterfowl feeding grounds (Strayer, et al. 2003; Spoonberg et al. 2005). Both water celery and riverweed are eaten by introduced Grass Carp (Weberg et al. 2015). Even conditions described in the 1991 report suggest the need for rehabilitation of the impoundment habitat to counteract the effects of sedimentation and reservoir aging and avoid the lakes becoming dominated by Common Carp (Weber and Brown 2009; Pegg et al. 2015). Other sections of the New River support healthy and abundant populations of carnivorous fishes that are targeted by various sport anglers; these include Muskellunge, Flathead Catfish, Channel Catfish, Smallmouth Bass, Walleye (Orth and Newcomb 2002; Brendan et al. 2004; Copeland et al. 2006; Palmer et al. 2006, 2007; Dickinson et al. 2015; 2018; Doss et al. 2019). Michigan stream anglers respond to differences in fish abundance between sites and the probability of visiting a site increases with targeted biomass (Melstrom et al. 2015). The nexus of project operations has diminished to sport fishing potential in the Project impoundments and warrants a plan for rehabilitation.

12. The PAD does not recognize effects of project operations on the impoverishment of the local – regional economy and ecosystem services provided by the New River (Breslow et al. 2017). The PAD provides no evaluation of ecosystem services provided by the river with or without project operations. Nor does it contain any potential studies. Consequently, it appears that it expects FERC to balance by assuming "an implicit value of zero" being placed on ecosystem services. There is no explanation on how inevitable trade-offs between competing environmental, economic, and recreational ends be made and no studies to define these ends. Yet, Loomis (2000) maintained

that nonmarket valuation studies should play a significant role in such dam relicensing decisions. The information provided on price analysis of the project is not balanced with comparable studies that adopt conventional demand analysis of alternative or expanded recreational opportunities (Stephenson 2000; Stephenson and Shabman 2001). This is a major omission in the PAD and proposed studies.

Stephenson (2000) outlined a rational decision framework that could be adopted as an approach for scoping studies. This approach recognizes that licensing hydropower is stakeholder-driven and relies on building consensus among various stakeholders of different expertise, technical language, and values. "A rational analytic approach would create systems of structured analysis and a corresponding set of decision rules that would guide decisions about dam operations. The rational analytic approach begins with a limited number of decision participants that follow a formal decision logic. These participants conceptually identify objectives, formulate alternatives to meet those objectives, evaluate the consequences of each alternative, develop procedures to weigh the many different consequences and then choose an alternative based on some a priori decision criteria. Formal rules and procedures would be devised that would identify the rules of analysis that would evaluate, weigh, and choose between competing alternatives. These rules would provide the basis for an "objective" analysis and identify the "best" answers to the above questions." (Stephenson 2000). This type of stakeholder driven approach will satisfy the fundamental principles of the integrated license process, in particular "Early issue identification and resolution of studies needed to fill information gaps, avoiding studies post-filing." There are several measures for sharing development benefits of hydropower. These include but are not limited to the following: (1) Developing equity-sharing partnership solutions with local and regional institutions, and (2) Creating a jointly managed environmental mitigation and enhancement fund (Trussart et al. 2002).

13. Rehabilitation of a fishable walleye population in this reach of the New River would have substantial economic benefits to the impoverished local economy and is a high priority of the Department of Game and Inland Fisheries. The Byllesby-Buck project prevents spawning migration to the upper New River and increases the cost of the marker-assisted selection of brood stock because fingerlings have to be stocked above project boundary. Furthermore, the Project

creates habitat for invasive species that may negatively affect Walleye. Invasive species of concern in the New River include Hydrilla, Asiatic clams, and recent introduction of Quillback *Carpioides cyprinus* and Notchlip Redhorse *Moxostoma collapsum* – impacts as yet unknown (Easton et al. 1993; Weberg et al. 2015; Hilling et al. 2018; Buckwalter et al. 2018). Developing plans for invasive species management requires broad impact from stakeholders (Fouts et al 2017), yet there is no mention of this in the PAD. These unintended introductions are unsustainable – these have costs but no benefits. Finally, there was no mention of analysis of the feasibility of fish passage in the PAD. Mitigation of the Project effects should consider alternative mitigation or compensation measures such as fish passage for Walleye or enhanced stocking programs. The highly modified project reach has dramatically reduced biomass of sport fish targeted by local anglers. As mentioned earlier, Michigan stream anglers respond to differences in fish abundance between sites and, specifically, the probability of visiting a site increases with targeted biomass (Melstrom et al. 2015). The losses of recreational fishing benefits from the Project was not mentioned in the PAD but are likely to be substantial. Von Haefen (2003) estimates that recreational fishing in the lower Susquehanna River is worth about $30 per trip.

14. PAD recommends studies to address Geology and Soils, Water Resources, Fish and Wildlife, Wildlife and Botanical Resources, Wetlands and riparian habitat, recreational land use, aesthetic resources, and cultural and tribal resources and Socioeconomic Resources (Section 6). With the passage of the Electric Consumers Protection Act of 1986 (ECPA), FERC's consideration of environmental impacts with the requirement that equal consideration be given to the protection and enhancement of, and mitigation of damage to, wildlife, environmental quality, and recreational opportunity (Blum and Nadol 2001; Tarlock 2012). Specifically, these study plans, as written, do not appear to recognize FERC's "clear mandate to balance both power interests and environmental considerations." (Kosnik 2010) and no time frames for completion are indicated. As Tarlock (2012, p. 1765) wrote "species conservation and ecosystem restoration must be subject to continuing, rigorous assessment using adaptive management…. The central idea is that management decisions must be constantly monitored, evaluated, and modified or reversed when new information so counsels."

I thereby request a number of potential studies be conducted by the applicant so that power production can be balanced with protection of riverine biota and recreation. These study proposals include measurements that are likely important for understanding the potential environmental effects of the Byllesby-Buck project. These environmental metrics are included in the extensive list environmental metrics uncovered during a hydropower literature review conducted across several sectors (Parish et al. 2019). As outlined in the NOI and PAD, the study request are described below with all requisite information.

Study Requests

PCB contamination and pollution minimization plan

i. Describe the goals and objectives of each study proposal and the information to be obtained;
    a. Determine the PCB load that exists in the total sediment deposited in the two project impoundments and develop a plan for removal and safe disposition.

ii. If applicable, explain the relevant resource management goals of the agencies or Indian Tribes with jurisdiction over the resource to be studied;

Virginia Department of Environmental Quality. PCB TMDL coordinator is Mark Richards at Mark.Richards@deq.virginia.gov or 804-698-4392.

iv. If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

New River is an impaired water body and health advisories exist for fish caught from the New River.

v. Describe existing information concerning the subject of the study proposal and the need for additional information;

The New River PCB TMDL has been conducted and is available online at https://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/PCBTMDLs/NewRiverTMDLPCB.aspx

vi. Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied and how the study results would inform the development of license requirement.

The project has been storing sediment which limits the project life and ecological and recreational values of the impounded section. which limits the project life and ecological and recreational values of the impounded section.

“Significant maintenance dredging was performed at the Project in 1997 (p 5-9).” However, there is no mention of the impoundments as source for in the TMDL PCB load model. The draft TMDL report stated that “PCBs in streambed sediments are contributing to the system through the dynamic relationship between the sediment and water processes. This occurs through sediment resuspension and/or partitioning from sediment through desorption. To address contaminated bed sediments where localized hot spots exist (e.g., depositional area behind a dam), mechanical or vacuum dredging could be explored as an option to permanently remove PCBs from the system.” (Department of Biological Systems Engineering, Virginia Tech 2018).

vii. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

A model has been developed and calibrated to hydrology, sediment, and PCB levels in the upper New River. Many uncharacterized sources and streambed sediments represent a load in the PCB load model and the Byllesby-Buck project would PCB source is a boundary condition in the model. The study would estimate PCB load in sediments behind both Byllesby and Buck reservoirs using methods similar to those used in Department of Biological Systems Engineering, Virginia Tech (2018) .

viii. Describe considerations of the level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

There are no alternative studies proposed in the PAD that deal with the question of PCB loads in Project impoundments.

Water Willow propagation, rehabilitation, and water level plan

i. Describe the goals and objectives of each study proposal and the information to be obtained;

Determine shoreline habitats within the Project boundary that would be suitable for propagation and planting of American water willow for bank stabilization and nursery habitat for shoreline fish and other aquatic life.

ii. If applicable, explain the relevant resource management goals of the agencies or Indian Tribes with jurisdiction over the resource to be studied;

Enhance fish and wildlife productivity and biological diversity by stabilizing eroding banks and reducing sediment additions to the New River.

iv. If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

Enhanced habitat for wildlife viewing and fishing and increased water clarity in the New River.

v. Describe existing information concerning the subject of the study proposal and the need for additional information;

The PAD provides aerial photos but did not include vegetation map that indicated current location of American water willow in the project area. However, American water willow is a foundational plant that is common in many segments of the New River and provides habitat for many aquatic invertebrates and juvenile fishes (Lobb and Orth 1991). Water willow is resistant to these many disturbances and is now being extensively planted in reservoirs for shoreline stabilization.

vi. Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied and how the study results would inform the development of license requirement

Water level fluctuations and long periods of inundation will cause mortality of the American water willow. With proper water level management extensive beds of water willow will grow and reduce shoreline erosion. Many agencies and lake management firms are propagating and planting water willow to reduce shoreline erosion (Collingsworth et al. 2009).

vii. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

A survey with LIDAR or drones during June through August can provide a map of current distribution of the water willow. Water willow can be transplanted to areas where shoreline erosion treatments are needed.

viii. Describe considerations of the level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

There were no alternative studies proposed. The methods described are readily applicable for reasonable costs.

Target biological community in the two bypass reaches and rehabilitation of the foundational plant, riverweed.

i. Describe the goals and objectives of each study proposal and the information to be obtained;

Define the metrics for a restorable biological community in the bypass reach below Byllesby Dam and Buck Dam.

Develop minimum instream flow requirements for bypass reaches.

Propagate and replant the bypass reaches with the foundational plant, Hornleaf riverweed *Podostemum ceratophyllum.*

Monitor compliance with minimum instream flow and biological metrics for bypass reach.

ii. If applicable, explain the relevant resource management goals of the agencies or Indian Tribes with jurisdiction over the resource to be studied;

Ecosystem productivity to support aquatic biodiversity and the downstream sport fish production.

iv. If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

Healthy aquatic ecosystems for easily accessible riverine fishing.

v. Describe existing information concerning the subject of the study proposal and the need for additional information;

The bypass reaches are dewatered much of the year and provide little biological productivity to the river. No information was provided in the PAD to assess the biological resources in these bypass reaches.

vi. Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied and how the study results would inform the development of license requirement

The Project has operated since 1912 with no minimum instream flow requirement. Therefore, the aquatic community expected in this bedrock-dominated river section has been totally lost and needs to be rehabilitated. Conditions on the new license should include minimum instream flow to support the metrics for a restorable biological community in the bypass reaches.

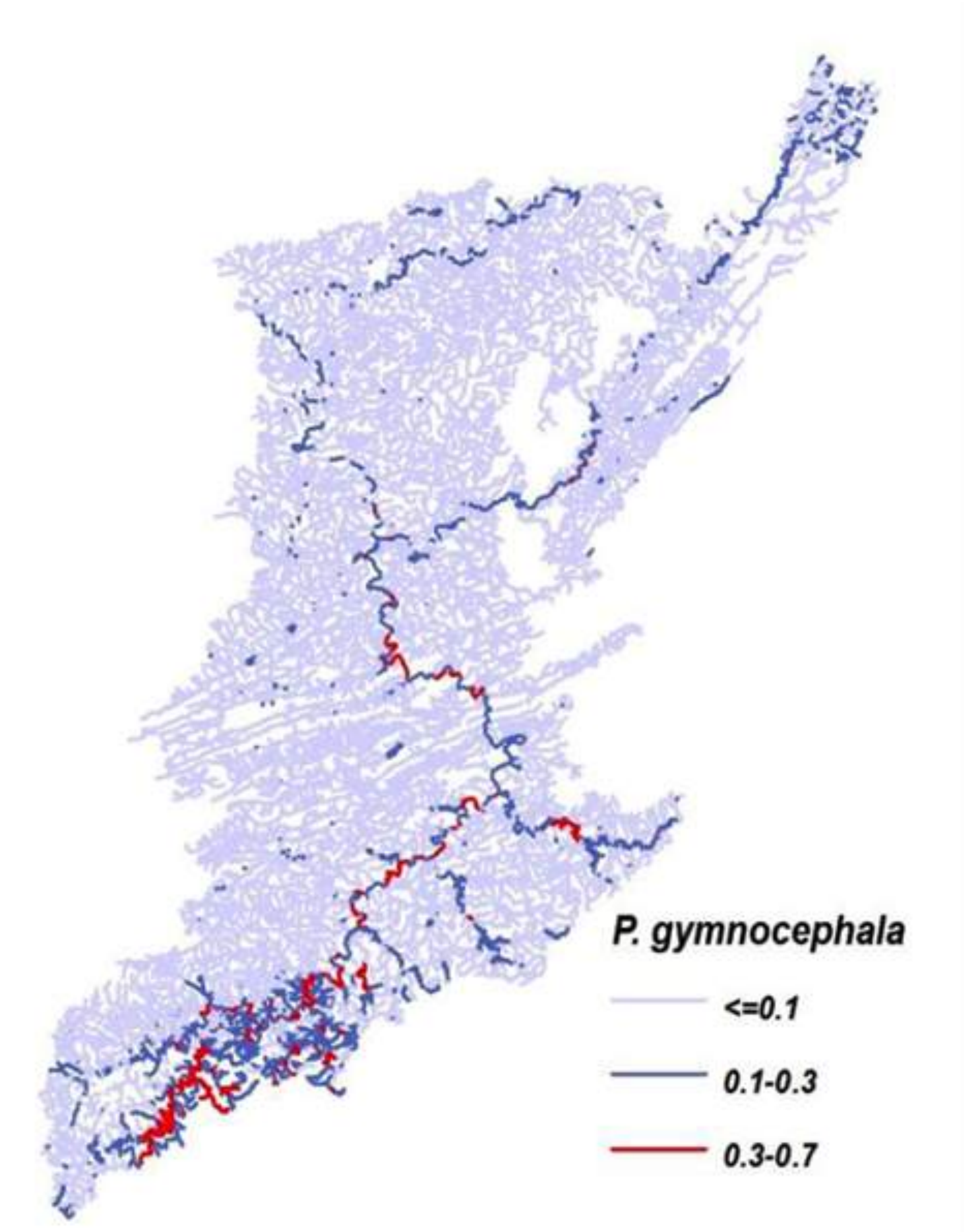
vii. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

Species distribution models provide an approach to develop fine scale maps to predict the spatial distribution of aquatic species in the New River. Frimpong et al. (2014) and Huang et al. (2016) applied these methods to select fishes of the New River with good success. The models predict the probability of occurrence by rivers segment, which can be displayed via maps. See example map for the Appalachia Darter (below)

The methods and data can be applied for Hornleaf riverweed, crayfish, and many other New River fishes and mussels. With treatments such as gravel addition, the bypass reach may be colonized by spawning chubs and other nest associates (McManamay et al. 2010; Peoples et al. 2013).

viii. Describe considerations of the level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

No alternative studies were proposed to address the question in the PAD.



Probability of occurrence of the Appalachia Darter *Percina gymnocephala* (Frimpong et al. 2014).

Enhancement plan for biodiversity and sport fishing in project area

i. Describe the goals and objectives of each study proposal and the information to be obtained;

Adaptive management of the sport fish in the project area and monitor effects of the flow regime and other management interventions.

ii. If applicable, explain the relevant resource management goals of the agencies or Indian Tribes with jurisdiction over the resource to be studied;

Increase abundance of harvestable size Walleye.

Increase natural reproduction of Walleye below Buck Dam and above Byllesby reservoir.

Enhance biodiversity of unique flora and fauna of the New River.

Increase fishing access and fishing quality in Byllesby and Buck impoundments.

iv. If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

Enhance biological diversity, sport fish production, and fishing satisfaction.

v. Describe existing information concerning the subject of the study proposal and the need for additional information;

There are numerous species of concern in the upper New River. Many were once abundant and at critically low levels of abundance. These include three foundational aquatic plants, four species of rare dragonflies, five species of freshwater mussels, an unknown number of crayfish species, Eastern Hellbender (federal and state species of concern), indeterminate number of endemic fishes, and unique New River Walleye. The extent of project impacts on this assemblage has never been studied. Furthermore, it is desired that natural reproduction of Walleye eventually replaces the need for an expensive program of annual stocking by the VDGIF.

vi. Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied and how the study results would inform the development of license requirement

There is a close interaction between Byllesby-Buck hydroelectric plant operations and loss of habitat for foundational vegetation, crayfish, and a diverse macroinvertebrate fauna that should be mitigated in future license conditions.

vii. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

The complex project conditions warrant continuing, rigorous assessment using adaptive management so that management decisions are constantly monitored, evaluated, and modified or reversed when new information indicates. Therefore, this study request requires formation of a small, dedicated adaptive management team to lead studies during the ILP and continue some level of monitoring after a new license is provided.

viii. Describe considerations of the level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

Survey of rare dragonflies and multi taxa survey.

i. Describe the goals and objectives of each study proposal and the information to be obtained;

Compare the occurrence and abundance of species of crayfish, dragonflies, and small fishes in Project boundary with upstream and downstream reference locations.

ii. If applicable, explain the relevant resource management goals of the agencies or Indian Tribes with jurisdiction over the resource to be studied;

Biodiversity conservation is a goal of the Virginia Department of Conservation and Restoration and the Department of Game and Inland Fisheries. Dragonflies are sensitive to sediment, water quality, climatic factors, making this group a potential useful indicator of local conditions (Bush et al. 2013).

iv. If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

Rare crayfish, dragonflies, and fishes have never been inventoried in the Project area to define project impacts. These unique New River fauna, many endemic, provide many ecosystems services in regulating abundance of aquatic insects and processing dead organic matter.

v. Describe existing information concerning the subject of the study proposal and the need for additional information;

The pygmy snaketail dragonfly (*Ophiogomphus howei*), Allegheny river cruiser (M*acromia alleghanensis*), spine-crowned clubtail (*Gomphus abbreviatus*), and green-faced clubtail (*Gomphus viridifrons*) are rare dragonflies mentioned in Virginia's State Wildlife Action Plan (VDGIF 2015). Carey et al. (2017) recently identified all four species from New River surveys near Fries, Virginia. Crayfish, hellbenders, and some fishes can be surveyed simultaneously for a cost-effective comparison of multi taxa.

vi. Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied and how the study results would inform the development of license requirement

The project altered habitat for these river-dwelling aquatic organisms via sediment deposition, substrate changes, and flow alteration. There are no previous comparisons of the Project with reference conditions.

vii. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

Species occurrence of dragonflies can be inferred during adult, nymph, and exuviae surveys. Exuviae occupancy probabilities suggested several reliable indicators of species residency, such as (1) finding adults on ≥4 surveys, (2) finding tenerals on ≥2 surveys, and (3) counting >20 adults on ≥1 surveys (Bried et al. 2015). Haag et al. 2013 and Williams et al. 2014 described field methods commonly used for collecting macroinvertebrates and crayfish.

viii. Describe considerations of the level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

Recreational value and access development mitigation

i. Describe the goals and objectives of each study proposal and the information to be obtained;

Determine barriers to access of the New River by recreationists.

Develop plan to improve access.

ii. If applicable, explain the relevant resource management goals of the agencies or Indian Tribes with jurisdiction over the resource to be studied;

The Virginia Department of Game and Inland Fisheries expects an increase in fishing participation with improvement in access in the upper New River. The Virginia Department of Conservation and Recreation manages the New River Trail which can connect to access improvements through the Project Boundary. The U.S. Forest Service owns land that adjoins the Project area and can manage to improve access and campsites.

iv. If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

Outdoor recreation is the fastest growing industry in southwest Virginia and can support improvements in the local economy. Access to the river is a principal barrier to participation in water-based recreation in this section of the New River.

v. Describe existing information concerning the subject of the study proposal and the need for additional information;

This information is provided in section 6 of the PAD. "Appalachian plans to conduct a recreational assessment of the Project to assess existing recreational opportunities and potential improvements to facilities. The scope of this study would be limited to within the FERC-approved Project boundary. Recent data regarding usage and capacity of the existing recreation facilities is available through monitoring conducted by Appalachian during the term of the existing license. The most recent monitoring was completed in 2014 (2015 report, see Section 5.8.2). As such, Appalachian does not propose to conduct additional recreational use monitoring for this relicensing, but will incorporate existing monitoring information into the study report and recommendations. "

vi. Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied and how the study results would inform the development of license requirement.

The Project is currently a major barrier to a float-based water tourism industry due to lack of portage around the Project.

vii. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

Meetings with stakeholder agencies, VDGIF and VDCR and local outfitters, appear to be appropriate first steps to create an improved access plan.

viii. Describe considerations of the level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

Level of effort and cost is appropriate as it reflects the plans proposed in section 6 of the PAD.

Thanks for the opportunity to review and comment on the Project PAD.

Sincerely,

Donald J. Orth, PhD
Thomas H. Jones Professor

References Cited

Appalachian Power Company. 2019. PRE-APPLICATION DOCUMENT Byllesby-Buck Hydroelectric Project FERC NO. 2514.

http://www.aephydro.com/HydroPlant/ByllesbyBuck

Angermeier, P.L., and M.J. Pinder. 2015. Viewing the status of Virginia's environment through the lens of freshwater fishes. *Virginia Journal of Science* 66(3). Article 2 http://digitalcommons.odu.edu/vjs/vol66/iss3/2

Appalachian Power Company. 1991. The status of fish populations in the vicinity of Byllesby/Buck hydroelectric project. Report. Roanoke, Virginia. 107 pp.

Argentina, J.E., Freeman, M.C., Freeman, B.J., 2010a. Predictors of occurrence of the aquatic macrophyte *Podostemum ceratophyllum* in a southern Appalachian river. *Southeastern Naturalist* 9:465-476.

Argentina, J.E., Freeman, M.C., Freeman, B.J., 2010b. The response of stream fish to local and reach-scale variation in the occurrence of a benthic aquatic macrophyte. *Freshwater Biology* 55: 643-653.

Blumm, M.C., and V.A. Nadol. 2001. The decline of the hydropower czar and the rise of agency pluralism in hydroelectric licensing. 26 *Columbia Journal of Environmental Law* 81

Bozek, M.A., T.J. Haxton, and J.K. Raabe. 2011. Chapter 5 Walleye and Sauger Habitat. Pages 133-197 in B.A. Barton, Editor, Biology, Management, and Culture of Walleye and Sauger, American Fisheries Society, Bethesda, Maryland.

Brendan, T.O., E.M. Hallerman, and B.R. Murphy. 2004. Predatory Impact of Muskellunge on New River, Virginia, Smallmouth Bass. *Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies* 58:12–22

Breslow et al. 2017. Evaluating indicators of human well-being for ecosystem-based management. *Ecosystem Health and Sustainability* 3:1-18.

Bried, J.T., A.M. Dillon, B.J. Hager, M.A. Patten, and B. Luttbeg. 2015. Criteria to infer local species residency in standardized adult dragonfly surveys. *Freshwater Science* 34:1105-1113.

Buckwalter, J.D., E.A. Frimpong, P.L. Angermeier, and J. N. Barney. 2018. Seventy years of stream-fish collections reveal invasions and native range contractions in an Appalachian (USA) watershed. *Diversity and Distributions* 24:219-232.

Burgmeier, N.G., T.M. Sutton, and R.N. Williams. 2011. Spatial ecology of the Eastern Hellbender (*Cryptobranchus alleganiensis alleganiensis*) in Indiana. *Herpetologica* 67:135-145.

Bush, A., G. Theischinger, D. Nipperess, E. Turak, and L. Hughes. 2013. Dragonflies: climate canaries for river management. *Diversity and Distributions* 19:86-97.

Carey, C.S., D.J. Orth, and V. Emrick. 2018. Biological Surveys for Fries Hydroelectric Project in the upper New River, Grayson County, Virginia. Final Report to TRC Solutions, Reston, Virginia. Conservation Management Institute, Department of Fish and Wildlife Conservation, College of Natural Resources and Environment, Virginia Polytechnic Institute and State University, Blacksburg, VTCMI-04-2018. 65 pp.

https://www.researchgate.net/publication/324865901_Biological_Surveys_for_Fries_Hydroelectric_Project_Relicensing_FINAL_REPORT_Biological_Surveys_for_Fries_Hydroelectric_Project_in_the_Upper_New_River_Biological_Surveys_for_Fries_Hydroelectric_Project

Colburn, K. 2018. Decision reached on the restoration of the New River dries. American Whitewater accessed February 22, 2018 at

https://www.americanwhitewater.org/content/Article/view/articleid/33933/

Collingsworth, P.D., R.A. Oster, C.W. Hickey, R.C. Heidinger, and C.C. Kohler. 2009. Factors affecting water willow establishment in a large reservoir. *Lake and Reservoir Management* 25:191-198.

Connelly W.J., Orth D.J. & Smith R.K. 1999. Habitat of the riverweed darter, *Etheostoma podostemone* Jordan, and the decline of riverweed, *Podostemum ceratophyllum*, in the tributaries of the Roanoke River, Virginia. *Journal of Freshwater Ecology* 14:93–102.

Copeland, J. R. 2017. Upper New River Walleye Management Plan 2017 to 2022. Virginia Department of Game and Inland Fisheries, Blacksburg, Virginia. 6 pp.

Copeland, J.R., D.J. Orth, and G.C. Palmer. 2006. Smallmouth Bass management in the New River, Virginia: A case study of population trends with lessons learned. *Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies* 60:180-187.

Davis, D.A., E.B. Beaumont, and J.L. Wood. 2018 Investigating the decline of *Podostemum ceratophyllum* in West Virginia Rivers. *West Virginia Academy of Sciences* 90 http://www.pwvas.org/index.php/pwvas/article/view/333

DeRolph, C.R., M.P. Schramm, and M.S. Bevelhimer. 2016. Predicting environmental mitigation requirements for hydroprojects through the integration of biophysical and socio-political geographies. *Science of the Total Environment* 566-567:888-918.

Department of Biological Systems Engineering, Virginia Tech. 2018. PCB Total Maximum Daily Load Development for Reed Creek, the Upper New River, Peak Creek, Walker Creek, Stony Creek, and the Lower New River. Prepared for the Virginia Department of Environmental Quality, VT-BSE Document No. 2018-0001. Available at https://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/PCBTMDLs/NewRiverTMDLPCB.aspx

Dickinson, B.D., D. J. Orth, and S. L. McMullin. 2015. Characterizing the human dimension of a hidden fishery: riverine trotline fishers. *Fisheries* 40:386–394.

Dickinson, B.D., S.L. McMullin, D.J. Orth, and J.R. Copeland. 2018. Trotline catch rates vary by hook and bait type in the New River, Virginia. *Journal of the Southeastern Association of Fish and Wildlife Agencies* 5:46-52.

Doss, S.S., B.R. Murphy, L. Castello, J.A. Williams, J. Copeland, and V.J. DiCenzo. 2019. Field evaluation and simulation modeling of length limits and their effects on fishery quality for Muskellunge in the New River, Virginia. *North American Journal of Fisheries Management* 39:3-16.

Dunn, C. G., and P.L. Angermeier. 2016. Development of habitat suitability indices for the Candy Darter, with cross-scale validation across representative populations. *Transactions of the American Fisheries Society* 145:1266–1281.

Dunn, C.G., and P.L. Angermeier. 2018. Remaining populations of an upland stream fish persist in refugia defined by habitat features at multiple scales. *Diversity and Distributions* 25:385-399.

Easton R.S., D.J. Orth, and N.M. Burkhead. 1993. The first collection of rudd, *Scardinius erythrophthalmus* (Cyprinidae), in the New River, West Virginia. *Journal of Freshwater Ecology* 8:263–264.

Easton, R. S., and D. J. Orth. 1994. Fishes of the main channel New River, West Virginia. *Virginia Journal of Science* 45:265-277.

Fayram, A.H., M.J. Hansen, and N.A. Nate. 2005. Determining optimal stocking rate using a stock-recruitment model: an example using walleye in northern Wisconsin. *North American Journal of Fisheries Management* 25:1215-1225.

Federal Register (FR). 2018. Endangered and threatened wildlife and plants; designation of critical habitat for the Candy Darter. A proposed rule by the Fish and Wildlife Service. 83(225):59232-59268. 11/21/2018. https://www.federalregister.gov/documents/2018/11/21/2018-25315/endangered-and-threatened-wildlife-and-plants-designation-of-critical-habitat-for-the-candy-darter

Fouts, K.L., N. Poudyal, R. Moore, J. Heerin, and S.B. Wilde. 2017. Informed stakeholder support for managing invasive *Hydrilla verticillata* linked to wildlife deaths in a southeastern reservoir. *Lake and Reservoir Management* 33:1-10.

Freeman, M.C., Z.H. Bowen, K.D. Bovee, and E.R. Irwin. 2001. Flow and habitat effects on juvenile fish abundance in natural and altered flow regimes. *Ecological Applications* 11:179-190.

Frimpong, E.A., J. Huang, and Y. Liang. 2014. Preliminary Application of a framework for modeling habitat suitability and distribution of stream fishes with field testing. Final Report submitted to U.S. Geological Survey. Reston, Virginia. 24 pp.

Fritz, K.M., and J.W. Feminella. 2003. Substratum stability associated with the riverine macrophyte *Justicia americana*. *Freshwater Biology* 48:1630-1639.

Gillenwater, D., T. Granata, and U. Zika. 2006. GIS-based modeling of spawning habitat suitability for walleye in the Sandusky River, Ohio, and implications for dam removal and river restoration. *Ecological Engineering* 28:311-323.

Gibson, I., A.B. Welsh, S.A. Welsh, and D.A. Cincotta. 2018. Genetic swamping and possible species collapse: tracking introgression between the native Candy Darter and introduced Variegate Darter. *Conservation Genetics* DOI: 10.1007/s10592-018-1131-2

Grabowski, T. B., and J.J. Isely. 2007. Effects of flow fluctuations on the spawning habitat of a riverine fish. *Southeastern Naturalist* 6(3):471–478. https://doi.org/10.1656/1528-

Grubaugh, J.W. and J.B. Wallace. 1995. Functional structure and production of benthic community in a Piedmont river: 1956-1957 and 1991-1992. *Limnology and Oceanography* 40:490-501.:311-323.

Huang, J., E.A. Frimpong, and D.J. Orth. 2016. Temporal transferability of stream fish distribution models: can uncalibrated SDMs predict distribution shifts over time? *Diversity and Distributions* 22: 651-662

Hill, B.H. 1981. Distribution and production of *Justicia americana* in the New River, Virginia. *Castanea* 46:162–169.

Hill, B.H. and J.R. Webster. 1984. Productivity of *Podostemum ceratophyllum* in the New River, Virginia. *American Journal of Botany* 71:130–136.

Hilling, C.D., S.L.Wolfe, J.R. Copeland, D.J. Orth, E. M. Hallerman. 2018. Occurrence of Two non-indigenous catostomid fishes in the New River, Virginia. *Northeastern Naturalist* 25:215-221.

Hove, M.C., and nine coauthors. 2011. Early life history and distribution of Pistolgrip (*Tritigonia verrucosa* (Rafinesque, 1820)) in Minnesota and Wisconsin. *The American Midland Naturalist* 165:338-354

Haag, W.R., R.J. DiStefano, S. Fennessy, and B.D. Marshall. 2013. Invertebrates and plants. Pages 453-519 in A.V. Zale, D.L. Parrish, and T.M. Sutton, editors. Fisheries Techniques, Third Edition. American Fisheries Society, Bethesda, Maryland.

Hopkins, C.B., C.D. Hilling, and D.J. Orth. In review Variation in walleye egg size. *Journal of Fish and Wildlife Management*

Hutchens, J.J., Jr., J. B. Wallace, and E.D. Romaniszyn. 2003. Role of *Podostemum ceratophyllum* Michx. in structuring benthic macroinvertebrate assemblages in a southern Appalachian river. *North American Benthological Society* 23:713-727.

International Hydropower Association. N.D. Hydropower sustainability guidelines on good international business practice. 184 pp. https://www.hydropower.org/publications/hydropower-sustainability-guidelines

Jachowski, C., and W. Hopkins. 2014. Occurrence and habitat use of Eastern Hellbenders (*Cryptobranchus alleganiensis alleganiensis*) in the New River, VA. Prepared for Virginia Department of Game and Inland Fisheries. 23 pp.

Jirka, K.J., and R.J. Neves. 1990. Freshwater mussel fauna (Bivalvia: Unionidae) of the New River Gorge National River, West Virginia. *Nautilus* 103:136-139.

Kamler, E. 2005. Parent-egg-progeny relationships in teleost fishes: an energetics perspective. *Reviews in Fish Biology and Fisheries* 15:399-421.

Kennedy, J., and H. White III. 1979. Description of the nymph of *Ophiogomphus howei* (Odonata Gomphidae). *Proceedings of the Entomological Society of Washington* 81 64-69.

Kimber, A., J.L. Owens, and W.G. Crumpton. 1995. Light availability and growth of wildcelery (*Vallisneria americana*) in upper Mississippi River backwaters. *River Research and Applications* 11:167-174.

Kosnik, L. 2010. Balancing environmental protection and energy production in the federal hydropower licensing process. *Land Economics* 86:444-466.

Leonard, P.M., and D.J. Orth. 1985. Comparisons of fish assemblages in the New River, West Virginia, above and below polluted tributaries. New

River Symposium, National Park Service, Glen Jean, West Virginia. Pp. 95-106

Leonard, P.M., and D.J. Orth. 1986. Application and testing of an index of biotic integrity in small, coolwater streams. *Transactions of the American Fisheries Society* 115:401-414.

Lobb, M.D., III, and D.J. Orth. 1988. Microhabitat use by the Bigmouth Chub *Nocomis platyrhynchus* in the New River, West Virginia. *The American Midland Naturalist* 120::32-40.

Lobb, M. D., III, and D. J. Orth. 1991. Habitat use by an assemblage of fish in a large warmwater stream. *Transactions of the American Fisheries Society* 119:65-78.

Loomis, J.B. 2000. Environmental valuation techniques in water resource decision making. *Journal of Water Resources Planning and Management* 6:399-344.

Loughman et al. 2017. *Cambarus* (*C.*) *appalachiensis,* a new species of crayfish (Decapoda: Cambaridae) from the New River basin of Virginia and West Virginia, USA. *Zootaxa* 4243(3)432-454.

Lukas, J. A., and D.J. Orth. 1995. Factors affecting nesting success of smallmouth bass in a regulated Virginia stream. *Transactions of the American Fisheries Society* 124: 726–735.

McKay, S. K., A. R. Cooper, M. W. Diebel, D. Elkins, G. Oldford, C. Roghair, and D. Wieferich. 2017. Informing watershed connectivity barrier prioritization decisions: a synthesis. *River Research and Applications* 33:847–862.

McManamay, R. A., D. J. Orth, C. A. Dolloff, and M. A. Cantrell. 2010. Gravel addition as a habitat restoration technique for tailwaters. *North American Journal of Fisheries Management* 30:1238-1257

McManamay, R.A., J.T. Young, and D.J. Orth. 2012. Spawning of White Sucker (*Catostomus commersoni*) in a stormwater pond inlet. *The American Midland Naturalist* 168:466-476.

McManamay, R. A., D. J. Orth, C. A. Dolloff, and D. M. Matthews. 2013. Case study: application of the ELOHA framework to regulated rivers in the Upper Tennessee River basin. *Environmental Management* 51:1210–1235.

McManamay, R.A., B.K. Peoples, D.J. Orth, C.A. Dolloff, and D.C. Matthews. 2015. Isolating causal pathways between flow and fish in the regulated river hierarchy. *Canadian Journal of Fisheries and Aquatic Sciences* 72:1731-1748.

McManamay, R.A., J.S. Perkin, and H.I. Jager. 2019. Commonalities in stream connectivity restoration alternatives: an attempt to simplify barrier removal optimization. *Ecosphere* 10: e02596 https://doi.org/10.1002/ecs2.2596

Melstrom, R.T., F. Lupi, P.C. Esselman, and R.J. Stevenson. 2015. Valuing recreational fishing quality in rivers and streams. *Water Resources Research* 51:140-150.

Mion, J.B., R.A. Stein, R. A., and EA. Marschall. 1998. River discharge drives survival of larval walleye. *Ecological Applications* 8: 88–103.

Miranda, L.E., and R.M. Krogman. 2015. Functional age as an indicator of reservoir senescence. *Fisheries* 40:170-176.

Nelson, D.J., and D.C. Scott. 1962. Role of detritus in the productivity of a rock-outcrop community in a piedmont stream. *Limnology and Oceanography* 7(3):396-413.

Ney, J.J., P.L. Angermeier, B.R. Barr, and M.C. Scott. 1993. Potential for reestablishment of a walleye fishery in the New River, Virginia upstream of Buck Dam. Document prepared for American Electric Power Company. Virginia Tech Department of Fisheries and Wildlife Sciences. 60 p.

Orth, D. J. 1995. Food web influences on fish population responses to instream flow. *Bulletin Français de la Pêche et de la* Pisciculture 327/328/329:317-328.

Orth, D.J., and T.J. Newcomb. 2002. Certainties and uncertainties in defining essential habitats for riverine smallmouth bass. Pages 251-264 in M.S. Ridgway and D.P. Philipp, eds. Black Bass: Ecology, Conservation, and Management. American Fisheries Society Symposium 31. Bethesda, Maryland.

Pahl, J.P. 2009. Effects of flow alteration on the aquatic macrophyte *Podostemum ceratophyllum* (riverweed); local recovery potential and regional monitoring strategy. Master's thesis, University of Georgia.

Palmer, G.C., M. Culver, D. Dutton, B.R. Murphy, E.M. Hallerman, N. Billington, and J. Williams. 2006. Genetic analysis shows distinct walleye stocks in Claytor Lake and the upper New River, Virginia. *Proceedings of the Southeastern Association of Fisheries and Wildlife Agencies* 60:125–131.

Palmer, G.C., J. Williams, M. Scott, K. Finne, N. Johnson, D. Dutton, B.R. Murphy, and E.M. Hallerman, 2007. Genetic marker-assisted restoration of the presumptive native walleye fishery in the New River, Virginia and West Virginia. *Proceedings of the Annual Conference of the Southeastern Association of Fisheries and Wildlife Agencies* 61:17-22.

Parish, E.S., B.M. Pracheil, R.A. McManamay, S.L. Curd, C.R. DeRolph, and B.T. Smith. 2019. Review of environmental metrics used across multiple sectors and geographies to evaluate the effects of hydropower development. *Applied Energy* 238:101-118.

Pegg, M. A., and seven coauthors. 2015. Reservoir rehabilitation: seeking the fountain of youth. *Fisheries* 40(4):177-182

Peoples, B.K., R.A. McManamay, D.J. Orth, E.A. Frimpong. 2013. Nesting habitat use by river chubs in a hydrologically variable Appalachian tailwater. *Ecology of Freshwater Fish* DOI: 10.1111/eff.12078

Philbrick, C.T., P.K.B. Philbrick, and B.M. Lester. 2015. Root fragments as dispersal propagules in the aquatic angiosperm *Podostemum ceratophyllum* Michx. (Hornleaf Riverweed, Podostemaceae). *Northeastern Naturalist* 22:643-647.

Pinder, M. J. and C. S. Garriock. 1998. New distributional record for Orconectes virilis Hagen, 1870, in the New River, Virginia. *Banisteria* 12:42–43.

Pinder, M.J., E.S. Wilhelm, and J.W. Jones. 2002. Status survey of the freshwater mussels (Bivalvia: Unionidae) in the New River drainage. *Walkerana* 13(29/39):189-223.

Quinn, S.P. 1992. Angler perspectives on walleye management. *North American Journal of Fisheries Management* 12:367-378.

Renwick, W.H., Smith, S.V., Bartley, J.D., and Buddemeier, R.W. 2005. The role of impoundments in the sediment budget of the conterminous United States. *Geomorphology* 71: 99–111. doi:10.1016/j.geomorph.2004.01.010.

Roell, M.J., and D.J. Orth. 1993. Trophic basis of production of stream-dwelling smallmouth bass, rock bass, and flathead catfish in relation to invertebrate bait harvest. *Transactions of the American Fisheries Society* 122:46-62.

Roell, M.J. and D.J. Orth. 1998. Indirect of fishery exploitation and pest control in a riverine food web. *North American Journal of Fisheries Management* 18:337-346.

Russ, W.T., Z.J. Loughman, R.F. Thoma, B.T. Watson, and T.D. Ewing. 2016. New River crayfish range wide status assessment. *Journal of the Southeastern Association of Fish and Wildlife Agencies* 3:39–45.

https://www.researchgate.net/publication/303565183_New_River_Crayfish_Range_Wide_Status_Assessment

Rutherford, E.S., J. Allison, C. R. Ruetz III, J. R. Elliott, J. K. Nohner, M. R. DuFour, R. P. O'Neal, D. J. Jude & S. R. Hensler. 2016. Density and survival of walleye eggs and larvae in a Great Lakes Tributary. *Transactions of the American Fisheries Society* 145: 563-577.

Shingleton, M.V., C.H. Hocutt, and J.R. Stauffer, Jr. 1981. Temperature preference of the New River Shiner. *Transactions of the American Fisheries Society* 110:660-661.

Spoonberg, A.F., D.M. Lodge. 2005. Seasonal belowground herbivory and a density refuge from waterfowl herbivory for *Vallisneria americana*. *Ecology* 86:2127-2134.

Spotila, J.A., K.A. Moskey, and P.S. Prince. 2015. Geologic controls on bedrock channel width in large, slowly-eroding catchments: Case study of the New River in eastern North America. *Geomorphology* 230:51-63.

Starh, K.J., and D.E. Shoup. 2015. American water willow mediates survival and antipredator behavior of juvenile Largemouth Bass. *Transactions of the American Fisheries Society* 144:903-910.

Stahr, K.J., and M.A. Kaemingk. 2017. An evaluation of emergent macrophytes and use among groups of aquatic taxa. *Lake and Reservoir Management* 33:314-323.

Steelhammer, R. 2019. Planned New River Dries recreation enhancements to be completed by late June. Charleston Gazette-Mail Accessed February 22, 2019 at https://www.wvgazettemail.com/news/planned-new-river-dries-recreation-enhancements-to-be-completed-by/article_a7a73059-9729-5656-8a51-a7fd9f4d71bb.html

Stephenson, K. 2000. Taking Nature into Account: Observations about the Changing Role of Analysis and Negotiation in Hydropower Relicensing. 25 *William and Mary Environmental Law and Policy Review* 473 https://scholarship.law.wm.edu/wmelpr/vol25/iss2/7

Stephenson, K., and L. Shabman. 2001. The role of nonmarket valuation in hydropower relicensing: an application of a pattern modeling approach. *Journal of Economic Issues* 35:497-504.

Strakosh, T.R., J.L. Eitzmann, K. B. Gido, and C.S. Guy. 2005. The response of water willow *Justicia americana* to different water inundation and desiccation regimes. *North American Journal of Fisheries Management* 25:1476-1485.

Strakosh, T.R. 2006. Effects of water willow establishment on littoral assemblages in Kansas reservoirs: focus on ag-0 largemouth bass. Doctoral dissertation, Kansas State University, Manhattan, Kansas. 142 pp.

Strayer, D.L., C. Lutz, H. M. Malcom, K. Munger, and W. H. Shaw. 2003. Invertebrate communities associated with a native (*Vallisneria americana*) and an alien (*Trapa natans*) macrophyte in a large river. *Freshwater Biology* 48: 1938-1949.

Tarlock, D., 2012. Hydro law and the future of hydroelectric power generation in the United States. *Vanderbilt Law Review* 65:1723–1767.

Trussart, S., D. Messier, V. Roquet, and S. Aki. 2002. Hydropower projects: a review of most effective mitigation measures. *Energy Policy* 30:1251-1259.

Unger, S.D., O.E. Rhodes, Jr, T.M. Sutton, and R.N. Williams. 2013. Population genetics of the Eastern Hellbender (*Cryptobranchus alleganiensis alleganiensis*) across multiple spatial scales. *PLoS ONE* 8(10): e74180. doi:10.1371/journal.pone.0074180

US Fish and Wildlife Service. 2018. Endangered and Threatened Wildlife and Plants; Endangered Species Status for the Candy Darter. *Federal Register* 83 FR 58747-58754 https://www.federalregister.gov/documents/2018/11/21/2018-25316/endangered-and-threatened-wildlife-and-plants-endangered-species-status-for-the-candy-darter

Virginia Department of Game and Inland Fisheries (VDGIF). 2015. Virginia's 2015 Wildlife Action Plan. Henrico, VA. 1135 pp.

Von Haefen, R. H. 2003. Incorporating observed choice into the construction of welfare measures from random utility models. *Journal of Environmental and Economic Management* 45:145–165.

Voshell, J.R., Jr., S.W. Hiner, and R.J. Layton. 1992. Evaluation of a benthic macroinvertebrate sampler. Journal of Freshwater Ecology 7:1-6.

Weber, M.J., and M.L. Brown. 2009. Effects of common carp on aquatic ecosystems 80 years after "carp as a dominant": ecological insights for fisheries management. *Reviews in Fisheries Science* 17:524-537.

Weberg, M.A., B.R. Murphy, A.L. Rypel, and J.R. Copeland. 2015. A survey of the New River aquatic plant community in response to recent triploid Grass Carp introductions into Claytor Lake, Virginia. *Southeastern Naturalist* 14(2):308-318.

Williams, K., S.K. Brewer, and M.R. Ellersieck. 2014. A comparison of two gears for quantifying abundance of lotic-dwelling crayfish. *Journal of Crustacean Biology* 34:54-60.

Wood, J., and M. Freeman. 2017. Ecology of the macrophyte *Podostemum ceratophyllum Michx*. (Hornleaf riverweed), a widespread foundation species of eastern North American rivers. *Aquatic Botany* 139:65-74. http://dx.doi.org/10.1016/j.aquabot.2017.02.009d

United States Department of the Interior

BUREAU OF INDIAN AFFAIRS

Eastern Regional Office
545 Marriott Drive, Suite 700
Nashville, TN 37214

IN REPLY REFER TO:
Branch of Natural Resources

APR 0 2 2019

ORIGINAL

Ms. Kimberly Bose
Secretary, Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

Subject: Comments for Byllesby-Buck Hydroelectric Project (FERC P-2514)

Dear Ms. Bose:

This letter constitutes the updated Bureau of Indian Affairs (BIA) comments regarding the Byllesby-Buck Hydroelectric Project (FERC Project P-2514). Carroll County, Virginia is an area of historic interest to the Monacan Indian Nation, which has recently received federal recognition. The Federal Energy Regulatory Commission has a responsibility to conduct complete tribal consultation before approving a project per 36 CFR Part 800.2(c)(2)(ii). The Nation's mailing address is:

Monacan Indian Nation
P.O. Box 960
Amherst, VA 24521

Should you have any questions, please feel free to contact Mr. Harold Peterson, Natural Resources Officer, at 615-564-6838.

Sincerely,

Bruce W. Maytubby, Sr.
for. Regional Director ACTING

Arlene f warren, Richmond, VA.

Project Name: NEW SCOPING Byllesby-Buck Hydroelectric Project,
Project #: P-2514-186
UPC #: N/A
Location: Carroll Co.

VDH – Office of Drinking Water has reviewed the above project. Below are our comments as they relate to proximity to public drinking water sources (groundwater wells, springs and surface water intakes). Potential impacts to public water distribution systems or sanitary sewage collection systems must be verified by the local utility.

There are no public groundwater wells within a 1-mile radius of the project site.

The following surface water intakes are located within a 5 mile radius of the project site:

PWS ID Number	System Name	Facility Name
1077240	FRIES_ TOWN OF	EAGLE BOTTOM CREEK
1197435	NEW RIVER REGIONAL WATER AUTHORITY	INTAKE - NEW RIVER

The project is within the watershed of the following public surface water sources (facilities where the project falls within 5 miles of the intake and is within the intake's watershed are formatted in bold):

PWS ID Number	System Name	Facility Name
1197435	NEW RIVER REGIONAL WATER AUTHORITY	INTAKE - NEW RIVER
1750100	RADFORD, CITY OF	INTAKE ON NEW RIVER
1121057	NRV REGIONAL WATER AUTH	NEW RIVER (RAW WATER) PUMP STATION
1155641	PULASKI COUNTY PSA	CLAYTOR LAKE
1121643	RADFORD ARMY AMMUNITION PLANT	NEW RIVER

Best Management Practices should be employed, including Erosion & Sedimentation Controls and Spill Prevention Controls & Countermeasures on the project site.

Materials should be managed while on site and during transport to prevent impacts to nearby surface water.

The Virginia Department of Health – Office of Drinking Water appreciates the opportunity to provide comments. If you have any questions, please let me know.

From: Elizabeth B Parcell <ebparcell@aep.com>
Sent: Thursday, May 2, 2019 2:06 PM
To: Copeland, John
Cc: Kittrell, Bill (DGIF); Allyson Conner; MacVane, Kelly; Kulpa, Sarah; Yayac, Maggie; Jonathan M Magalski
Subject: RE: [EXTERNAL] Byllesby Buck Recreation Management Plan and Report
Attachments: FERC Order BYBU Rec Plan 07 03 95.pdf; FERC Order BYBU Rec Plan 11 12 10.pdf; P-2514 Byllesby Buck Recreation Report.pdf

Hi Jon and thank you for your email.

Attached please find the Order Approving Revised Recreation Plan issued July 3, 1995 as well as the Order Modifying Recreation Plan issued November 12, 2010. Also attached is the last Form 80 filed with the Commission on March 19, 2015. In that Form 80 report, you'll note that it incorrectly states that the Byllesby Boat Ramp is maintained by VDCR. Guess we didn't catch that at the time.

I have been unable to locate an electronic copy of the Recreation Plan that was filed with FERC on August 31, 1994 and I am currently working out of the office but I will gladly resume my search efforts when I return to the Roanoke office. Please note that the plan would not have been updated per se, but the orders attached to it.

Liz

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

ELIZABETH B PARCELL | **PROCESS SUPV**
EBPARCELL@AEP.COM | D:540.985.2441
40 FRANKLIN ROAD SW, ROANOKE, VA 24011

From: Copeland, John <john.copeland@dgif.virginia.gov>
Sent: Wednesday, May 1, 2019 8:45 AM
To: Elizabeth B Parcell <ebparcell@aep.com>
Cc: Kittrell, Bill (DGIF) <Bill.Kittrell@dgif.virginia.gov>; John Copeland <john.copeland@dgif.virginia.gov>; Allyson Conner <Allyson.Conner@ferc.gov>
Subject: [EXTERNAL] Byllesby Buck Recreation Management Plan and Report

---

I mentioned these items in the FERC meeting on April 11.

I'd like to obtain a copy of each one as soon as possible.

1. Section 4-25 of the PAD mentions Article 411 referencing a Recreation Plan that was approved by FERC on July 3, 1995 and amended by FERC order on November 12, 2010. **I'd like a copy of the latest plan revision.**

2. Section 5.8.2 of the PAD mentions a Recreation Report filed on March 19, 2015. **I'd like to obtain a copy of this report.**

Thanks for your help.

John R. Copeland
Fisheries Biologist III
P 540.961.8304
M 540.871.6064
Virginia Department of Game & Inland Fisheries
A **2206 South Main Street, Suite C, Blacksburg, VA 24060**
www.dgif.virginia.gov
CONSERVE. CONNECT. PROTECT.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Appalachian Power Company

Project No. 2514-008
Virginia

ORDER APPROVING REVISED RECREATION PLAN

JUL 03 1995

On August 31, 1994, Appalachian Power Company, licensee for the Byllesby/Buck Project, FERC No. 2514, filed a revised recreation plan pursuant to Article 411 of the project license.[1] Supplemental information was filed by the licensee on October 24, 1994 and May 15, 1995.

Background

Pursuant to Article 411, the licensee was required to file, by September 1, 1994, a revised recreation plan which included pages E-48 to E-51, and figures E-18 and E-19a, of the application filed on December 16, 1991, and the public safety measures described in the material filed on May 24, 1993. Pages E-48 to E-51 of the application for license state the licensee proposes to construct an "environmental wetlands boardwalk" adjacent to the Byllesby development and upgrade canoe portages at the Byllesby and Buck developments. The public safety information filed on May 24, 1993, states the public safety measures at the project include sirens, alarms, strobe lights and, if necessary, verbal warnings from plant personnel, to alert recreationists of changes in flow. The licensee also states there are boat barriers and warning signs at each development, along with locked gates at the entrances to the spillway bridges.

During licensing the Virginia Department of Conservation and Recreation (VDCR) expressed a need for information kiosks at the project to better describe the warning sirens and safe usage of project lands and waters to area visitors. Thus, Article 411 requires the licensee to include in the revised recreation plan details for the installation of four informational kiosks at the project. Further, to address other concerns identified during licensing, the revised plan was to also include: (1) drawings showing how users would access the boardwalk from the New River Trail and proposed parking area, (2) descriptions of how disturbances to the Byllesby caretaker's cottage would be minimized, (3) drawings showing the location and wording of directional signs or buoys, and (4) an agreement with the Forest Service (FS) for a take-out facility on the west shore of Buck pool.

9507100254

1 66 FERC ¶ 62,188 (1994).

Proposed Plan

The August 31 filing includes the appropriate Exhibit E pages and public safety measures from previous filings, as well as the additional information and documentation of consultation required by Article 411. The supplemental information filed on October 24 consists of a revised Exhibit E drawing which shows the facilities around the Byllesby take-out site, as well as how users will access the take-out from the New River State Park Trail (NRSPT) and the parking area. The information filed on May 15 responds to the Commission's February 14, 1995 letter requesting additional information about the proposals made in the August 31 filing and also includes documentation of consultation with the State Historic Preservation Officer (SHPO).

As stated in the Exhibit E pages, the licensee proposes to upgrade the canoe portage area at the Byllesby development. Originally, the licensee proposed to incorporate the take-out portion of the portage into an environmental wetlands boardwalk. This area was to also serve as a canoe take-out and hand-carried boat launch site. Since the license application was filed, the licensee, the Virginia Department of Game and Inland Fisheries (VDGIF), and VDCR have taken another look at the boardwalk proposal and chosen to forego such construction. After further investigation the licensee, in conjunction with the Virginia agencies, decided to construct a concrete boat ramp on the east shoreline of Byllesby pool, approximately one mile upstream of the Byllesby dam. This facility is considered more appropriate for launching boats into the deeper sections of Byllesby pool (the primary intent of the launch near the take-out area) and, by not constructing the boardwalk, the licensee will avoid impacting wetland areas in the vicinity of the take-out near Byllesby dam.

Pursuant to the August 31 filing, the licensee proposes to construct the Byllesby take-out approximately 700 feet upstream of the Byllesby impoundment structures, on the west shore of Byllesby pool. The take-out will be accessed by an existing channel that will be marked with signs designating the distance to and location of the portage. The May 15 filing adds that the take-out structure will be a wooden platform approximately 12 feet long by 6 feet wide, with the surface approximately one foot above the Byllesby pool elevation. The take-out area will be accessible by a 6-foot-wide gravel pathway leading from the platform to a 10-car parking area. The parking area will be accessible from State Routes 602 and 737. The portage and portage path will be marked by five directional signs.

The put-in area for the Byllesby portage will be approximately 800 feet downstream of the project powerhouse, also on the west bank of the pool. Canoeists will access the put-in by following the edge of State Route 737 to a gently sloping embankment leading back to the river. Because the former

Byllesby caretaker's cottage is located near the pathway and is eligible for inclusion in the National Historic Register, the licensee was required to consider measures for minimizing disturbances to this structure. The licensee's August 31 filing states disturbances to the cottage will be minimized by securing wood over all doors and windows. Further, the licensee adds that disturbances to the cottage will be regularly monitored by the recreational monitoring requirements of Article 412. If additional security measures are considered necessary in the future, they will be addressed by Article 412 filings.[2]

The facilities proposed for the Buck development include a canoe portage, with take-out and put-in facilities, and an additional take-out area on the west shore of Buck pool. The take-out for the portage will be located approximately 700 feet upstream of the Buck powerhouse on the west bank of the intake channel. The portage and portage path will be identified with four directional signs. The put-in will be located approximately 600 feet downstream of the Buck powerhouse, also on the west bank of the river. Because of improvements done to the take-out and put-in by the licensee in 1992, no additional construction is considered necessary at this site. Signs identifying the location of the portage will be installed along the intake channel and the portage route.

Given there are no take-out facilities for canoeists who do not wish to portage around the Buck development, and because the Forest Service (FS) proposed to provide such a facility on project lands, an agreement between the licensee and the FS for an additional take-out facility upstream of the Buck dam was required by Article 411. If an agreement with the FS could not be reached, the licensee was required to develop preliminary plans to provide the facility. The August 31 filing states representatives from a number of resource agencies, including the FS, conducted a site visit on July 8, 1994, in search of an appropriate take-out location that would be accessible by

---

2 Article 412 of the project license requires the licensee to begin recreation monitoring studies in 1996 and repeat the studies once every six years during the term of the license, to coincide with Form 80 requirements. Each six-year report is to address a number of monitoring issues, one of which is, "[A]n evaluation of the need for additional recreation facilities or safety measures, and if appropriate, proposed amendments to the project's recreation and public safety plans that would accommodate such need." In addition, Article 409 of the license requires the licensee to develop and implement a cultural resources management plan to avoid and mitigate any impacts to the historical integrity of project features. Measures to protect the Byllesby caretaker's cottage are also to be addressed in this plan.

motorized vehicles. At that time an appropriate site could not be identified and the licensee proposed in the August 31 filing to provide a status report on the issue within six months of receiving approval of the revised plan. Pursuant to the Commission's request dated February 14, 1995, the licensee was asked to submit any additional information that may have been developed on the take-out proposal. The May 15 filing states another meeting was held with the resource agencies on April 3, 1995 and, once again, an appropriate take-out site could not be identified. The licensee again proposes to file a status report within six months of receiving approval of the revised plan.

In response to VDCR's request for informational kiosks at the project, the licensee proposes to install three kiosks at the facilities proposed in the revised plan, with a fourth kiosk proposed for the additional Buck pool take-out. The kiosk locations identified in the August 31 filing include a location near the Byllesby take-out on the NRSPT, near the west abutment of the Buck spillway, and along the NRSPT near the upper reaches of Byllesby pool. The kiosks are intended to be maintained by VDCR, with the information on the kiosks to be provided by the licensee, in accordance with Part 8 of the Commission's regulations.

In addition to developing portages at both developments and an additional take-out area at the Buck development, the August 31 filing proposes to develop a bank fishing/viewing area and a boat launch site on the Byllesby impoundment. The bank fishing/viewing area will be located approximately 3/4-mile upstream of the Byllesby impoundment structures on the west shore of Byllesby pool. The site is to be developed on a staging area created during stability work at the Byllesby structures and is to provide nearly 60 linear feet of shoreline access to the New River. The site will be accessed from the NRSPT, which is restricted to pedestrian, horse, and non-motorized vehicle traffic. Visitors with vehicles will be able to park at the parking area near the Byllesby take-out. As discussed previously, the Byllesby boat launch site will be located on the east shore of the pool approximately one mile upstream of the dam. This facility will be accessible from State Route 736 and will include a single-lane boat ramp and parking for approximately 12 vehicles (7 with trailers, 5 without). A parking space for persons with disabilities will be provided, along with a concrete sidewalk to the ramp.

With regard to developing management and maintenance guidelines for the facilities discussed in the revised recreation plan, the August 31 filing states the licensee has entered into a "Memorandum of Understanding" (MOU) with VDCR and VDGIF. This MOU establishes which agency will be responsible for constructing and/or maintaining each facility in the revised plan, as well as other recreation facilities along the river. The MOU establishes that the licensee will be responsible for constructing and maintaining the canoe portages at each development, except for the Byllesby take-out which will be constructed by VDGIF, but maintained by the licensee. The Byllesby boat launch site will be leased to VDGIF, who will also construct and maintain the facility. The bank fishing/viewing area, an existing facility, will be maintained by VDCR. The filed material states all project-related facilities could be constructed in 1995.

Consultation and Comments

Pursuant to the August 31 filing, the licensee requested comments on the revised recreation plan from the American Whitewater Affiliation, Coastal Canoeists, Inc., Float Fishermen of Virginia, Virginia Council on the Environment, FS, VDCR, and VDGIF. Only VDCR and VDGIF filed responses, with neither agency objecting to the revised plan.

The May 15 filing includes comments from the SHPO. The proximity of the Byllesby portage path to the former Byllesby caretaker's cottage was considered close enough to have possible impacts on the structure. Therefore, the licensee was requested in the Commission's February 14, 1995 letter to obtain SHPO consultation on the proposal to board-up the caretaker's cottage. This information was requested prior to the filing of the cultural resource management plan required by Article 409, as the plan is not due to be filed with the Commission until March 1, 1996. By letter dated May 3, 1995, the Virginia Department of Historic Resources (i.e. SHPO) concurred with the licensee's proposal to secure the building's door and windows with boards. SHPO further included sample specifications for boarding unused buildings. The May 15 filing states the licensee's securing methods will conform to these specifications.

Discussion

Although the licensee proposes to forego constructing the wetlands boardwalk near the Byllesby portage, Commission staff does not consider this an action which will negatively impact the recreational use of the project. The licensee has taken appropriate measures to provide boat launching access at another location on Byllesby pool and has provided a shorter portage around the Byllesby dam by eliminating the boardwalk. Further, the wetland area that exists between the marked channel and the river's edge, on which the boardwalk was to be located, will still be within view of the take-out platform. The licensee is reminded, however, that access paths from the NRSPT to the take-out area are to be provided as shown on Drawing E-19b, filed on October 24, 1994. With these access paths, the modifications to the Byllesby take-out will accommodate the needs of recreators at this site.

With regard to the licensee's inability to identify an additional take-out area on Buck pool, the licensee's request to file a status report within six months of the date of this order is considered appropriate. The licensee's May 15 filing states current site limitations (steep rocky shoreline, wetlands, adjoining facilities) make it impractical to construct a take-out facility on Buck pool. Further, at the April 3 site meeting to identify a take-out location, the FS, who originally proposed the take-out, expressed concerns about establishing the facility on the Buck pool. The FS is concerned about additional, uncontrolled user traffic that may occur in the New River Recreation Area. Because the FS and VDCR did not file formal comments on the Buck take-out site prior to the licensee's May 15 filing with the Commission, the licensee proposed the status report. The Commission should require that a status report on the Buck take-out be filed within six months of the date of this order and, if at that time, a site has not been identified, the licensee should request that the recreation plan be amended to delete the requirement for the take-out.

Commission staff further acknowledges the licensee's efforts for providing quality recreational experiences at the Byllesby and Buck developments. The licensee has joined with VDCR and VDGIF to form "The Partners in River Access Program," and has entered into a MOU with these agencies to better establish maintenance and management guidelines for a variety of facilities along the New River. This agreement has been entered into at the will of the licensee outside the terms and conditions of the project's license with the Commission. Therefore, the MOU will be excluded from the material approved by this order. The licensee is reminded, however, that they are ultimately responsible for ensuring that the facilities approved in the revised recreation plan are constructed and maintained in a manner which protects and enhances the recreational, scenic, and other environmental values of the project.

Excluding the MOU, the filed material adequately meets the requirements of Article 411 of the Byllesby/Buck Project license. The licensee has adequately addressed the needs of persons with disabilities and the facilities proposed in the revised recreation plan should provide ample opportunity for project visitors to access the New River and the Byllesby and Buck pools. To allow an appropriate amount of time to coordinate construction with involved agencies, the licensee should be given until December 31, 1996 to complete construction of the approved facilities. Therefore, the revised recreation plan should be approved as discussed.

<u>The Director orders:</u>

(A) The revised recreation plan, excluding the Memorandum of Understanding, filed on August 31, 1994 and supplemented by on

October 24, 1994 and May 15, 1995, should be approved and made part of the license. The approved recreation facilities should be constructed by December 31, 1996.

(B) Within six months of the date of issuance of this order, the licensee shall file a status report on the development of an additional take-out area on Buck pool. This report should identify the location of the take-out, the type of facilities to be provided, a construction schedule, and documentation of consultation with the U.S. Forest Service, Virginia Department of Game and Inland Fisheries, Virginia Department of Conservation and Recreation, and the State Historic Preservation Officer (SHPO). If a site for an additional take-out facility on Buck pool cannot be identified within six months of the date of issuance of this order, the licensee should file a request to amend the recreation plan for the project, to delete the requirement for the additional take-out. An amendment request should stipulate the reasons for deleting the requirement, describe the measures taken to identify an appropriate location, and document consultation with the above agencies on the proposed amendment, with the exception of SHPO.

(C) Within 90 days of completing construction, the licensee shall file as-built drawings of the facilities approved by this order. The drawings should be of an appropriate scale to show the facilities/amenities at each site and should include an overall site plan which shows the location of the areas in relation to one another. Further, the overall site plan should clearly identify which facilities are approved components of the recreation plan and which are facilities provided by other agencies.

(D) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to 18 CFR § 385.713.

J. Mark Robinson
Director, Division of Project Compliance and Administration

133 FERC ¶ 62,146
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

American Electric Power Service Corporation Project No. 2514-129

ORDER MODIFYING RECREATION PLAN

(Issued November 12, 2010)

1. On September 17, 2010, American Electric Power Service Corporation, licensee for the Byllesby and Buck Hydroelectric Project (FERC No. 2514), filed a request to modify its recreation plan to change the location of the canoe portage take-out upstream of the Byllesby development. The Order Approving Revised Recreation Plan was issued on July 3, 1995.[1] The project is located on the New River in Carroll County, Virginia.

2. The Byllesby canoe portage take-out has become increasingly difficult for the public to access due to decreasing water depths. The licensee proposes to permanently relocate the canoe portage take-out to a site just upstream of the boat barrier and downstream of the existing take-out for the Byllesby development.

3. The proposed take-out would be located approximately 200 feet downstream of the existing portage channel entrance. From the relocated take-out site, there would be a crushed stone pathway approximately 200 feet in length at the north end of the wetland area that will connect to an existing stone access way. Canoeists could then follow the existing portage path around the Byllesby powerhouse. The gate at the entrance to the existing stone access way would be modified to allow canoeists to exit but would not allow vehicle traffic to enter the site. Signage will be provided to direct canoeists to the relocated take-out and portage pathway. It is anticipated that the work would be completed by the start of the next recreational boating season in April 2011.

4. The licensee has consulted with the U.S. Forest Service (FS) and the Virginia Department of Conservation and Recreation (VDCR) regarding the relocation of the canoe portage take-out. Included in the filing are copies of comments from the FS dated August 27, 2010, and comments from VDCR dated August 27, 2010 and September 7, 2010. Neither agency objects to the relocation or design of the canoe portage take-out location.

[1] 72 FERC ¶ 62,003 (1995)

5. Since lower water levels and sedimentation at the current location of the Byllesby canoe portage take-out have made it difficult and unsafe for recreational use, it is in the public interest to relocate the canoe portage take-out. The licensee's request should be approved. Upon completion of the facilities, the licensee should file drawings showing the location and layout of the facilities, as-built, in relation to the project boundary. Also, in order to accurately include permanent recreation facilities in the Commission's geographic database for the project, the licensee should file site-specific information on the location of project recreation facilities.

The Director orders:

(A) The proposed amendment to the recreation plan for the relocation of the canoe portage take-out at the Byllesby development for the Byllesby and Buck Project No. 2514, filed on September 17, 2010, by American Electric Power Service Corporation is approved and the recreation plan is amended accordingly.

(B) The licensee shall file with the Commission, for approval, within 60 days of completing the canoe portage take-out relocation approved in ordering paragraph (A) above, as-built-drawings showing these changes in relation to the project boundary.

(C) Within 45 days of the date of this order, American Electric Power Service Corporation shall file location point data representative of new canoe portage take-out location approved in this order. The location point must be positionally accurate to comply, at a minimum, with National Map Accuracy Standards for maps at a 1:24,000 scale. The location point must include latitude/longitude, in decimal degrees, based on the horizontal reference datum of the North American Datum of 1983 (NAD 83).

(D) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the FPA, 16 U.S.C. § 8251 (2006), and the Commission's regulations at 18 C.F.R. § 385.713 (2010). The filing of a request for rehearing does not operate as a stay of the effective date of this order, or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Robert J. Fletcher
Chief, Land Resources Branch
Division of Hydropower
Administration and Compliance

FERC FORM 80
RECREATION REPORT

BYLLESBY/BUCK PROJECT
(FERC NO 2514)

Prepared for:

Appalachian Power Company
Roanoke, Virginia

Prepared by:

Kleinschmidt

Pittsfield, Maine
www.KleinschmidtGroup.com

March 2015

FERC Form 80
Recreation Report

Byllesby/Buck Project
(FERC NO. 2514)

Prepared for:

Appalachian Power Company
Roanoke, Virginia

Prepared by:

Kleinschmidt

Pittsfield, Maine
www.KleinschmidtGroup.com

March 2015

FERC FORM 80 RECREATION REPORT

BYLLESBY/BUCK PROJECT
(FERC NO. 2514)

APPALACHIAN POWER COMPANY

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOS

LIST OF APPENDICES

J:\843\079\Docs\Other APC Projects\Byllesby Buck Reusens Rec Report\Byllesby Buck\001 Byllesby Buck Recreation Report 3-17-15.docx

FERC FORM 80 RECREATION REPORT

BYLLESBY/BUCK PROJECT
(FERC NO 2514)

APPALACHIAN POWER COMPANY

1.0 INTRODUCTION

1.1 BACKGROUND

Appalachian Power Company (Appalachian) operates the Byllesby/Buck Project, which is licensed by the Federal Energy Regulatory Commission (FERC) as Project No. 2514. The Project consists of two developments located on the New River in Carroll County, Virginia: the 21.6 MW Byllesby Development and the 8.5 MW Buck Development.

1.2 PURPOSE AND CONTENT OF THE STUDY

Section 8.11 of FERC regulations require that licensees prepare a License Hydropower Development Recreation Report (Form 80) for each hydroelectric development every six years. The purpose of completing the Form 80 is to provide sufficient information for FERC regarding recreational facilities located at the Project, which aid in determining whether existing recreation facilities at the Project are adequate to accommodate public demand.

This report provides a summary of the recreation use estimated to occur at the Project. This report is organized in the following manner:

- Section 2.0 provides an overview of the recreation facilities at each Development.
- Section 3.0 presents the study methodology.
- Section 4.0 provides the results of FERC Form 80 study effort including information on the project related recreation sites, existing recreation use levels and site capacities, and the adequacy of the licensee's recreation facilities at the project sites to meet recreation demand.

2.0 STUDY AREA

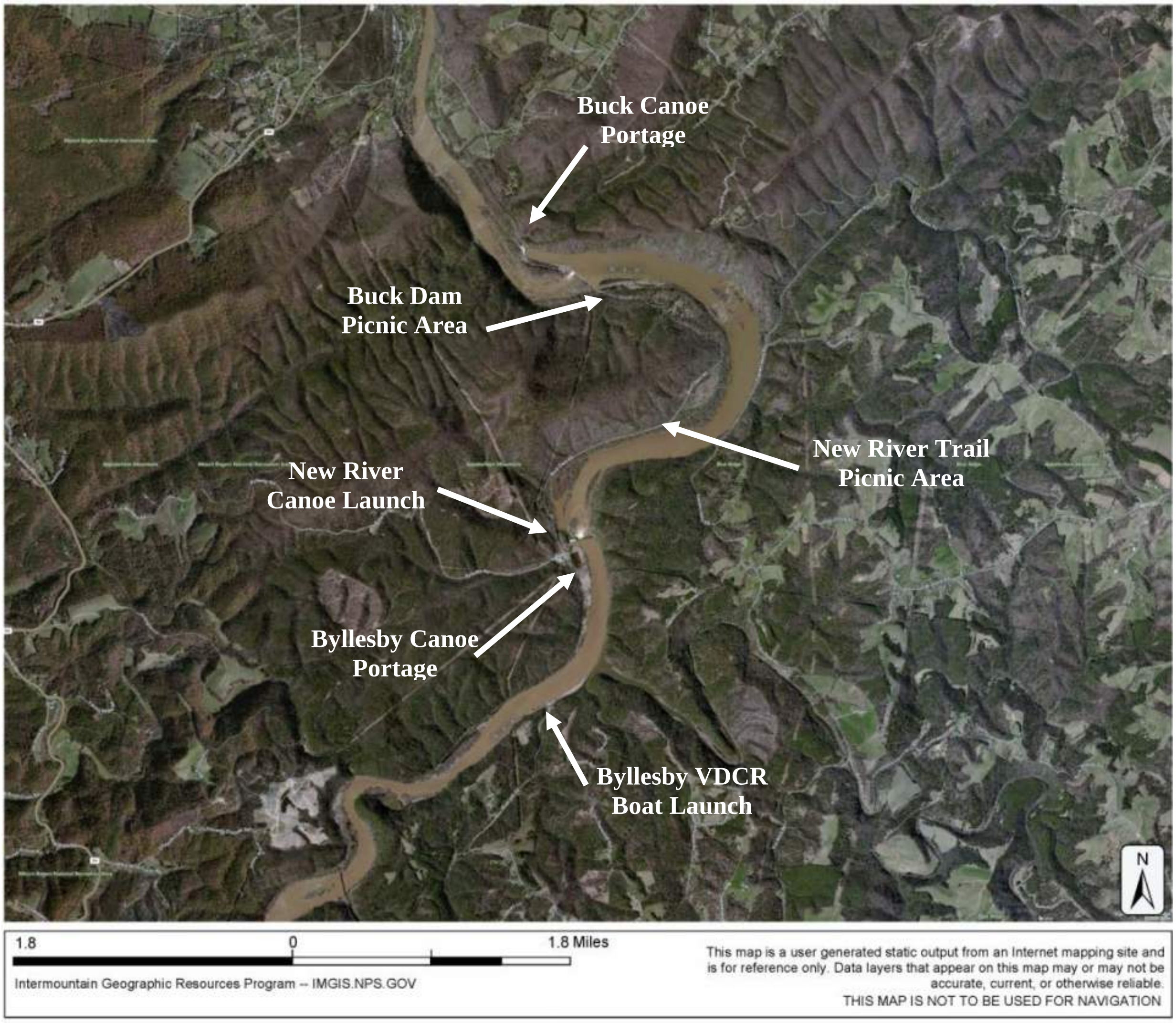
2.1 BYLLESBY DEVELOPMENT

The Byllesby Development is located upstream of the Buck Development near Ivanhoe, Virginia, in Carroll County. The Byllesby Dam impounds 239 acres of the New River. Public recreation facilities at the Development include the Byllesby Canoe Portage, located just upstream of the Dam; the New River Canoe Launch, located just downstream of the Dam and which serves as the put-in for the canoe portage trail; and the Byllesby VDCR Boat Launch, located on the impoundment (Figure 2-1). The New River Trail State Park, a multi-use hiking, biking and equestrian trail, can be accessed from the Byllesby Canoe Portage site.

2.2 BUCK DEVELOPMENT

The Buck Development is located downstream of the Byllesby Development also near Ivanhoe Virginia, in Carroll County. The Buck Dam impounds a short reach (66 acres) of the New River between the Buck and Byllesby Dams. Public recreation facilities at the Buck Development include: the Buck Canoe Portage, which is accessible only from the water; the New River Trail Picnic Area, which is accessible only from the water or via a portion of the New River Trail; and the Buck Dam Picnic New River Trail State Park (Figure 2-1).

FIGURE 2-1 BYLLESBY/BUCK PROJECT RECREATION FACILITIES



3.0 METHODOLOGY

Kleinschmidt utilized existing data and collected primary data in 2014 through the use of traffic counters deployed at all project recreation sites.

3.1 DATA COLLECTION

3.1.1 LITERATURE REVIEW AND DATA SEARCH

To inform the final Form 80s and required Recreation Report, Kleinschmidt collected and reviewed existing recreation data, including:

- Project boundary maps and access area maps;
- Appalachian staff interviews;
- 2003 and 2009 Form 80 documentation for each development (i.e., Form 80 and supplemental Recreation Reports);
- US Census population data;
- Virginia Department of Conservation and Recreation (VDCR) website; and
- Recreation use data collected in support of project relicensing efforts.

3.1.2 RECREATION SITE INVENTORY

A recreation site inventory was conducted at the Buck Dam Picnic Area, Byllesby VDCR Boat Launch, Byllesby Canoe Portage, New River Canoe Launch, and the New River Trail Picnic Area on March 24, 2014. The inventory collected general capacity information at each of the recreation sites along with photo-documentation of the sites. Inventory Results can be found in Section 4.1. Because it is accessible only from the water, an inventory of the Buck Canoe Portage was not conducted by Kleinschmidt staff in the spring of 2014.

3.1.3 TRAFFIC COUNTER METHODOLOGY

Traffic counters were placed at strategic locations at the Byllesby VDCR Boat Launch, the Byllesby Canoe Portage, the New River Canoe Launch, and the Buck Dam Picnic Area to accurately capture entrances and exits (as appropriate) by vehicles. The counters remained in place from late March through October 30, 2014.

Traffic counts were not deployed at the Buck Canoe Portage, which is owned and operated by Appalachian, or the New River Trail Picnic Area, which is owned and operated by the VDCR, because both recreation sites are unavailable by vehicle. The Buck Canoe Portage is accessible by water; while the New River Trail Picnic Area is accessible by the New River Trail. Recreation use at the Buck Canoe Portage was estimated using data from the 1997 Recreational Use Monitoring Study (Appalachian, 1997). Use of the New River Trail Picnic Area is anticipated to be captured by traffic counter deployed at likely origination points (project-related public access sites that serve as trailheads for the New River Trail. The Byllesby Canoe Portage was closed for the season due to dredging at the Byllesby Dam.

The counters were programmed to collect data continuously and set to record the total of vehicle entering or exiting the site at 1-hour intervals. Data from the traffic counter was downloaded approximately every two weeks on non-holiday weekends initially in order to prevent data loss and to ensure accurate performance and that aberrant data was not being recorded. Once it was confirmed that the traffic counters were functioning accurately, data collection was undertaken at least monthly on non-holiday weekends (Table 3-1). The traffic counters recorded both entrances and exits, and total traffic was estimated by dividing the counts by two (except at the New River Canoe Launch at the Byllesby Development, where two traffic counters were placed at the separate entrances and exits, and the data were added together before dividing by two). To ensure coverage during the majority of daylight hours and to account for pre-dawn and post-dusk angling use, the daytime sampling period for traffic counter data collection was defined as being between the hours of 5:00 am and 9:00 pm. The nighttime sampling period was defined as being between the hours of 9:01 pm and 4:59 am. The daily vehicle counts were summed across each daytime or nighttime period.

During the monthly traffic counter data collection, a trained recreation clerk supplemented the traffic counter data by collecting spot counts in the parking lot(s) to address the capacity portion of FERC Form 80. Clerks also indicate on the Daily Summary Report, the total number of observed individuals and activities in which visitors were engaged during this surveillance.

TABLE 3-1 BYLLESBY/BUCK TRAFFIC COUNTER DATA COLLECTION/SPOT COUNT SCHEDULE

DATES	TIME	SITE	DIRECTION
Saturday, April 05, 2014	7:13 AM	Buck Canoe Portage	Clockwise
Sunday, April 20, 2014	10:55 AM	Byllesby VDCR Boat Launch	Counter
Saturday, June 14, 2014	3:14 PM	Byllesby VDCR Boat Launch	Clockwise
Saturday, August 09, 2014	9:29 AM	Buck Dam Picnic Area	Clockwise
Saturday, August 24, 2014	7:00 AM	Byllesby Canoe Portage	Counter
Sunday, September 14, 2014	7:49 AM	New River Trail Picnic Area	Counter
Sunday, October 5, 2014	11:45 AM	New River Canoe Launch	Counter

3.2 DATA ANALYSIS

The Form 80 is divided into two sections, referred to as Schedules 1 and 2, respectively. Schedule 1 includes basic Project and overall public use information, including an estimate of total annual recreation days[1] and peak weekend average[2] and specified in terms of daytime and nighttime use. Schedule 2 requests an inventory of recreation resources for the Project, and an estimate of the percent capacity at which sites are currently used. Appalachian's use estimates for project-related, developed recreation sites at the Project is presented below.

3.2.1 SCHEDULE 1 USE ESTIMATES

3.2.1.1 TRAFFIC COUNTER USE ESTIMATES

The recreation days for the peak summer recreation season were calculated using the 2014 vehicle traffic counter data. The daily totals of vehicle entrances between 5:00 am and 9:00 pm were summed by month and day type. The nighttime totals of vehicle entrances between 9:01 pm and 4:59 am also were summed by month and day type. These counts were then multiplied by the average number of people in each vehicle, derived from the spot count data, to estimate daytime and nighttime recreation days. Traffic counters record entrances and exits, including multiple visits by the same individual within a 24-hour period; therefore, converting vehicles to people as a representation of recreation days is appropriate.

[1] FERC defines recreation day as each visit by a person to a development (as defined above) for recreational purposes during any portion of a 24-hour period.
[2] FERC defines peak weekend use as weekend when recreational use is at its peak for the season (July 4 weekend and other holiday weekends). On these weekends, recreational use may exceed the capacity of the area to handle such use.

Equipment tampering resulted in incomplete data at the Byllesby VDCR Boat Launch. Specifically, the hose was removed to the side of the road on approximately April 20 and was reattached across the road on May 15. Spot count data or the data from a similar month in the same season was used to supplement use estimates at these sites for months with incomplete or poor quality traffic counter data.

3.2.2 Schedule 2 Facility Capacity Estimates

Parking capacity was used as a proxy for facility capacity, the percent of the capacity at which the site is used. The facility use capacity estimates were calculated by comparing the average observed number of vehicles at the development recreation sites on sampled non-peak weekend days with the optimal parking spaces for each recreation site. For sites with paved parking, optimal parking was determined by the total delineated spaced. For sites with gravel parking, optimal parking was determined based on vehicle dimensions and turn-around space.

4.0 RESULTS

4.1 RECREATION INVENTORY

The Byllesby/Buck Project supports six project-related public recreation facilities, two of which are owned and operated by Appalachian and the remaining sites are owned and operated by VDCR. The Reusens Project supports one project-related public recreation facility, which is owned and operated by Amherst County, Virginia.

4.1.1 BYLLESBY/BUCK PROJECT

4.1.1.1 BYLLESBY DEVELOPMENT

4.1.1.2 BYLLESBY VDCR BOAT LAUNCH

The Byllesby VDCR Boat Launch is located on the eastern side of the Byllesby Development impoundment in the Town of Galax, Virginia. This boat launch consists of a single lane boat concrete boat launch and a gravel parking area with space for 5 regular vehicles and 7 vehicles with trailers. Signage prohibits camping and swimming at the site.

PHOTO 4-1 BYLLESBY VDCR BOAT LAUNCH SIGNAGE

PHOTO 4-2 BYLLESBY VDCR BOAT LAUNCH PARKING AREA

PHOTO 4-3 BYLLESBY VDCR BOAT LAUNCH

PHOTO 4-4 VIEW OF THE NEW RIVER TRAIL FROM THE BYLLESBY VDCR BOAT LAUNCH

4.1.1.3 BYLLESBY CANOE PORTAGE

The Byllesby Canoe Portage is owned and operated by Appalachian. The site consists of a hand-carry canoe take out and an information trailhead kiosk for the New River Trail State Park. The portage trail runs for 1,500 feet along the Buck Dam Road to the canoe put-in at the New River Canoe Launch. The site provides a gravel parking area measuring approximately 2,850 square feet with a single unpaved ADA parking space. Signage indicates that the site is open to the public and owned by Appalachian; the bass size and creel limit for the New River; and directs users to the portage trail put-in. The Byllesby Canoe Portage was temporary closed during the 2014 season because the reservoir was drawn down for dredging. The drawdown began on March 17, 2014 and was completed on December 19, 2014.

PHOTO 4-5 BYLLESBY CANOE PORTAGE SIGNAGE AND NEW RIVER TRAIL

PHOTO 4-6 BYLLESBY CANOE PORTAGE ACCESS ROAD AND DIRECTIONAL SIGNAGE

PHOTO 4-7 BYLLESBY CANOE PORTAGE PARKING AREA

PHOTO 4-8 SIGNAGE NOTIFYING USERS ABOUT BYLLESBY CANOE PORTAGE CLOSURE

4.1.1.4 NEW RIVER CANOE LAUNCH

Directly downstream of the Byllesby Dam is a small gravel parking area with space for five vehicles. There is a short trail leading to a hand carry boat launch that serves at the put-in for the Byllesby Canoe Portage. Signage indicates that motor vehicles are prohibited on the trail leading down to the water.

PHOTO 4-9 NEW RIVER CANOE LAUNCH SIGNAGE

PHOTO 4-10 NEW RIVER CANOE LAUNCH PARKING AREA

PHOTO 4-11 NEW RIVER CANOE LAUNCH TRAIL TO THE WATER

4.1.2 BUCK DEVELOPMENT

4.1.2.1 BUCK DAM PICNIC AREA

The Buck Dam Picnic Area is operated by the VDCR and is located on the western bank of the Buck Dam. The site provides gravel parking for four vehicles, an information kiosk and access to the New River Trail. Approximately 1,000 feet from the parking area on the New River Trail, there is a picnic area with a picnic table, trashcan, portable restroom facility, and a hitching post for equestrian trail users. Signage indicates that there is no trespassing allowed on the top of the Buck Dam and that there is no fishing, swimming, or boating allowed in the vicinity.

PHOTO 4-12 BUCK DAM PICNIC AREA SIGNAGE

PHOTO 4-13 BUCK DAM PICNIC AREA PARKING AREA, TRAILHEAD AND KIOSK

PHOTO 4-14 BUCK DAM PICNIC AREA

4.1.2.2 NEW RIVER TRAIL PICNIC AREA

The New River Trail Picnic Area is located along the Buck impoundment between the Buck and Byllesby Developments and is owned and operated by the VDCR. This site is accessible only by the New River Trail or from the water and provides benches, picnic tables, a trashcan and informal angling access to the Buck impoundment. There is no parking or signage associated with this site.

PHOTO 4-15 NEW RIVER TRAIL PICNIC AREA

PHOTO 4-16 NEW RIVER TRAIL

4.1.2.3 BUCK DAM CANOE PORTAGE

The Buck Dam Canoe Portage is located on the left bank of Mountain Island directly across the river from the Buck Dam Picnic Area and is owned and operated by Appalachian. This site consists of a hand carry take-out and a hand carry put in. The crushed stone take out is located on Mountain Island, just upstream from the boat barrier above the powerhouse. The portage route follows the maintenance road on the island to the powerhouse, and then follows a trail about 600 ft downstream to the hand carry put-in. The put-in point is a small cleared area on the bank of the tailrace channel. The site is only accessible by water. Because of this constraint, the site was not inventoried or monitored by Kleinschmidt staff during the 2014 summer season.

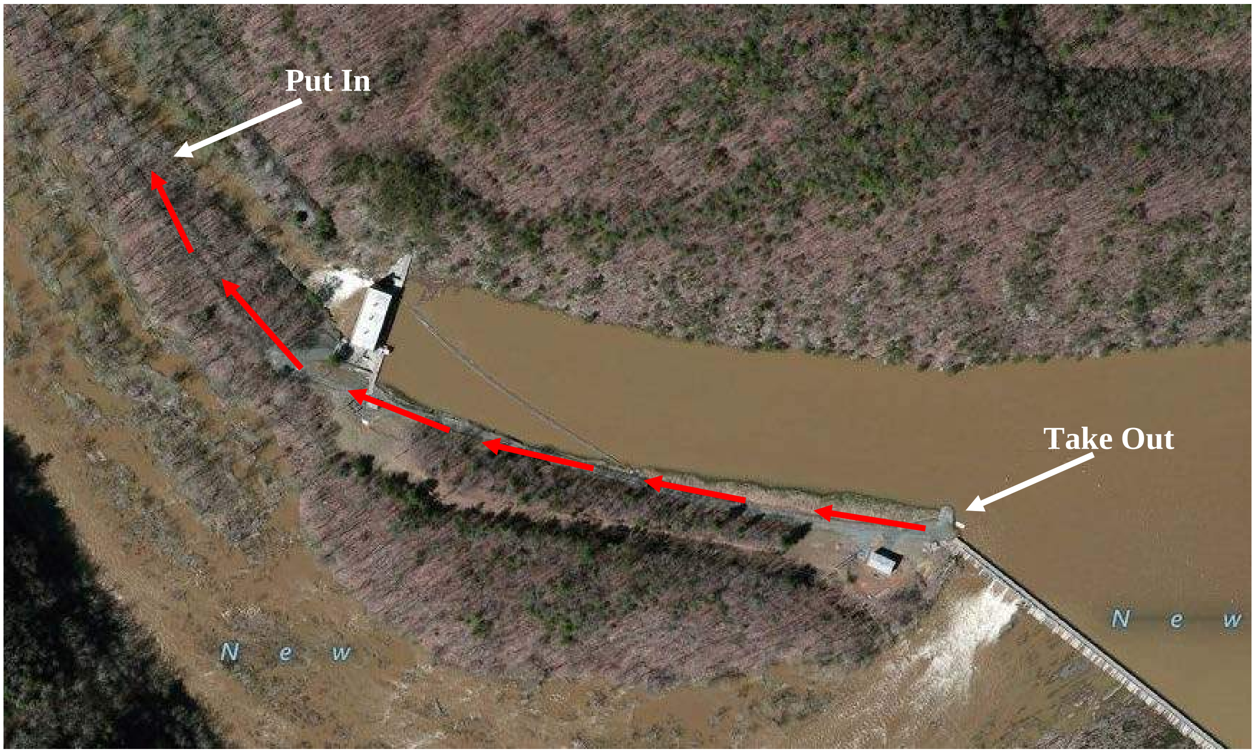


PHOTO 4-17 BUCK DAM CANOE PORTAGE

4.2 RECREATION USE

4.2.1 RECREATION USE ESTIMATES

The Byllesby/Buck Project supported a total of 15,896 daytime and nighttime recreation days in 2014. Daytime summer use totaled 13,225 recreation days; while daytime winter season use totaled 836 recreation days.

TABLE 4-1 RECREATION DAYS AT THE BYLLESBY/BUCK PROJECT

	BYLLESBY	BUCK
Daytime Summer	8,609	4,616
Daytime Winter	517	319
TOTAL	9,126	4,935

The Byllesby Development received the most recreation use with 9,126 daytime recreation days. The Buck Development received less recreation use with 4,935 daytime recreation days. The Byllesby VDCR Boat Launch was the most popular recreation site with a weekend average of 15.7 vehicles observed on non-holiday weekends, while the Buck Dam Picnic Area was the least popular recreation site with a weekend average of 7.1 vehicles recorded on non-holiday weekends. According to spot count data fishing was the most popular activity at the recreation sites.

Winter use for the Project was estimated as a percentage of summer use based on past monitoring efforts.

4.2.2 Recreation Site Capacity

None of the recreation facilities at the Project were close to exceeding their capacity. The only site at the Buck Development with parking facilities, the Buck Dam Picnic Area was at 11.1 percent capacity on average summer weekends, while the Buck Canoe Portage and the New River Trail Picnic Area were both considered to be at 10 percent capacity based on the 2009 Form 80. The Byllesby Development facilities were at 9.8 to 10.7 percent capacity, on average. The Schedule 2 inventory and facility capacity information for each of the developments are provided in Appendix A.

Facility capacity use densities reported in the 2003 and 2009 FERC Form 80 Recreation Reports for the Project have remained relatively stable over the years (Appalachian 2003a, Appalachian 2003b, Appalachian 2009). For the Buck Development, the Buck Canoe Portage had the highest facility capacity in 2003 and 2009 at 20 percent. At the Byllesby Development the Byllesby VDCR Boat Launch had the highest facility capacity in 2003 at 30 percent; while the Byllesby Canoe Portage had the highest facility capacity in 2009 at 33 percent.

The 2014 Form 80 sees the facility capacities decrease for Project-related recreation resources, while the total recreation days remained relatively stable. This decrease in the facility capacities could stem from an increase in parking capacity at the recreation sites or more accurate inventory of the recreation sites.

5.0 CONCLUSIONS

Results of the recreation site inventory suggest that all recreation sites are generally in fair to very good condition overall with no repairs or improvements recommended.

Based upon data collected as part of the Form 80 study, the capacity of recreational facilities at the Project are sufficient to meet the current demand. The 2014 results show that The Buck Dam Picnic Area has the largest percentage of use relative to facility capacity at only 17.4 percent. This site provides parking and trailhead access to the New River Trail State Park where recreators can participate in multiple recreation activities including those that are not associated with project lands and waters. This site is considered to have adequate capacity to allow for growth in the future. Therefore, we contend, that the recreation resources at the Project are sufficient and acceptable to satisfy recreation demand currently and in the future and that no additional recreation facilities are needed at this time.

6.0 REFERENCES

Appalachian Power Company (Appalachian). 1997. A Recreational Use Monitoring Study for the Byllesby/Buck Hydroelectric Project No. 2514. Filed June 27, 1997.

Appalachian Power Company (Appalachian). 2003a. FERC Form 80 Report for the Byllesby Development (FERC No. 2514) Filed April 1, 2003.

Appalachian Power Company (Appalachian). 2003b. FERC Form 80 Recreation Report for the Buck Development (FERC No. 2514). Filed April 1, 2003.

Appalachian Power Company (Appalachian). 2009. FERC Form 80 Reports for the Byllesby/Buck Project (FERC No. 2514). Filed March 30, 2009.

Appendix A

FERC Form 80 Recreation Reports

Federal Energy Regulatory Commission (FERC)
FERC Form 80

Licensed Hydropower Development Recreation Report

Form Approved
OMB No. 1902-0106
Expires: 09/30/2016
Burden 3.0 hours

General Information:
This form collects data on recreation amenities at projects licensed by FERC under the Federal Power Act (16 USC 791a-825r). This form must be submitted by licensees of all projects except those specifically exempted under 18 CFR 8.11 (c). For regular, periodic filings, submit this form on or before April 1, 2015. Submit subsequent filings of this form on or before April 1, every 6th year thereafter (for example, 2021, 2027, etc.). For initial Form No. 80 filings (18CFR 8.11(b)), each licensee of an unconstructed project shall file an initial Form No. 80 after such project has been in operation for a full calendar year prior to the filing deadline. Each licensee of an existing (constructed) project shall file an initial Form No. 80 after such project has been licensed for a full calendar year prior to the filing deadline. Filing electronically is preferred. (See http://www.ferc.gov for more information.) If you cannot file electronically, submit an original and two copies of the form to the: Federal Energy Regulatory Commission, Office of the Secretary, 888 First St., NE, Washington, DC 20426.

The public burden estimated for this form is three hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing the collection of information. Send comments regarding the burden estimate or any aspect of this collection of information, including suggestions for reducing burden, to: FERC via e-mail DataClearance@ferc.gov; or mail to 888 First Street NE, Washington, DC 20426 (Attention: Information Clearance Officer) and Office of Management and Budget (OMB), via e-mail to oira_submission@omb.eop.gov; or mail to OMB, Office of Information and Regulatory Affairs, Attention: Desk Officer for FERC, Washington, DC 20503. Include OMB Control Number 1902-0106 as a point of reference. No person shall be subject to any penalty for failing to comply with a collection of information if the collection of information does not display a valid control number (44 U.S.C. § 3512 (a)).

Instructions:
a. All data reported on this form must represent publicly available recreation amenities and services located within the project boundary.
b. To ensure a common understanding of terms, please refer to the Glossary on page 3.
c. Report actual data for each item. If actual data are unavailable, then please estimate.
d. Submit a completed form for each development at your project.

Schedule 1. General Data

1. Licensee Name: APPALACHIAN POWER CO
2. Project Name: BYLLESBY & BUCK
3. Project Number: 2514
4. Development Name: BYLLESBY

Complete the following for each development if more than one.

8. Reservoir Surface Area at Normal Pool (acres): 239.00
9. Shoreline Miles at Normal Pool: 14.00
10. Percent of Shoreline Available for Public Use: 50.00

States Development/Project Traverses (List state with largest area within the development/project boundary first):

5. State #1: VA
6. State #2: ______

7. Type of Project License: (check one) Major ✓ Minor ☐

11. Data Collection Methods (enter percent for each method used; total must equal 100%):

70.00 traffic count/trail count
______ attendance records
______ staff observation
______ visitor counts or surveys
30.00 estimate (explain)
100%

For 2014, enter only the licensee's annual recreational construction, operation, and maintenance costs for the development (project). Also, enter the annual recreational revenues for that year.

Item	Licensee's Annual Recreation Costs and Revenues (In Whole Dollars)	
	Construction, Operation and Maintenance Costs	Recreation Revenues for Calendar Year
12. Dollar Values	$2,000.00	$0.00

13. Length of Recreation Season: Summer: From (MM/DD) 4/1 To 10/31 Winter: From (MM/DD) 11/1 To 3/31

Period	Number of visits to all recreational areas at development/project (in Recreation Days)	
	Annual Total	Peak Weekend Average (see Glossary)
14. Daytime	9,126	162
15. Nighttime	953	13

Respondent Certification: The undersigned certifies that he/she examined this report; and to the best of his/her knowledge, all data provided herein are true, complete, and accurate.

Frank M. Simms	Plant Manager - Hydro	(540) 985-2875
Legal Name	Title	Area Code/Phone No.
Frank M. Simms	March 16, 2015	2014
Signature	Date Signed	Reporting Year Ending

Title 18 U.S.C.1001 makes it a crime for any person knowingly and willingly to make to any Agency or department of the United States any false, fictitious or fraudulent statement or misrepresentation as to any matter within its jurisdiction.

Schedule 2. Inventory of <u>Publicly Available</u> Recreation Amenities Within the Project Boundary

16. Enter data for each Recreation Amenity Type (a). For User Free (b) and User Fee (c) enter the number of publicly available recreation amenities, located within the project boundary, regardless of provider. For FERC Approved (d) enter the number of amenities identified under User Free (b) and User Fee (c) for which the licensee has an ongoing responsibility for funding or maintenance (see Glossary for further detail). For Capacity Utilization(f), of the total publicly available amenities (b) + (c), compare the average non-peak weekend use (see Glossary) for each recreation amenity type (during the recreation season, with the highest use, reported on Schedule 1, Item 13) with the total combined capacity of each amenity type and enter a percentage that indicates their overall level of use. For example, if all public boat launches are used to half capacity during the non-peak weekend days, enter 50% (should use exceed capacity for an amenity type, enter the appropriate percentage above 100).

Recreation Amenity Type (a)	Number of Recreation Amenities			Total Units (e)	Capacity Utilization (%) (f)
	User Free (b)	User Fee (c)	FERC Approved (d)		
Boat Launch Areas. Improved areas having one or more boat launch lanes (enter number in column e) and are usually marked with signs, have hardened surfaces, and typically have adjacent parking.	2	0	2	2 Lanes	10
Marinas. Facilities with more than 10 slips on project waters, which include one or more of the following: docking, fueling, repair and storage of boats; boat/equipment rental; or sell bait/food (see Glossary FERC approved).	0	0	0	N/A	
Whitewater Boating. Put-ins/Take-outs specifically designated for whitewater access.	0	0	0	N/A	
Portages. Sites designed for launching and taking out canoes/kayaks and the improved, designated, and maintained trails connecting such sites (enter length of trail in column e).	1	0	1	1,500ft	0
Tailwater Fishing. Platforms, walkways, or similar structures to facilitate below dam fishing.	0	0	0	N/A	
Reservoir Fishing. Platforms, walkways, or similar structures to facilitate fishing in the reservoir pool or feeder streams.	0	0	0	N/A	
Swim Areas. Sites providing swimming facilities (bath houses, designated swim areas, parking and sanitation facilities).	0	0	0	0 Acres	
Trails. Narrow tracks used for non-automobile recreation travel which are mapped and designated for specific use(s) such as hiking, biking, horseback riding, snowmobiling, or XC skiing (excludes portages, paths or accessible routes; See Glossary).	0	0	0	0 Miles	
Active Recreation Areas. Playground equipment, game courts/fields, golf/disc golf courses, jogging tracks, etc.	0	0	0	0 Acres	
Picnic Areas. Locations containing one or more picnic sites (each of which may include tables, grills, trash cans, and parking).	0	0	0	0 Sites	
Overlooks/Vistas. Sites established to view scenery, wildlife, cultural resources, project features, or landscapes.	0	0	0	0 Acres	
Visitor Centers. <u>Buildings</u> where the public can gather information about the development/project, its operation, nearby historic, natural, cultural, recreational resources, and other items of interest.	0	0	0	N/A	
Interpretive Displays. <u>Signage/Kiosks/Billboards</u> which provide information about the development/project, its operation, nearby historic, natural, cultural, recreational resources, and other items of interest.	0	0	0	N/A	N/A
Hunting Areas. Lands open to the general public for hunting.	0	0	0	0 Acres	
Winter Areas. Locations providing opportunities for skiing, sledding, curling, ice skating, or other winter activities.	0	0	0	0 Acres	
Campgrounds. Hardened areas developed to cluster campers (may include sites for tents, trailers, recreational vehicles [RV], yurts, cabins, or a combination, but excludes group camps).	0	0	0	0 Acres	N/A
Campsites. Sites for tents, trailers, recreational vehicles [RV], yurts, cabins, or a combination of temporary uses.	0	0	0	N/A	
Cottage Sites. Permanent, all-weather, buildings rented for short-term use, by the public, for recreational purposes.	0	0	0	N/A	
Group Camps. Areas equipped to accommodate large groups of campers that are open to the general public (may be operated by public, private, or non-profit organizations).	0	0	0	0 Sites	
Dispersed Camping Areas. Places visitors are allowed to camp outside of a developed campground (enter number of sites in clmn. e).	0	0	0	0 Sites	
Informal Use Areas. Well used locations which typically do not include amenities, but require operation and maintenance and/or public safety responsibilities	0	0	0	0	
Access Points. Well-used sites (not accounted for elsewhere on this form) for visitors entering project lands or waters, without trespassing, for recreational purposes (may have limited development such as parking, restrooms, signage).	0	0	0	N/A	
Other. Amenities that do not fit in the categories identified above. Please specify (if more than one, separate by commas): 0	0	0	0	0	

Glossary of FERC Form 80 Terms

Data Collection Methods. (Schedule 1, Item 11) – If a percentage is entered for the estimate alternative, please provide an explanation of the methods used (if submitted on a separate piece of paper, please include licensee name, project number, and development name)

Development. The portion of a project which includes:
(a) a reservoir; or
(b) a generating station and its specifically-related waterways.

Exemption from Filing. Exemption from the filing of this form granted upon Commission approval of an application by a licensee pursuant to the provisions of 18 CFR 8.11(c).

General Public. Those persons who do not have special privileges to use the shoreline for recreational purposes, such as waterfront property ownership, water-privileged community rights, or renters with such privileges.

Licensee. Any person, state, or municipality licensed under the provisions of Section 4 of the Federal Power Act, and any assignee or successor in interest. For the purposes of this form, the terms licensee, owner, and respondent are interchangeable *except where:*
(a) the *owner* or licensee is a subsidiary of a parent company which has been or is required to file this form; or
(b) there is more than one owner or licensee, of whom only one is responsible for filing this form. Enter the name of the entity that is responsible for filing this report in Schedule 1, Item 2.1.

Major License. A license for a project of more than 1,500 kilowatts installed capacity.

Minor License. A license for a project of 1,500 kilowatts or less installed capacity.

Non-Peak Weekend. Any weekend that is not a holiday and thus reflects more typical use during the recreation season.

Number of Recreation Amenities. Quantifies the availability of natural or man-made property or facilities for a given recreation amenity type. This includes all recreation resources available to the public within the development/project boundary. The resources are broken into the following categories:

User Free (Schedule 2, column b) - Those amenities within the development/project that are free to the public;

User Fee (Schedule 2, column c) - Those amenities within the development/project where the licensee/facility operator charges a fee;

FERC Approved (Schedule 2, column d) – Those amenities within the development/project required by the Commission in a license or license amendment document, including an approved recreation plan or report. Recreation amenities that are within the project boundary, but were approved by the licensee through the standard land use article or by the Commission through an application for non-project use of project lands and waters, are typically not counted as FERC approved, unless they are available to the public, but may be counted as either user free or user fee resources. The total FERC approved amenities column does not necessarily have to equal the sum of user free and user fee amenities.

Peak Use Weekend. Weekends when recreational use is at its peak for the season (typically Memorial Day, July 4th & Labor Day). On these weekends, recreational use may exceed the capacity of the area to handle such use. Include use for all three days in the holiday weekends when calculating Peak Weekend Average for items 14 & 15 on Schedule 1.

Recreation Day. Each visit by a person to a development (as defined above) for recreational purposes during any portion of a 24-hour period.

Revenues. Income generated from recreation amenities at a given project/development during the previous calendar year. Includes fees for access or use of area.

Total Units (Schedule 2, column e) – Provide the total length, or area, or number that is appropriate for each amenity type using the metric provided.

Trails. Narrow tracks used for non-automobile recreation travel which are mapped and designated for specific use(s) such as hiking, biking, horseback riding, snowmobiling, or XC skiing. Trails are recreation amenities which provide the opportunity to engage in recreational pursuits, unlike paths (means of egress whose primary purpose is linking recreation amenities at a facility) or accessible routes (means of egress which meets the needs of persons with disability and links accessible recreation amenities and infrastructure at a facility).

Federal Energy Regulatory Commission (FERC)
FERC Form 80

Licensed Hydropower Development Recreation Report

Form Approved
OMB No. 1902-0106
Expires: 09/30/2016
Burden 3.0 hours

General Information:
This form collects data on recreation amenities at projects licensed by FERC under the Federal Power Act (16 USC 791a-825r). This form must be submitted by licensees of all projects except those specifically exempted under 18 CFR 8.11 (c). For regular, periodic filings, submit this form on or before April 1, 2015. Submit subsequent filings of this form on or before April 1, every 6th year thereafter (for example, 2021, 2027, etc.). For initial Form No. 80 filings (18CFR 8.11(b)), each licensee of an unconstructed project shall file an initial Form No. 80 after such project has been in operation for a full calendar year prior to the filing deadline. Each licensee of an existing (constructed) project shall file an initial Form No. 80 after such project has been licensed for a full calendar year prior to the filing deadline. Filing electronically is preferred. (See http://www.ferc.gov for more information.) If you cannot file electronically, submit an original and two copies of the form to the: Federal Energy Regulatory Commission, Office of the Secretary, 888 First St., NE, Washington, DC 20426.

The public burden estimated for this form is three hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing the collection of information. Send comments regarding the burden estimate or any aspect of this collection of information, including suggestions for reducing burden, to: FERC via e-mail DataClearance@ferc.gov; or mail to 888 First Street NE, Washington, DC 20426 (Attention: Information Clearance Officer) and Office of Management and Budget (OMB), via e-mail to oira_submission@omb.eop.gov; or mail to OMB, Office of Information and Regulatory Affairs, Attention: Desk Officer for FERC, Washington, DC 20503. Include OMB Control Number 1902-0106 as a point of reference. No person shall be subject to any penalty for failing to comply with a collection of information if the collection of information does not display a valid control number (44 U.S.C. § 3512 (a)).

Instructions:
a. All data reported on this form must represent publicly available recreation amenities and services located within the project boundary.
b. To ensure a common understanding of terms, please refer to the Glossary on page 3.
c. Report actual data for each item. If actual data are unavailable, then please estimate.
d. Submit a completed form for each development at your project.

Schedule 1. General Data

1. Licensee Name: APPALACHIAN POWER CO	**Complete the following for each development if more than one.**
2. Project Name: BYLLESBY & BUCK	8. Reservoir Surface Area at Normal Pool (acres): 66.00
3. Project Number: 2514	9. Shoreline Miles at Normal Pool: 2.00
4. Development Name: BUCK	10. Percent of Shoreline Available for Public Use: 50.00
States Development/Project Traverses (List state with largest area within the development/project boundary first): 5. State #1: VA 6. State #2: ____ 7. Type of Project License: (check one) Major ✓ Minor ☐	11. Data Collection Methods (enter percent for each method used; total must equal 100%): 70.00 traffic count/trail count ____ attendance records ____ staff observation ____ visitor counts or surveys 30.00 estimate (explain) 100%

For 2014, enter only the licensee's annual recreational construction, operation, and maintenance costs for the development (project). Also, enter the annual recreational revenues for that year.

Item	Licensee's Annual Recreation Costs and Revenues (In Whole Dollars)	
	Construction, Operation and Maintenance Costs	Recreation Revenues for Calendar Year
12. Dollar Values	$2,000.00	$0.00

13. Length of Recreation Season: Summer: From (MM/DD) 4/1 To 10/31 Winter: From (MM/DD) 11/1 To 3/31

Period	Number of visits to all recreational areas at development/project (in Recreation Days)	
	Annual Total	Peak Weekend Average (see Glossary)
14. Daytime	4,935	76
15. Nighttime	882	12

Respondent Certification: The undersigned certifies that he/she examined this report; and to the best of his/her knowledge, all data provided herein are true, complete, and accurate.

Frank M. Simms	Plant Manager - Hydro	(540) 985-2875
Legal Name	Title	Area Code/Phone No.
[signature]	March 16, 2015	2014
Signature	Date Signed	Reporting Year Ending

Title 18 U.S.C.1001 makes it a crime for any person knowingly and willingly to make to any Agency or department of the United States any false, fictitious or fraudulent statement or misrepresentation as to any matter within its jurisdiction.

Schedule 2. Inventory of <u>Publicly Available</u> Recreation Amenities Within the Project Boundary

16. Enter data for each Recreation Amenity Type (a). For User Free (b) and User Fee (c) enter the number of publicly available recreation amenities, located within the project boundary, regardless of provider. For FERC Approved (d) enter the number of amenities identified under User Free (b) and User Fee (c) for which the licensee has an ongoing responsibility for funding or maintenance (see Glossary for further detail). For Capacity Utilization(f), of the total publicly available amenities (b) + (c), compare the average non-peak weekend use (see Glossary) for each recreation amenity type (during the recreation season, with the highest use, reported on Schedule 1, Item 13) with the total combined capacity of each amenity type and enter a percentage that indicates their overall level of use. For example, if all public boat launches are used to half capacity during the non-peak weekend days, enter 50% (should use exceed capacity for an amenity type, enter the appropriate percentage above 100).

Recreation Amenity Type (a)	Number of Recreation Amenities			Total Units (e)	Capacity Utilization (%) (f)
	User Free (b)	User Fee (c)	FERC Approved (d)		
Boat Launch Areas. Improved areas having one or more boat launch lanes (enter number in column e) and are usually marked with signs, have hardened surfaces, and typically have adjacent parking.	0	0	0	0 Lanes	
Marinas. Facilities with more than 10 slips on project waters, which include one or more of the following: docking, fueling, repair and storage of boats; boat/equipment rental; or sell bait/food (see Glossary FERC approved).	0	0	0	N/A	
Whitewater Boating. Put-ins/Take-outs specifically designated for whitewater access.	0	0	0	N/A	
Portages. Sites designed for launching and taking out canoes/kayaks and the improved, designated, and maintained trails connecting such sites (enter length of trail in column e).	1	0	1	1,320ft	10
Tailwater Fishing. Platforms, walkways, or similar structures to facilitate below dam fishing.	0	0	0	N/A	
Reservoir Fishing. Platforms, walkways, or similar structures to facilitate fishing in the reservoir pool or feeder streams.	0	0	0	N/A	
Swim Areas. Sites providing swimming facilities (bath houses, designated swim areas, parking and sanitation facilities).	0	0	0	0 Acres	
Trails. Narrow tracks used for non-automobile recreation travel which are mapped and designated for specific use(s) such as hiking, biking, horseback riding, snowmobiling, or XC skiing (excludes portages, paths or accessible routes; See Glossary).	1	0	1	0 Miles	10
Active Recreation Areas. Playground equipment, game courts/fields, golf/disc golf courses, jogging tracks, etc.	0	0	0	0 Acres	
Picnic Areas. Locations containing one or more picnic sites (each of which may include tables, grills, trash cans, and parking).	2	0	2	2 Sites	11
Overlooks/Vistas. Sites established to view scenery, wildlife, cultural resources, project features, or landscapes.	0	0	0	0 Acres	
Visitor Centers. <u>Buildings</u> where the public can gather information about the development/project, its operation, nearby historic, natural, cultural, recreational resources, and other items of interest.	0	0	0	N/A	
Interpretive Displays. <u>Signage/Kiosks/Billboards</u> which provide information about the development/project, its operation, nearby historic, natural, cultural, recreational resources, and other items of interest.	1	0	1	N/A	N/A
Hunting Areas. Lands open to the general public for hunting.	0	0	0	0 Acres	
Winter Areas. Locations providing opportunities for skiing, sledding, curling, ice skating, or other winter activities.	0	0	0	0 Acres	
Campgrounds. Hardened areas developed to cluster campers (may include sites for tents, trailers, recreational vehicles [RV], yurts, cabins, or a combination, but excludes group camps).	0	0	0	0 Acres	N/A
Campsites. Sites for tents, trailers, recreational vehicles [RV], yurts, cabins, or a combination of temporary uses.	0	0	0	N/A	
Cottage Sites. Permanent, all-weather, buildings rented for short-term use, by the public, for recreational purposes.	0	0	0	N/A	
Group Camps. Areas equipped to accommodate large groups of campers that are open to the general public (may be operated by public, private, or non-profit organizations).	0	0	0	0 Sites	
Dispersed Camping Areas. Places visitors are allowed to camp outside of a developed campground (enter number of sites in clmn. e).	0	0	0	0 Sites	
Informal Use Areas. Well used locations which typically do not include amenities, but require operation and maintenance and/or public safety responsibilities	0	0	0	0	
Access Points. Well-used sites (not accounted for elsewhere on this form) for visitors entering project lands or waters, without trespassing, for recreational purposes (may have limited development such as parking, restrooms, signage).	0	0	0	N/A	
Other. Amenities that do not fit in the categories identified above. Please specify (if more than one, separate by commas):	0	0	0	0	

Licensed Hydropower Development Recreation Report

Glossary of FERC Form 80 Terms

Data Collection Methods. (Schedule 1, Item 11) – If a percentage is entered for the estimate alternative, please provide an explanation of the methods used (if submitted on a separate piece of paper, please include licensee name, project number, and development name)

Development. The portion of a project which includes:
(a) a reservoir; or
(b) a generating station and its specifically-related waterways.

Exemption from Filing. Exemption from the filing of this form granted upon Commission approval of an application by a licensee pursuant to the provisions of 18 CFR 8.11(c).

General Public. Those persons who do not have special privileges to use the shoreline for recreational purposes, such as waterfront property ownership, water-privileged community rights, or renters with such privileges.

Licensee. Any person, state, or municipality licensed under the provisions of Section 4 of the Federal Power Act, and any assignee or successor in interest. For the purposes of this form, the terms licensee, owner, and respondent are interchangeable *except where:*
(a) the *owner* or licensee is a subsidiary of a parent company which has been or is required to file this form; or
(b) there is more than one owner or licensee, of whom only one is responsible for filing this form. Enter the name of the entity that is responsible for filing this report in Schedule 1, Item 2.1.

Major License. A license for a project of more than 1,500 kilowatts installed capacity.

Minor License. A license for a project of 1,500 kilowatts or less installed capacity.

Non-Peak Weekend. Any weekend that is not a holiday and thus reflects more typical use during the recreation season.

Number of Recreation Amenities. Quantifies the availability of natural or man-made property or facilities for a given recreation amenity type. This includes all recreation resources available to the public within the development/project boundary. The resources are broken into the following categories:

User Free (Schedule 2, column b) - Those amenities within the development/project that are free to the public;

User Fee (Schedule 2, column c) - Those amenities within the development/project where the licensee/facility operator charges a fee;

FERC Approved (Schedule 2, column d) – Those amenities within the development/project required by the Commission in a license or license amendment document, including an approved recreation plan or report. Recreation amenities that are within the project boundary, but were approved by the licensee through the standard land use article or by the Commission through an application for non-project use of project lands and waters, are typically not counted as FERC approved, unless they are available to the public, but may be counted as either user free or user fee resources. The total FERC approved amenities column does not necessarily have to equal the sum of user free and user fee amenities.

Peak Use Weekend. Weekends when recreational use is at its peak for the season (typically Memorial Day, July 4th & Labor Day). On these weekends, recreational use may exceed the capacity of the area to handle such use. Include use for all three days in the holiday weekends when calculating Peak Weekend Average for items 14 & 15 on Schedule 1.

Recreation Day. Each visit by a person to a development (as defined above) for recreational purposes during any portion of a 24-hour period.

Revenues. Income generated from recreation amenities at a given project/development during the previous calendar year. Includes fees for access or use of area.

Total Units (Schedule 2, column e) – Provide the total length, or area, or number that is appropriate for each amenity type using the metric provided.

Trails. Narrow tracks used for non-automobile recreation travel which are mapped and designated for specific use(s) such as hiking, biking, horseback riding, snowmobiling, or XC skiing. Trails are recreation amenities which provide the opportunity to engage in recreational pursuits, unlike paths (means of egress whose primary purpose is linking recreation amenities at a facility) or accessible routes (means of egress which meets the needs of persons with disability and links accessible recreation amenities and infrastructure at a facility).

United States Department of the Interior

NATIONAL PARK SERVICE
NORTHEAST REGION
15 State Street
Boston, Massachusetts 02109-3572

May 7, 2019 Filed Electronically

Kimberly Bose, Secretary ER 19/0090
Federal Energy Regulatory Commission
888 First Street, N. E.
Washington, DC 20426

Re: National Park Service (NPS) Comments on FERC's March 8,, 2019 NOI to File Application, Soliciting Comments on PAD, SD1, and Study Requests for the Byllesby and Buck Hydroelectric Project; FERC No. P-2514-170 – Carroll County, Virginia

Dear Secretary Bose:

General Comments

On May 31, 2002, Department of the Interior Secretary Gale Norton designated the New River Trail as a component of the National Recreation Trail System (NRT). The New River Trail joined a network of more than 900 so designated trails that taken together, encompassing more than 10,000 miles. http://www.americantrails.org/nationalrecreationtrails/06appsnrt.html

This 57-mile rail-trail system offers recreational users a valuable linear park experience and acts as a low-impact recreation corridor, alternative transportation route, community green space, outdoor classroom, and provides links to local and state parks including the New River Trail State Park, public boat launches and the USFS Mt. Rogers National Recreation Area.

Comments on the PAD

Impacts associated with project operations extend beyond the project boundaries, but the applicant proposes to limit any analysis to the limited area within the project boundary. See PAD P. 4.2-1 and Exhibit G drawings. This omits a considerable segment of the river between Buck Dam and Lake & Byllesby Dam, including Buck Falls and numerous island habitats. Any study plans and analysis should include coverage of this area to ensure that FERC has an adequate factual basis upon which to evaluate project impacts and identify adequate mitigation, protection and enhancement measures.

Section 5.8 Recreation and Land Use

5.8.1.1 Byllesby Development

The Byllesby Boat Launch is maintained by the Virginia Department of Game and Inland Fisheries (VDGIF), and as currently configured with gravel, often requires considerable replacement after high water events. A paved surface would provide for additional stability in general and especially after flooding events. According to VDGIF personnel, the parking area is receives more use than can be accommodated.

The Byllesby Canoe Portage parking lot has been relocated from the current portage take-out, with a parking location at the site of the former portage take-out. This displacement of parking facilities necessitates an additional carry, but is not addressed in the PAD description. If this relocation is due to the flashboard replacement project, the applicant should detail when this condition will be addressed, and the final location and conditions to be replaced. The put in below the Byllesby bypass reach is not adequately documented with photographs or a description of the put-in facilities below the bypass.

5.8.1.2 Buck Development

The Buck Dam Canoe Portage take-out and put in at the tailrace are not adequately documented with photographs in the PAD. There is an undeveloped vertical drop of about 3 feet into flowing water, making it difficult to use. The applicant should address how to remedy this situation to provide for safe and convenient access back to the river at this location.

5.8.2 Current Project Recreation Use Levels and Restrictions

A 2015 Form 80 Recreation Report filed in March 2015 (5-84 of the PAD), cites fishing as the most popular activity at the recreation sites on the Byllesby development. However, the PAD does not adequately address fishing access at project locations, nor potential additional or alternative locations where fishing access could be provided at the project. Popular locations include tailrace areas, but no formal angler access is provided at these locations at either project.

Comments on PAD Proposed Studies

Currently available recreational use data is not adequate to assess existing recreational opportunities, user demand, and the possible need for improvements to facilities. The closure of the U.S. Forest Service campground on Buck Reservoir and the development of an improved Byllesby Pool Boat Launch have shifted use, but there has not been any recent evaluation of canoe portage use, particularly as a result of the take-out location relocation at Byllesby Dam.

The need for additional angling access including at the project tailraces, should be evaluated and included in any recreational needs assessment. VDGIF currently manages the Loafer's Rest Access area downstream from the Buck Dam tailrace, however, neither this site nor the associated parking area are close enough to the tailrace or close enough to the river to provide reasonable access and use. There is also no current ADA compliant angler access available at either project. There are also no facilities for riverside camping areas; the former U.S. Forest Service campground area on Buck Reservoir might address this need. Other potential sites should be identified as well.

A more complete assessment of current use and demand is needed as a foundation for a recreational needs assessment. Therefore, the NPS concurs with and supports the Study Requests associated with recreational needs and assessment made by the VDGIF and filed with FERC on May 7, 2019.

Foregoing Studies in Lieu of Protection, Mitigation, and Enhancement Measures

There may be an opportunity to reduce some of these studies in scope, or even forego some of them, if agreements can be reached up front regarding certain Protection, Mitigation, and Enhancement (PM&E) measures. The NPS recommends that the Applicant convene a meeting with the stakeholders after receiving all of the study requests to determine which studies could be reduced or eliminated in return for agreements to proceed with certain PME measures.

The NPS appreciates the opportunity to provide these comments and looks forward to continued assistance to the applicant and other stakeholders in these proceedings. If you have any questions, please feel free to contact Kevin_Mendik@nps.gov NPS Northeast Region Hydro Program Coordinator.

Sincerely,

Kevin Mendik

NPS-NER Hydro Program Manager

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
http://www.fws.gov/chesapeakebay

May 7, 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First St., N.E., Room 1A
Washington, DC 20426

RE: Byllesby-Buck Hydroelectric Project (FERC # 2514 - 186) - Review of Pre-Application Document, Scoping Document 1, and Request for Studies

Dear Secretary Bose:

The U.S. Fish and Wildlife Service (Service) has reviewed the January 7, 2019, Notice of Intent (NOI) to File for a License and Attached Pre-Application Document (PAD), filed by Appalachian Power Company, a unit of American Electric Power (AEP) (Applicant) for the proposed Byllesby-Buck Hydroelectric Project (Project), which would be located at the existing Byllesby and Buck Dams on the upper New River, near the city of Galax, in Carroll County, VA. The Service also participated in the April 10 and 11, 2019 public scoping meetings in Galax, VA, hosted by the Federal Energy Regulatory Commission (FERC), and is providing comment on the Scoping Document 1.

The following comments are provided pursuant to the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended: 16 U.S.C. 1531 *et seq*.), the Migratory Bird Treaty Act (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat.755), and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq*.).

The Byllesby development consists of the following: (1) a 64 foot high, 528 foot long concrete dam and main spillway topped with four sections of 9 foot high flashboards, five sections of 9 foot high inflatable crest gates, and six bays of 10 foot high Tainter gates; (2) an auxillary spillway including six sections of 9 foot high flashboards; (3) a 239-acre reservoir with a gross storage capacity of 2,000 acre-feet; (4) a powerhouse containing four generating units with a total installed capacity of 21.6 megawatts (MW); and (5) appurtenant facilities. The Byllesby development is estimated to produce 41,752 megawatt hours (MWh) on average annually, and could operate down to a low flow of 73 cubic feet per second (cfs) and up to a high flow of 5,868 cfs.

The Buck development consists of the following: (1) a 42 foot high, 353 foot long concrete dam; (2) a 1,005 foot long, 19 foot high spillway section topped with 20 sections of 9 foot high flashboards, 4 sections of 9 foot high inflatable crest gates, and 6 bays of 10 foot high Tainter gates; (3) a 66 acre reservoir with a gross storage capacity of 661 acre-feet; (4) a powerhouse containing 3 generating units with a total capacity of 8.5 MW; and (5) appurtenant facilities. The Buck development is estimated to produce 36,980 MWh on average annually, and could operate down to a low flow of 60 cfs and up to a high flow of 3,540 cfs.

General Comments on the PAD

The PAD outlines a project area delineation that does not include, currently, the affected, impounded area between these two developments operated in synchrony. The impounded reaches of the New River encompassed by the Byllesby-Buck Project have displaced habitat important to a variety of aquatic insects (including rare Odonates), freshwater mussels, crayfish, Eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*), native fishes, and fish spawning areas, including the native New River strain of walleye (*Sander vitreus*). These impoundments block fish migration, disrupting freshwater mussel populations and associated fish host species from dispersing upstream and downstream in the New River. The lack of sand and gravel areas in the bypass reaches, combined with the high levels of sedimentation in the reservoirs, diminish mussel habitat for green floater ((*Lasmigona subviridis*, under Federal review, state listed threatened) and other species. None of these impacts are discussed in the PAD. Promoting and maintaining appropriate natural spawning and rearing conditions for the New River walleye population is also a priority, but is not adequately addressed in the PAD.

Specific Comments on Scoping Document 1

Scoping Document, 3.2.2 Proposed Environmental Measures

Geologic and Soil Resources

The Applicant does not propose any protection, mitigation and enhancement (PM&E) measures yet related to geology and soils. The lack of knowledge of the existing sedimentation processes and results of operations of the dams must be addressed to adequately manage this habitat resource for the aquatic community. The Service supports the Sedimentation Study Request provided by VDGIF in their May 7, 2019 comment letter, and hopes that FERC and the Applicant will give it their full consideration. Only with that full understanding can the Applicant and agencies address needed management measures for riverine sediment.

Aquatic Resources

The Applicant proposes to continue to provide a minimum flow of 360 cfs, or inflow to the project, whichever is less, to the New River downstream of each powerhouse to protect aquatic resources (Article 403). This minimum flow is not designated for the bypassed reaches which are approximately 475 foot (0.1 mile) long at Byllesby and 0.8 mile long at Buck, and which currently receive only leakage flows, not minimum flows, when all flow is through the powerhouses. The bypassed reaches are not provided water flow when all the flow is diverted to the powerhouses, such that there is a lack of habitat and connectivity of the pools. These reaches are sediment starved, lacking suitable spawning habitat or habitat for the endemic Kanawha darter (*Etheostoma kanawhae*) and Kanawha minnow (*Phenacobius teretulus,* both Virginia Species of Greatest Conservation Need, Tier IIIc), odonates and crayfish. Under current and proposed operations, the bypassed reaches are also denied the potential for supporting the Eastern hellbender or federally listed candy darter (*Etheostoma osburni*) and Kanawha darter.

An instream flow study, PHABSIM or other evaluation of each bypassed reach is needed to determine appropriate minimum flows to these reaches to protect aquatic resources. In addition to appropriate fish species (e.g., the endemic Kanawha darter, and Kanawha minnow, walleye, smallmouth bass (*Micropterus dolomieu*), other species to be evaluated should include Eastern hellbender, New River crayfish (*Cambarus chasmodactylus*), green floater, and possibly a species of odonate.

Terrestrial Resources
The Service supports the continued adherence to the Wildlife Management Plan, including inspections of undeveloped land for evidence of human disturbance, consultation with Virginia Department of Game and Inland Fisheries (VDGIF) about any impacts, and monitoring of bank erosion (Article 408).

Threatened and Endangered Species
Any Project-related tree removal (e.g., for maintenance, recreational improvements) should involve consultation with the Service under Section 7 of the ESA, for the protection of the Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*).

The candy darter was listed as endangered under the Endangered Species Act in November, 2018, and the Service will consider requesting protection, mitigation and enhancement (PM&E) measures to aid in this species' recovery. The species occurs only in the Upper Kanawha River Basin, including the Gauley, Greenbrier, and New River watersheds. This species occurs in Cripple Creek, downstream from the Buck Development. Its habitat use "extends into the large New River" where it occupies runs, riffles, and swift pockets (Jenkins and Burkhead 1993). Such measures are especially appropriate within the New River drainage where the species is endemic, and will also benefit the closely related endemic Kanawha darter. The Upper New River drainage may also be the only drainage within the candy darter's current range where the variegate darter (*Etheostoma variatum*) does not occur, which is important because the most significant threat to the candy darter is hybridization with the variegate darter (USFWS 2018).

We are currently aware of few proposed activities that could affect suitable wetlands, except for the potential one foot winter drawdown of the reservoir. In consultation with FERC and their representative, the Service will determine whether there are concerns related to relicensing with regards to the federally listed threatened bog turtle (*Glyptemys muhlenbergii*), which is dependent on wetland habitat for all of its life stages, and breeding, feeding, and sheltering.

There is a 1992 record of Virginia spiraea (*Spiraea virginiana*), along the western shoreline of the Byllesby impoundment. Based on this record, habitat and presence/absence surveys were conducted in April and July of 2017 for proposed impoundment drawdowns to replace wooden flashboards with inflatable Obermeyer gates. Virginia spiraea was not found. The Service considers the results to be valid for 2 years, and may request a new survey, with particular focus on the suitable habitat identified by the Service, where this species was documented in 1992. This species may be affected by impoundment fluctuations or drawdowns.

Recreation and Land Use

The Service supports the May 7, 2019 comments provided by VDGIF and the National Park Service regarding recommendations for safe outdoor recreation access and opportunities to this important stretch of the New River. Their expertise and recommendations are crucial to one of the Service's national priorities, Connecting People to Nature.

Specific Comments on the PAD

Project Area

The Byllesby-Buck Project area described as necessary for project operations in Figure 4.2.1 of the PAD does not include more than a mile long section of the upper area of Buck Reservoir. The entire river reach between Byllesby and Buck Dams is affected by project operations and is used for project operations. Therefore, it should be included in the project area. There is a direct nexus between project operations and ecological and recreational effects in this reach of the New River.

Project Influence

The Byllesby-Buck Project affects a larger area of the New River upstream and downstream from the project area. New River ecological and geologic processes are influenced by the projects for some distance upstream and downstream from the project area in the following ways: (1) the project reservoirs influence ambient New River water temperature and other water quality parameters, with habitat effects on resident coolwater flora and fauna, including New River endemic fishes; (2) liberation of reservoir sediment deposits during project operations result in increased turbidity in downstream reaches influenced by project flow, disrupting ecological processes, suspending contaminants like PCBs, and thereby negatively affecting angling and recreational use; (3) New River walleye populations are affected by project placement, with the dams likely inundating historic New River walleye spawning areas; (4) project dams block New River walleye migration, requiring substantial VDGIF effort and expense to maintain walleye populations upstream and downstream of the Project via hatchery rearing and stocking programs; and (5) loss of upstream mussel fauna due to Project dams blocking migration of host fishes.

The magnitude and spatial scale of this Project Influence on aquatic species is not adequately addressed in the PAD. Determining the spatial scale of Project Influence will help determine adequate reference conditions for ecological comparisons. Determining the downstream spatial influence will involve consideration of project flow attenuation and downstream turbidity effects of project operations, as well as other downstream water quality and recreational impacts.

4.1 Cumulative Effects

The Service does not agree with the conclusion that continued operation of the Project does not contribute to any cumulative effects on aquatic resources. A case can be made for cumulative effects of this Project, with its two developments, and other dams and hydropower projects on the New and Kanawha Rivers, contributing to effects on fish and freshwater mussel populations (barriers to migration and dispersal, entrainment impacts, reduction in available riffle habitats and an increase in lacustrine habitats where sediments accumulate, fish stranding in bypassed reaches with no or insufficient minimum flows, reduction in transport of spawning gravels, and lack of suitable spawning substrates in bypassed reaches); reduction in suitable hellbender, crayfish, and odonate habitat; reduction in transport of organic materials; increased water temperature; and reduced dissolved oxygen.

Section 4.3.1 Reservoirs

The description of the Project reservoirs lacks recent bathymetric information, including average depth of the reservoirs. The PAD cites surveys done in 1990, but lacks more current information. In the absence of this information, assumptions are made about project sedimentation rates and effects on Project operations, raising questions about effects on reservoir biota and recreational use. Direct observation indicates that the reservoirs have been substantially modified by sediment deposition, raising concerns about what rehabilitation is needed to restore aquatic habitat, with resulting floral and faunal improvements and fisheries benefits.

Section 4.4.1 Current Operations

Ramping rate operations for the Buck Dam bypass reach are described on pages 4-21 but no estimates of resulting downstream flows are included in the description of spillway gate opening sizes.

Section 4.4.2 Proposed Operations

A brief evaluation of lower normal pool operations in winter months (December through March) is discussed in this section, but no consideration is given to potential effects during that period. Lower winter pool elevation could affect potential bog turtle wetland hydrology or inhibit recreational access during winter months. In addition, lower winter pool elevation could result in bank erosion effects within the Project Area in areas with a limited riparian buffer.

Section 5.3 Water Resources

As shown in Table 5.3-1, a subset of flow data is depicted for Byllesby-Buck prorated to the drainage area from the gage data of the USGS gage 03164000, New River near Galax, VA. The period of record chosen by the Applicant to be depicted in the PAD is 1987-2016, with narrative reference to a historic high August 1940 flow of 141,000 cfs. The flow duration curves found in Appendix E are not sufficient nor detailed enough to characterize the seasonality, duration, and magnitude of daily flows the reference reaches of the New River experience, and what would be expected to occur in the bypass channels of Buck Dam (4,100 feet long, unknown width) and Byllesby Dam (475 feet long, unknown width). Currently these channels are dewatered nearly 100 percent of the time during January (Byllesby), February, and April through August in a dry year (2002), as shown in Table 4.4-1.

A longer period of record than 30 years (1986-2016) is likely necessary for determining appropriate representative data, among which the “wet year,” a “dry year,” and an “average year” and others years could be conveyed. Although those chosen years may be illustrative of important distributions within the precipitation spectrum, they may be the 25th or 75th quartiles or 90 percent exceedance, rather than the lowest and highest maximums we might expect during the period of licensing. The PAD should provide a fuller picture of daily flows potentially experienced within and currently removed from the aquatic habitats of bypass reaches by using a longer period (>30 years) of representative data.

Section 5.4.8.2 Bypass Reach Habitat and Flows
The description of existing environment and resource impacts on the bypass reach does not discuss what flows are provided by spillway gate openings at Buck Dam, nor is there any discussion of the need for minimum flow to the bypass reach, particularly a concern below Buck Dam. The bypass reaches are primarily bedrock, lacking sand, gravel, and cobbles essential for supporting local fauna. This PAD section does not discuss bypass reach habitat adequately to provide a context for understanding flow needs in these channels.

Section 5.6 Wetlands, Riparian, and Littoral Habitat
While this section describes the extent of wetland habitat in the reservoirs, it lacks specifics on littoral habitat, including documentation of emergent and submersed aquatic vegetation. Adjacent New River reaches are known to be inhabited by foundational native aquatic vegetation species such as hornleaf riverweed (*Podostemum ceratophyllum*), water willow (*Justicia americana*), common elodea (*Elodea canadensis*), and eelgrass or water celery (*Vallisneria americana*), creating aquatic habitat and food web benefits for riverine fauna, but this PAD section does not describe the existence or lack of these aquatic vegetation species in the reservoirs or the river reaches in the Project Area. The wetlands information in the PAD is also inadequate in describing how these areas are used recreationally, including for wildlife viewing and waterfowl hunting.

Section 5.7 Rare, Threatened and Endangered Species
As noted in the PAD, the candy darter (*Etheostoma osburni*) was listed as endangered under the Endangered Species Act on November 21, 2018. The Service will consider requesting protection, mitigation, and enhancement (PM&E) measures to aid in this species' recovery, based on anticipated Project impacts.

The species occurs only in the Upper Kanawha River Basin, including the Gauley, Greenbrier, and New River watersheds. Cripple Creek, downstream from the Buck Development, is proposed to be listed as federally designated "critical habitat." (83 FR 59232, November 21, 2018). Candy darter habitat use "extends into the large New River" where it occupies runs, riffles, and swift pockets (Jenkins and Burkhead 1993). Such PM&E measures are especially appropriate within the New River drainage where the species is endemic, and will also benefit the closely related endemic Kanawha darter. The Upper New River drainage may also be the only drainage within the candy darter's current range where the variegate darter does not occur. Significant threats to the candy darter include hybridization with the variegate darter, as well as ongoing contributing threats of excessive sedimentation, warming water temperatures, habitat fragmentation, changes in water quality and flow, catastrophic events, and competition or predation associated with other introduced species. (USFWS Candy Darter Recovery Outline, October 1, 2018).

5.7.2.2 Mussels

The green floater mussel is also currently under Federal review for potential listing under the

Endangered Species Act. A decision is anticipated in 2020. The green floater has been documented in the project vicinity, immediately downstream of the Buck Dam, as well as upstream and downstream of both dams throughout the New River. The PAD does not reference green floater in this section, despite its current status as a state threatened species in Virginia. A full discussion of impacts to listed mussels is warranted.

5.7.2.3 Herpetofauna
Although the Service determined on April 4, 2019, that the Eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) is not warranted at this time to be listed as an endangered species throughout its entire range under the Endangered Species Act, (84 FR 13223, April 4, 2019, https://www.govinfo.gov/content/pkg/FR-2019-04-04/pdf/2019-06536.pdf), a distinct population segment in Missouri has been proposed for listing. The Eastern hellbender remains a federal Species of Concern for which the Service seeks to protect and enhance populations to prevent its listing under the Endangered Species Act in the future. It is incorrectly noted in the PAD as a Tier II species (Very High Conservation Need) within Virginia's Wildlife Action Plan (VWAP 2015), while it is actually a Tier 1a species in the VWAP Appendix A, Virginia Species of Greatest Conservation Need. The PAD's Table 5.7.2 has the correct Tier 1a designation. The Service is requesting a multi-taxa biological survey study be performed within the Project Area. As a completely aquatic species that prefers clear, fast flowing, well oxygenated stream and river habitats, the Eastern hellbender serves an important role within the aquatic community and ecological heritage of the New River. The Service agrees that the Eastern hellbender should be included within the multi-taxa surveys requested for odonates and crayfishes.

Studies Proposed in the PAD

Shoreline Stability Assessment
This study lacks a sedimentation assessment aspect. Sedimentation is a significant effect on habitat at the Project that needs assessment. Relying on results from the upstream Fries project, a smaller project, is not adequate. Watershed sedimentation modeling from the Claytor Project is mentioned but not adequately explained to provide context for the conclusions drawn. Downstream sediment effects and reservoir rehabilitation needs could potentially be addressed by removal of sediment from the Project Area, but cannot be assessed through a Shoreline Stability Assessment study alone. The Service supports the Sedimentation Study Request provided by VDGIF in their May 7, 2019 comment letter, and hopes that FERC and the Applicant will give it their full consideration.

Water Quality
This study needs a thermal context that considers how the Project affects the thermal regime of the New River due to likely project effects on coolwater endemic fish, including the federally endangered candy darter. In addition, the study needs to examine turbidity effects of project operations. Finally, it needs to include analysis of chlorophyll a levels in the reservoirs and downstream transport.

Bypass Reach Aquatic Habitat and Flow Assessment

Due to changes in New River fish populations since 1997, including increased numbers of New River walleye downstream from Buck Dam, this evaluation needs to look at stranding issues after bypass reach spill events. It should also evaluate how spill gates can be used to limit stranding and create upstream and downstream connectivity in the bypass reaches and how bypass reach habitat is modified relative to reference conditions, particularly as it relates to the lack of sand, gravel, and cobble substrates important to multiple faunal groups. In addition, the study needs a flow modeling component to evaluate how spillway gates can be used to create seasonally appropriate flows. As there is currently no specified plan for which gates are opened in a strategic sequence for optimizing flow within the wide downstream channel (AEP, pers. comm., April 11, 2019 Scoping Meeting), this is an operational measure that needs to be enhanced within the study.

Inflatable Obermeyer Crest Gate Operational Effectiveness Evaluation

This study should be integrated with the Bypass Reach Aquatic Habitat and Flow Assessment study to determine how the crest gates can be used to provide improved bypass reach flows.

Wetland and Riparian Habitat Characterization

This study needs to include documentation of emergent and submersed aquatic vegetation beds in the Project Area. In addition, it should evaluate ways to enhance these areas for wildlife and recreational use, particularly with regard to wildlife viewing and waterfowl hunting opportunities.

Recreational Needs Assessment

From the Service's site visit on February 20, 2019, we believe that currently available recreational use information is not adequate to assess existing recreational opportunities and potential improvements to facilities. During the current license term, closure of the U.S. Forest Service campground area on Buck Reservoir and the development of an improved Byllesby Pool Boat Launch alone have likely shifted use. We are not aware of any recent evaluation of canoe portage use, particularly as a result of the take-out location adjustment at Byllesby Dam. A complete assessment of current use is needed as a foundation for a recreational needs assessment.

There is an unmet need for angling access in desirable fishing locations, including the tailrace areas of both dams. These areas, including the Buck Dam tailrace, need to be examined as potential fishing access areas. VDGIF currently manages the Loafer's Rest access area downstream from the Buck Dam tailrace, but this access site is not reasonably close to the tailrace, nor is the parking area located close enough to the New River to be useful to most anglers. Handicapped angler access is also not available at the Project. In addition, paddlers and anglers on the New River need riverside camping areas. The former U.S. Forest Service campground area on Buck Reservoir is a likely site. Other sites should be identified as well.

Studies Not Proposed in the PAD

In section 6.2.3.2 of the PAD, no broad aquatic surveys are proposed for this relicensing because the Applicant believes such surveys are not necessary for the evaluation of Project effects or potential PM&E measures. The reasoning for this seems to rely on a combination of distribution results from Fries Project surveys and the lack of proposed operational changes. This reasoning ignores the lack of needed faunal and aquatic vegetation information in the Project Area. Because the Byllesby-Buck Project is located in a more remote area of the New River than the Fries Project, knowledge of the New River fauna in the Byllesby-Buck Project area is limited. The New River supports a unique fauna of coolwater fish, invertebrates, the Eastern hellbender, and ecologically important aquatic vegetation beds. The lack of broad faunal and aquatic plant surveys with corresponding reference sites outside the area of Project Influence leaves a critical informational need unfilled. Reasonable efficiencies could be achieved by performing these surveys in concert with one another. The Service believes this information need should be addressed by relicensing studies.

Study Requests by the Service

The Service requests that the Applicant conduct the following additional studies. We strongly urge the Licensee to undertake these studies or discuss alternatives with the Service and other resource agencies.

Biological and Aquatic Vegetation Surveys within the Project Area

1. Describe the goals and objectives of each study proposal and the information to be obtained.
Goal: Gather current distributional information on multiple fauna and foundational aquatic vegetation beds within the Project Area.
Objective: Conduct biological surveys of fish, crayfishes, Odonates, freshwater mussels, Eastern hellbender and associated habitat within the Project Area with appropriate reference sites for comparison.
Objective: Conduct survey of foundational aquatic vegetation beds within the Project Area with appropriate reference sites for comparison.

2. Relevant resource management goals of the agencies or Indian Tribes with jurisdiction over the resource to be studied.
The mission of the Service is "working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people." Resource management goals include protecting federally listed species, and precluding the need to list at-risk species (species that the state may identify as Species of Greatest Conservation Need, SGCN), and where justified, provide fish passage for aquatic connectivity as well as to ensure protection of species which are known or potential hosts for the glochidia (larva) of at-risk freshwater mussel species.

3. Public interest
The requester is a resource agency.

4. Describe existing information concerning the subject of the study proposal and the need for additional information.
The New River supports a unique fauna of coolwater fish (including the native New River walleye), multiple invertebrates (including four species of rare Odonates listed in Virginia's

Wildlife Action Plan), crayfishes, and freshwater mussels), the Eastern hellbender, and ecologically important aquatic vegetation beds that link invertebrate production with higher trophic levels, including important game fishes. In spite of increased scientific information about these organisms and habitats relative to the previous Project relicensing, a knowledge gap remains regarding these organisms and habitats within the Project Area. Because the Byllesby-Buck Project is located in a remote area of the New River, knowledge of the New River in the Byllesby-Buck Project area is limited. The lack of broad faunal and aquatic plant surveys with corresponding reference sites outside the area of Project Influence leaves a critical informational need unfilled. Reasonable efficiencies could be achieved by performing these surveys in concert with one another.

5. Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied and how the study results would inform the development of license requirement.
The nexus between Project operations and effects on Project Area fauna and foundational aquatic plants result from Project flows, turbidity, sedimentation and maintenance dredging operations, as well as temperature and other water quality effects from the Project. Study results would inform PME measures to benefit aquatic resources within the Project Area.

6. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.
Acceptable study methodology for the biological survey component was employed in the Biological Survey Report for the Fries Project, published in the Fries Project (# 2883-Final License Application). Acceptable study methodology for the aquatic vegetation survey component is available from multiple publications, including a recent survey by Weberg et al. (2015).

7. Describe considerations of the level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.
The level of effort and cost associated with this proposed survey are not cost prohibitive. Reasonable efficiencies could be achieved by performing these surveys in concert with one another as much as possible, given the target species. No alternative studies have been proposed to meet the stated information needs presented by this study request. In fact, the study proposed was determined to be unnecessary by the applicant. The Service believes this study is critical due to the lack of current information on organisms and habitat in the Project Area.

Fish Protection and Downstream Passage Studies
Fish moving downstream are subjected to potential mortality from impingement and entrainment. Many hydroelectric project licenses have incorporated trash racks with 1-inch clear bar spacing to physically exclude most adult fish from the turbines, alternate downstream passage routes, and other features (e.g., reduced approach velocities, adequate plunge pools) to encourage safe downstream fish passage. Both developments have intake screens with 15 degree incline and 2.28-inch clearance between the intake bars. The developments utilize Vertical

Francis turbine units (four at Byllesby, three at Buck), but in the context of multiple, stacked hydropower projects, cumulative entrainment impacts are likely. The Applicant has not proposed additional measures to ensure safe, timely, and effective downstream fish passage. Therefore, we request that downstream passage studies be undertaken.

These studies should include a literature search of available passage designs for the species of concern, as well as information on the relative effectiveness of each design. The Service has a blade strike analysis model which may be useful in this effort. Existing facilities at other dams should be investigated. Careful attention should be paid to attraction flows, guidance mechanisms, and velocities. If the Applicant agrees to provide an alternate downstream bypass, the fish moving downriver must be diverted away from the turbines and guided to the downstream passage facility, and adequate attraction and conveyance flows must be provided. A passage facility should not create a bottleneck that would delay downstream movement or expose the fish to excessive predation. Any passage facilities should be designed to prevent blockage from ice and debris, and should be as maintenance-free as is feasible. They must also be able to operate under all flow conditions experienced in the New River.

In addition to a literature review and on-site investigations of existing facilities, the Applicant should collect site-specific data from the Project to aid in the design of protection and passage facilities. This information should include flows, velocities, water depths, and substrates. The Applicant should also collect information on the passage requirements of the fish species found in the New River. This information should include swimming speeds (including burst speeds), where in the water column these fish are likely to be moving, different forms of attractants or repellents (e.g., sound, light, etc.) that may help guide each species.

1. Goals and Objectives
The goals and objectives of this study are to provide information on potential fish passage and protection structures, or other measures, which could be utilized at this Project. The information obtained will allow the Service's fishway engineers to evaluate the potential effectiveness of various options.

2. Resource Management Goals
Resource management goals include providing safe, timely, and effective passage for fish species that migrate, such as smallmouth bass, walleye, white sucker, northern hogsucker and others. Additional goals include providing passage to fish species which serve as glochidial hosts to freshwater mussels found in the Project Area, in order to prevent negative impacts to fish and mussel populations from the proposed project, and to aid in the continued existence of these populations in the New River. The primary focus is on safe downstream passage measures.

3. Public Interest
The requestor is a resource agency.

4. Existing Information
The PAD provides no information regarding passage alternatives.

5. Nexus to Project Operations and Effects
The project blocks the upstream-downstream migration of fishes and utilization of riverine habitat (e.g., reduced downstream passage over dam crest; downstream diversion through powerhouse; the turbines will entrain fish, resulting in some immediate mortality, as well as latent mortality and cumulative mortality from multiple, stacked hydropower projects).

6. Methodology Consistent with Accepted Practice
The recommended study uses standard literature reviews and site-specific data collection techniques common to most hydro licensing activities.

7. Level of Effort, Cost, and Why Alternative Studies Will Not Suffice
The level of effort would involve moderate literature review, discussions with fishway engineers, and site-specific data collection. The study could be completed in less than one year, but may require more time to design effective facilities. The actual cost is unknown and would depend upon the number of alternatives examined. The existing information in the PAD is inadequate to allow a thorough examination of alternatives; however, most of the information needed should be available in the existing literature.

<u>Hydraulic & Instream Flow (Aquatic Habitat) Study</u>
The proposed project may cause localized changes in the velocity and direction of water flow. These changes could alter aquatic habitat, water quality, and sediment movement and deposition patterns, which in turn may adversely affect freshwater mussels and other aquatic life.

1. Goals and Objectives
The goals and objectives of this study are to determine the impacts of modifying the discharge location and configuration of the flow discharge on the current velocity and direction, sediment transport and deposition patterns, aquatic species and habitats, and recreation in the tailwaters and bypass below the proposed project.

2. Resource Management Goals
The goal of the study is to determine if the proposed discharge from the power plant, or reduced spillage to dam tailwater and bypass habitats, would have an adverse effect on fish communities (e.g., spawning habitat), freshwater mussel communities, or on angling opportunities.

3. Public Interest
The requestor is a resource agency.

4. Existing Information
The Service is unaware of any site-specific studies or information that would address these concerns.

5. Nexus to Project Operations and Effects
Aquatic habitat, including spawning habitat and freshwater mussel beds, can be altered by the modification of flow from a hydropower facility. Changes to minimum flow may reorient the direction of flow as a result of the new discharge locations and reduced spillage over the dam

crest, and could also result in changes in sediment transport and deposition patterns.

6. Methodology Consistent with Accepted Practice
The recommended study uses standard study techniques used in many hydropower licensing activities. The Instream Flow Incremental Methodology developed by the Service incorporates a one-dimensional flow model that could be used for assessing the impact on habitat at various flow discharges. However, a two-dimensional (2-D) model would be preferred for the assessment of the discharge from the proposed power plant. A 2-D hydraulic model coupled with the Physical Habitat Simulation (PHABSIM) software would not only provide information about changes in habitat, but would also provide anticipated flow direction and velocity information over a wide range of flows. Assessments of changes in habitat using the PHABSIM software result in an assessment of pre- and post-project Weighted Use Area (WUA), which requires selection of target species and/or guilds. The Service requests that target species and/or guilds include a shallow-fast species (e.g., greenside darter) or guild, in order to determine how the proposed project may affect tailwater habitats and species.

A 2-D model includes 1-foot or finer contour bathymetry, a detailed digital terrain model (DTM), substrate and cover data to be overlaid on the DTM for modeling hydraulic roughness and aquatic habitat, water surface calibration data, and two-dimensional modeling of flow fields over a range of flows. The use of an Acoustic Doppler Current Profiler (ACDP) is standard for collecting information to be used in the model. The report output would include flow vectors, depth, substrate, shear velocities, boundary shear stress, drag coefficient, Froude numbers, and Reynolds numbers at various flow regimes, pre- and post-project, to identify changes in persistent suitable habitat for freshwater mussels and other aquatic organisms, and model assumptions and information regarding how the model was calibrated.

7. Level of Effort, Cost, and Why Alternative Studies Will Not Suffice
Consulting firms and some universities can perform instream flow studies. The methods for both one- and two-dimensional hydraulic flow studies are well established and the level of effort is reasonable. The Service recognizes that certain training, expertise, and equipment are necessary to conduct instream flow studies. However, numerous studies have been conducted on waters throughout the United States, including previous studies conducted for several other hydroelectric projects in the upper Ohio River basin.

The Service believes that a 2-D study would provide the best information to make a decision about impacts that may be associated with the proposed hydropower development. Alternative studies would not provide adequate information about changes in velocity, direction, and impacts on aquatic habitat for selected species to make informed decisions about resource issues. The Service is unable to determine the cost of the proposed study.

Foregoing Studies in Lieu of Protection, Mitigation, and Enhancement Measures
There may be an opportunity to reduce some of these studies in scope, or even forego some of them, if agreements can be reached up front regarding certain Protection, Mitigation, and Enhancement (PM&E) measures. The Service recommends that the Applicant convene a meeting with the stakeholders after receiving all of the study requests to determine which studies could be

reduced or eliminated in return for agreements to proceed with certain PME measures.

The Draft Study Plan developed by the Licensee should incorporate all of the above-listed studies. The study proposals incorporated into the Draft Study Plan should be as detailed as possible so that all parties know exactly what is being agreed to when the study plan is approved. Thank you for the opportunity to comment on this PAD and the opportunity to provide study requests. If you have any questions regarding this matter, please contact Janet Norman of my staff at 410-573-4533 or Janet_Norman@fws.gov.

Sincerely,

Genevieve LaRouche
Field Supervisor

cc: Lindy Nelson
Stephanie Nash

References:

Jenkins, R.E., and N.M. Burkehead. 1993. Freshwater fishes of Virginia. American Fisheries Society, Bethesda, Maryland.

Matthew A. Weberg, Brian R. Murphy, Andrew L. Rypel and John R. Copeland. 2015. A Survey of the New River Aquatic Plant Community in Response to Recent Triploid Grass Carp Introductions into Claytor Lake, Virginia. Southeastern Naturalist, 14(2):308-318.

USFWS. 2018 Candy Darter Recovery Outline.
https://ecos.fws.gov/docs/recovery_plan/2018%20CDRecoveryOutline.pdf

Commonwealth of Virginia
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
1111 E. Main Street, Suite 1400, Richmond, Virginia 23219
P.O. Box 1105, Richmond, Virginia 23218
(800) 592-5482
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director
(804) 698-4000

May 7, 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington D.C. 20426

Re: Comments on Scoping Document 1 for the Byllesby-Buck Hydroelectric Project (P-2514-186)

Dear Secretary Bose,

Thank you for the opportunity to comment on the Byllesby-Buck Hydroelectric Project (P-2514-186) Scoping Document (SD1). Virginia Department of Environmental Quality Staff (DEQ) Office of Water Supply staff attended the site visit on April 10, 2019 and the agency scoping meetings on April 10 and April 11, 2019 in Galax, Virginia.

Project Boundaries:

The Pre-Application Document (PAD) indicates two separate project boundaries anchored upstream by Byllesby Dam and downstream by Buck Dam. The separation (gap) in the project boundary was described during the site visit by applicant staff as a portion of the New River where the influences of Byllesby Dam have ended and where the influences of Buck Dam have not begun. However, also during the site visit, it was noted by applicant staff that the operations of Byllesby Dam directly influence the operation of Buck Dam. The site visit explanations by applicant staff were contradictory, and the PAD fails to adequately address the separation of the project boundary. DEQ recommends that the project boundary separation be eliminated and the area in question be included in the defined project boundary in the PAD.

Water Resources:

The PAD notes that sediment accumulation is known to be slowly occurring at locations within and around the reservoirs, in some cases leading to the creation of new wetland areas. The PAD further notes that if such areas interfere with the Project operations, there could be a need in the future to dredge such areas, such as was done in 1997 and 2014. The proposed studies do not include monitoring concentrations of Polychlorinated biphenyls (PCBs) within the sediment that may be dredged or present in the wetlands referenced. Although the Project is not in the New River PCB fish impairment area, PCB concentrations in sediment deposits behind the dams should be investigated. DEQ recommends EPA Method 1668 (PCB congener method has the sensitivity to account for downstream fish impairment.

Minimum Flows:

The PAD notes that during previous relicensing (early 1990's) the potential effects of Project operations on powerhouse tailrace habitat were evaluated with respect to erosional and depositional considerations, spring spawning habitat, and low-flow summer habitat. The previous relicensing findings found that fish likely to spawn in the tailrace would likely do so in spring when water levels would be typically elevated and because the channels below the powerhouses are steep-sided, little spawning surface would be exposed. Based on these previous findings, a minimum flow of 360 cfs was found to be adequate, and the applicant proposes to continue to provide this minimum flow for the new license.

However, standards and information about aquatic resources needs have improved during the previous three decades and we would expect that different flows could be required dependent upon species status and needs. There is significant scientific basis at this point to demonstrate aquatic life impacts from a single minimum flow rate and the Department no longer believes a single instream flow value is protective of aquatic life. Additionally, downstream water withdrawals for public water supplies or other beneficial uses may be affected by flow alterations from the operation of this hydroelectric facility during low flow periods. Any alterations to instream flow caused by the operation of this facility will be assessed during the Virginia Water Protection Permit review.

Virginia Water Protection Permit:

A Virginia Water Protection Permit (VWP permit) issued by the Department will be required for any construction activities in the New River as well as for the alterations to instream flow related to the operation of the hydroelectric plant. As a matter of agency practice, the VWP permit serves as the Clean Water Act § 401 state certification for the Federal Energy Regulatory Commission license. Absent completion of the VWP permit process, DEQ will issue a § 401 certificate conditioned on the receipt of the VWP permit. Please contact the Mr. Joseph Grist at Joseph.Grist@deq.virginia.gov or at DEQ - Office of Water Supply, P.O. box 1105, Richmond, Virginia 23218 about the VWP Permitting Process.

Sincerely,

Joseph Grist
DEQ Office of Water Supply
Water Withdrawal Permitting and Compliance Manager

Matthew J. Strickler
Secretary of Natural Resources

COMMONWEALTH of VIRGINIA
Department of Game and Inland Fisheries

Gary F. Martel
Acting Executive Director

May 7, 2019

Secretary Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Byllesby-Buck Project (P-2514-186) Comments on Pre-Application Document, Scoping Document 1, and Study Requests

Dear Secretary Bose:

We appreciate the opportunity to comment on the Byllesby-Buck Hydroelectric Project (Number 2514-186) Pre-Application Document (PAD), Scoping Document 1 (SD1), and the opportunity to provide Study Requests for this relicensing project. Virginia Department of Game and Inland Fisheries (VDGIF) Aquatic Wildlife Resources staff attended the Scoping Site Visit and the public meeting on April 10, 2019 and the agency meeting on April 11, 2019 in Galax, Virginia, and reviewed the PAD and SD1. We offer the following comments on the PAD and SD1 and then provide Study Requests. We also offer comments on the proposed studies as written in the PAD and summarized in the SD1, including important points about improvements or additions to those proposed studies.

General Comments on PAD

The impounded reaches of the New River encompassed by the Byllesby-Buck Project have displaced habitat important to a variety of aquatic insects (including rare odonates), freshwater mussels, crayfish, Eastern Hellbender, native fishes, and fish spawning areas, including the presumptive native New River walleye. These impoundments block fish migration, disrupting freshwater mussel populations and associated fish host species from dispersing upstream and downstream in the New River. The lack of sand and gravel areas in the bypass reaches, combined with the high levels of sedimentation in the reservoirs, diminish habitat for freshwater mussels and other aquatic life. None of these impacts are discussed in the PAD. Promoting and maintaining appropriate natural spawning and rearing conditions for the New River walleye population is a high priority for VDGIF, but is not adequately addressed in the PAD.

Specific Comments on PAD

1. **Project Area:** The Byllesby-Buck Project boundary displayed in Figure 4.2-1 of the PAD ignores more than a mile long section of the upper area of Buck Reservoir. The entire river reach between Byllesby and Buck Dams is affected by project operations and is used for project operations. Therefore, it should be included in the project boundary. There is a direct nexus between project operations and ecological and recreational effects in this reach of the New River.

2. **Project Influence:** The Byllesby-Buck Project affects a larger area of the New River upstream and downstream from the project area. New River ecological and geologic

processes are influenced by the projects for some distance upstream and downstream from the project area. Examples include: (1). The project reservoirs influence ambient New River water temperature and other water quality parameters, with habitat effects on resident coolwater flora and fauna, including New River endemic fishes; (2) Liberation of reservoir sediment deposits during project operations result in increased turbidity in downstream reaches influenced by project flow, disrupting ecological processes, suspending contaminants like PCB's, and negatively affecting angling and recreational use; (3) New River walleye populations are affected by project placement, with the dams likely inundating historic New River walleye spawning areas; (4) Project dams block New River walleye migration, requiring substantial VDGIF effort and expense to maintain walleye populations upstream and downstream of the Project via hatchery rearing and stocking programs; and, (5) Loss of upstream mussel fauna due to Project dams blocking migration of host fishes.

The magnitude and spatial scale of this Project Influence is not adequately addressed in the PAD. Determining the spatial scale of Project Influence will help determine adequate reference conditions for ecological comparisons during multiple study efforts. Determining the downstream spatial influence will involve consideration of project flow attenuation and downstream turbidity effects of project operations, as well as other downstream water quality and recreational impacts.

3. **Section 4.3.1 Reservoirs:** The description of the project reservoirs lacks recent bathymetric information, including average depth of the reservoirs. The PAD cites surveys done in 1990, but lacks more current information. In the absence of this information, assumptions are made about project sedimentation rates and effects on project operations, raising questions about effects on reservoir biota and recreational use. Direct observation indicates that the reservoirs have been substantially modified by sediment deposition, raising concerns about what rehabilitation is needed to restore aquatic habitat, with resulting floral and faunal improvements and fisheries benefits.

4. **Section 4.4.1 Current Project Operations:** Ramping rate operations for the Buck Dam bypass reach are described on page 4-21 but no estimates of resulting downstream flows are included in the description of spillway gate opening sizes.

5. **Section 4.4.2 Proposed Operations:** A brief evaluation of lower normal pool operations in winter months (December through March) is discussed in this section, but no consideration is given to potential effects during that period. Lower winter pool elevation could inhibit recreational access during winter months. In addition, lower winter pool elevation could result in bank erosion effects within the Project Area in areas with a limited riparian buffer.

6. **Section 5.3 Water Resources:** PAD section 5.3.2 titled "Flows" does not provide enough information to characterize the range of flows typical for the Project Area, which inhibits analysis of needed bypass reach flows. More information should be provided over a longer period of record than 30 years, providing likely dry, wet, and average year conditions that should be replicated in bypass reach flow management.

7. **Section 5.4.6 Freshwater Mussels**
   Section 5.4.6.1 Mussel Surveys from 2002 to 2017

This PAD review of recent mussel surveys in the New River failed to include the following: (1) VDGIF and Appalachian Power Company Claytor Lake drawdown assessments starting in 2006, and subsequent mussel salvages during alternating year Claytor Lake drawdowns, that included collection of Eastern Elliptio (*Elliptio complanata*); and, (2) A 2017 mussel relocation conducted by Environmental Solutions & Innovations, Inc. at the I-81 bridge downstream from Claytor Dam, where upwards of 8 species were collected, including the state threatened Pistolgrip (*Tritogonia verrucosa*) and where Eastern Elliptio was documented in the mainstem river for the first time. In addition, an assessment of this area by Stantec in 2017 turned up 1 state threatened Green Floater (*Lasmigona subviridis*).

8. **Section 5.4.8**

5.4.8.1 Fish and Aquatic Resources:
Entrainment: There is no mention of potential entrainment of larval mussels in this PAD review. In the report titled " Impingement Mortality and Entrainment Characterization Report Chesterfield Power Station June 2005-May 2006": by EA Engineering, Science, and Technology, Inc., bivalve young were entrained annually at 363.8 x 10^6 and were the largest number of invertebrates noted. Some information on and potential for bivalve entrainment should be included in the PAD.

5.4.8.2 Bypass Reach Habitat and Flows: The description of existing environmental and resource impacts on the bypass reach does not discuss what flows are provided by spillway gate openings at Buck Dam, nor is there any discussion of the need for minimum flow to the bypass reach, particularly a concern below Buck Dam. The bypass reaches are primarily bedrock, lacking sand, gravel, and cobbles essential for supporting local fauna. This PAD section does not discuss bypass reach habitat adequately to provide a context for understanding flow needs in these channels.

9. **Section 5.6 Wetlands, Riparian, and Littoral Habitat:** While this section describes the extent of the wetlands habitat in the reservoirs, it lacks specifics on littoral habitat, including documentation of emergent and submersed aquatic vegetation. Adjacent New River reaches are known to be inhabited by foundational native aquatic vegetation species such as *Podostemum ceratophyllum* (hornleaf riverweed) *Justicia americana* (water willow), *Elodea canadensis* (common elodea), and *Vallisneria americana* (eelgrass or water celery), creating aquatic habitat and food web benefits for riverine fauna, but this PAD section does not describe the existence or lack of these aquatic vegetation species in the reservoirs or river reaches in the Project Area. The wetlands information in the PAD is also inadequate in describing how these areas are used recreationally, including for wildlife viewing and waterfowl hunting.

10. **Section 5.7 Rare, Threatened, and Endangered Species:**

5.7.1.1 Candy Darter
As noted in the PAD, the Candy Darter (*Etheostoma osburni*) was listed as endangered under the federal Endangered Species Act on November 21, 2018. Since the PAD lacks sufficient detail on this species, we provide additional information below.

Candy Darter occurs only in the Upper Kanawha River Basin, including the Gauley, Greenbrier and New River watersheds. In the Virginia portion of the New River, it is only known from the Ridge and Valley Province. Cripple Creek, downstream from the

Buck Development, is proposed to be listed as federally designated "critical habitat." Current Virginia Tech research by Katie McBaine, under the direction of Dr. Paul Angermeier at Virginia Tech, demonstrates that the Cripple Creek Candy Darter population inhabits the lowest reaches of the creek near its confluence with the New River. According to Jenkins and Burkhead's species account in Freshwater Fishes of Virginia, Candy Darter habitat use "extends into the large New River" where it occupies runs, riffles, and swift pockets (Jenkins and Burkhead 1993). Suitable Candy Darter habitat is available downstream from Cripple Creek in the Ridge and Valley Province. The Upper New River drainage may be the only drainage within the Candy Darter's current range where the Variegate Darter (*Etheostoma variatum*) does not occur. Significant threats to the candy darter include hybridization with the Variegate Darter, as well as ongoing contributing threats of excessive sedimentation, warming water temperatures, habitat fragmentation, changes in water quality and flow, catastrophic events, and competition or predation associated with other introduced species. (USFWS Candy Darter Recovery Outline, October 1, 2018).

VDGIF will consider requesting protection, mitigation, and enhancement (PME) measures to aid in this species' recovery. Such PME measures are especially appropriate within the New River drainage where the species is endemic, and will also benefit the closely related endemic Kanawha darter.

5.7.2.2 Mussels
This section of the PAD fails to mention the Green Floater in its references to species with state legal status as a state threatened species which is known from the project vicinity. This species is also being reviewed for federal listing, which should also be discussed in the PAD.

5.7.2.3 Herpetofauna
The U.S. Fish and Wildlife Service determined on April 4, 2019 that the Eastern Hellbender (*Cryptobranchus allieganiensis allieganiensis*) is not warranted to be listed as an endangered species across its range, but remains a federal Species of Concern. The text section in the PAD relative to Eastern Hellbender lists this species as a Tier II species in Virginia's Wildlife Action Plan, which is erroneous. Eastern Hellbender is actually a Tier I a species (Species of Critical Conservation Need). The correct information on this species is found in Table 5.7-2, which should also be reflected in this text section of the PAD. VDGIF is requesting a multi-taxa biological survey study be performed within the Project Area. This survey effort should include searches for Eastern Hellbender and its habitat due to its status federally and Tier I a status in Virginia's Wildlife Action Plan.

11. Section 5.8 Recreation and Land Use
5.8.1.1 Byllesby Development

- *Byllesby VDCR Boat Launch*: This launch site on the Byllesby pool is incorrectly identified as a VDCR Boat Launch site. The site is maintained by VDGIF. It has a number of inadequacies that create maintenance problems, including the gravel surface, which requires extensive replacement after flooding events. A hard surface parking lot would require much less improvement work after flooding events. According to VDGIF personnel familiar with use patterns, the parking area is undersized for the use it receives.

- *Byllesby Canoe Portage*: The canoe portage parking lot at the Byllesby pool is displaced from the current portage take-out, with a parking location at the site of the former portage take-out. This displacement of parking facilities requires extra carry by users of the portage, and is not addressed in the PAD description. In addition, re-entry below the Byllesby bypass reach is not adequately documented with photographs or a description of the put-in facilities below the bypass.

5.8.1.2 Buck Development

- *Buck Dam Canoe Portage*: The portage take-out at Buck Dam and return location in the Buck tailrace are not adequately documented in the PAD, with a lack of pictures accompanying the description. The return location involves an undeveloped vertical drop of about 3 feet into flowing water, making it difficult to use, but no pictures accompany this section to allow adequate evaluation of this condition.

5.8.2 Current Project Recreation Use Levels and Restrictions

- In a 2015 Recreation Report filed in March 2015 (mentioned on page 5-84 of the PAD), fishing is cited as the most popular activity at the recreation sites on the Byllesby development. However, the PAD does not adequately discuss how fishing access is provided at project locations, nor does it address other locations where fishing access could be provided at the project. For example, popular locations include tailrace areas where fish activity is enhanced by flow and aeration. Creating and maintaining angler access areas where fish activity is enhanced are high priorities for VDGIF. The PAD does not adequately address access issues related to the tailrace areas of either project dam.

Studies Proposed in the PAD

1. *Shoreline Stability Assessment*: This study lacks a sedimentation assessment aspect. Sedimentation is a significant effect on habitat at the Project that needs assessment. Relying on results from the upstream Fries project, a smaller project, is not adequate. Watershed sedimentation modeling from the Claytor Project is mentioned but not adequately explained to provide context for the conclusions drawn. Downstream sediment effects and reservoir rehabilitation needs could potentially be addressed by removal of sediment from the Project Area, but cannot be assessed through a Shoreline Stability Assessment study alone. A significant outcome from a comprehensive shoreline stability and sediment study could be development of a sediment management plan.

2. *Water Quality*: This study needs a thermal context that considers how the project affects the thermal regime of the New River due to likely project effects on coolwater endemic fish, including the federally endangered Candy Darter. In addition, the study needs to examine turbidity effects of project operations. Finally, it needs to include analysis of chlorophyll a levels in the reservoirs and downstream transport.

3. *Bypass Reach Aquatic Habitat and Flow Assessment*: Due to changes in New River fish populations since 1997, including increased numbers of New River walleye downstream from Buck Dam, this evaluation needs to look at stranding issues after bypass reach spill events, with field data collection. It should also evaluate how spill gates can be used to limit stranding and create upstream and downstream connectivity in the bypass reaches and how bypass reach habitat is modified relative to reference conditions, particularly as

it relates to the lack of sand, gravel, and cobble substrates important to multiple faunal groups. In addition, the study needs a flow modeling component to evaluate how spillway gates can be used to create seasonally appropriate flows.

4. *Inflatable Obermeyer Crest Gate Operational Effectiveness Evaluation*: This study should be integrated with the Bypass Reach Aquatic Habitat and Flow Assessment study to determine how the crest gates can be used to provide improved bypass reach flows.

5. *Wetland and Riparian Habitat Characterization*: This study needs to include documentation of emergent and submersed aquatic vegetation beds in the Project Area. In addition, it should evaluate ways to enhance these areas for wildlife and recreational use, particularly with regard to wildlife viewing and waterfowl hunting opportunities.

6. *Recreational Needs Assessment*: VDGIF is not convinced that currently available recreational use information is adequate to assess existing recreational opportunities and potential improvements to facilities. During the current license term, closure of the U.S. Forest Service campground area on Buck Reservoir and the development of an improved Byllesby Pool Boat Launch alone have likely shifted use. VDGIF is not aware of any recent evaluation of canoe portage use, particularly as a result of the take-out location adjustment at Byllesby Dam. A more complete assessment of current use is needed as a foundation for a recreational needs assessment.

   We state elsewhere in our comments the need for angling access in desirable fishing locations, including the tailrace areas of both dams. These areas, including the Buck Dam tailrace, need to be examined as potential fishing access areas. VDGIF currently manages the Loafer's Rest Access area downstream from the Buck Dam tailrace, but this access site is not reasonably close to the tailrace, nor is the parking area located close enough to the New River to be useful to most anglers. Handicapped angler access is also not available at the Project. In addition, paddlers and anglers on the New River need riverside camping areas. The former U.S. Forest Service campground area on Buck Reservoir is a likely site. Other sites should be identified as well.

Studies Not Proposed in the PAD

In section 6.2.3.2 of the PAD, no broad aquatic surveys are proposed for this relicensing because the applicant believes such surveys are not necessary for the evaluation of Project effects or potential PM&E measures. Reasoning in this section relies on a combination of distribution results from Fries Project surveys and the lack of proposed operational changes. However, this reasoning ignores the lack of needed faunal and aquatic vegetation information in the Project Area. Because the Byllesby-Buck Project is located in a more remote area of the New River than the Fries Project, knowledge of the New River fauna in the Byllesby-Buck Project area is limited. The New River supports a unique fauna of coolwater fish, invertebrates (including, but not limited to freshwater mussels), and the Eastern Hellbender, and ecologically important aquatic vegetation beds. The lack of broad faunal and aquatic plant surveys with corresponding reference sites outside the area of Project Influence leaves a critical informational need unfilled. Reasonable efficiencies could be achieved by performing these surveys in concert with one another. VDGIF believes this information need should be addressed by relicensing studies.

Comments on SD1

General Comments

The New River supports a unique fauna of coolwater fish, invertebrates, and the Eastern Hellbender, and ecologically important aquatic vegetation beds. The lack of focus by Appalachian Power on broad faunal and aquatic plant surveys with corresponding reference sites outside the area of Project Influence leaves a critical informational need unfilled. VDGIF believes this information need should be considered in the EA.

Specific Comments

***Section 3.2.1 Proposed Project Facilities and Operation*:** Lower winter pool elevation could inhibit recreational access during winter months. In addition, lower winter pool elevation could result in bank erosion effects within the Project Area in areas with a limited riparian buffer.

***Section 4.1.1 Resources that could be Cumulatively Affected*:** VDGIF recommends examining the following list of cumulatively affected resources: (1) Sedimentation impacts to reservoir habitat; (2) Downstream sediment transport due to project operations with multiple ecological and recreational effects; (3) Temperature and other water quality parameters affected by the existence of the Project; and, (4) Riverine habitat and biota altered by the Project reservoirs and in the bypass reaches.

***Section 4.2 Resource Issues*:** VDGIF agrees that the preliminary list of resource issues to be addressed in the EA is as complete as possible at this time with the following suggestions for additional considerations under each resource section.

4.2.1 Geologic and Soils Resources: Sedimentation is a significant effect on habitat at the Project that needs assessment. A shoreline erosion assessment needs to include an examination of sedimentation sources and habitat impacts, including how the current state of sedimentation contributes to downstream sediment transport and related impacts downstream on riverine biota and recreational and angling use.

4.2.2 Aquatic Resources:

Bullet 1 (Water Quality): Water quality issues need to include a consideration of turbidity effects of project operations on downstream resources as well as examining chlorophyll a levels in the reservoirs and downstream transport.

Bullet 2 (Adequacy of 360-cfs minimum flow): Analysis of the existing 360-cfs minimum flow for aquatic resources needs to include an examination of how power generation flow fluctuations affect aquatic resources in terms of turbidity and flow fluctuation effects on fish and mussel spawning. In addition, this analysis needs to include an examination of flow fluctuation impacts on recreational use.

Bullets 3 and 7 (Minimum flow and Ramping Rates in the Buck Bypass Reach): Due to changes in New River fish populations since 1997, including increased numbers of New River walleye downstream from Buck Dam, this analysis needs to include: (1) An examination of stranding issues after bypass reach spill events; (2) How spill gates can be used to limit stranding and create upstream and downstream connectivity in the bypass reach; and, (3) How bypass reach habitat is modified relative to reference conditions, particularly as it relates to the lack of sand, gravel, and cobble substrates important to multiple faunal groups. In addition, this analysis needs to evaluate how spillway gates can be used to create seasonally appropriate flows.

4.2.3 Terrestrial Resources: Analysis of continued project operation and maintenance on riparian and wetland habitat needs to include consideration of emergent and submersed aquatic vegetation beds as well as the importance of these beds to terrestrial and aquatic species.

4.2.4 Threatened and Endangered Species: Both the Candy Darter and the Eastern Hellbender need to be considered in this analysis. The Green Floater mussel is also a species being reviewed for federal listing, so it should be included as well.

Candy Darter
Note our earlier comments on the inadequacy of the information on this species in the PAD. VDGIF will consider requesting PME measures to aid in this species' recovery. Such PME measures are especially appropriate within the New River drainage where the species is endemic, and will also benefit the closely related endemic Kanawha darter.

Eastern Hellbender
Note our earlier comments on the PAD with regard to specifics on this species importance. VDGIF is requesting a multi-taxa biological survey study be performed within the Project Area. This survey effort should include searches for Eastern Hellbender and its habitat due to its federal Species of Concern status and its Tier I a status (Species of Critical Conservation Need) in Virginia's Wildlife Action Plan.

***Section 5.0 Proposed Studies*:**
During the Scoping meeting, VDGIF noted that the Wetland and Riparian Habitat Characterization study is not included in the proposed list of studies in SD1. It needs to be included under the Terrestrial Resources Section of SD1. Our comments relative to this proposed study under the specific PAD comments section of this letter should also be noted here.

Shoreline Stability Assessment: This study lacks a sedimentation assessment aspect. Sedimentation is a significant effect on habitat at the Project that needs assessment. Downstream sediment effects and reservoir rehabilitation needs could potentially be addressed by removal of sediment from the Project Area, but cannot be assessed through a Shoreline Stability Assessment study alone.

Water Quality Study: This study needs a thermal context that considers how the project affects the thermal regime of the New River due to likely project effects on coolwater endemic fish, including the federally endangered Candy Darter. In addition, the study needs to examine turbidity effects of project operations. Finally, it needs to include analysis of chlorophyll a levels in the reservoirs and downstream transport.

Bypass Reach Aquatic Habitat and Flow Assessment and Inflatable Obermeyer Crest Gate Operational Effectiveness Evaluation: These separate studies need to be integrated as much as possible due to the need to include gate operation considerations in bypass reach habitat and flow assessment. Due to changes in New River fish populations since 1997, including increased numbers of New River walleye downstream from Buck Dam, this evaluation needs to examine: (1) Stranding issues after bypass reach spill events, (2) How spill gates can be used to limit stranding and create upstream and downstream connectivity in the bypass reaches; and, (3) How bypass reach habitat is modified relative to reference conditions, particularly as it relates to the lack of sand, gravel, and cobble substrates important to multiple faunal groups. In addition, the study needs to evaluate how spillway gates can be used to create seasonally appropriate flows.

Recreational Needs Assessment: VDGIF is not convinced that currently available recreational use information is adequate to assess existing recreational opportunities and potential improvements to facilities. A more complete assessment of current use is needed as a foundation for a recreational needs assessment due to changes in use patterns over time associated with changing availability of river access. Analysis of recreational needs should include consideration of most desirable fishing locations, handicapped accessible facilities, and riverside camping opportunities.

Study Requests

Biological and Aquatic Vegetation Surveys within the Project Area

Goals and Objectives:

- **Goal:** Gather current distributional information on multiple fauna and foundational aquatic vegetation beds within the Project Area.
    - **Objective:** Conduct biological surveys of fish, crayfishes, Odonates, freshwater mussels, Eastern hellbender and associated habitat within the Project Area with appropriate reference sites for comparison.
    - **Objective:** Conduct survey of foundational aquatic vegetation beds within the Project Area with appropriate reference sites for comparison.

Relevant Resource Management Goals:
The mission of the Virginia Department of Game and Inland Fisheries includes the conservation of wildlife resources and their habitats for the benefit of present and future generations.

Background and Existing Information:
The New River supports a unique fauna of coolwater fish (including the native New River walleye), multiple invertebrates (including 4 species of rare Odonates listed in Virginia's Wildlife Action Plan), crayfishes, freshwater mussels, the Eastern hellbender, and ecologically important aquatic vegetation beds that link invertebrate production with higher trophic levels, including important game fishes. In spite of increased scientific information about these organisms and habitats relative to the previous Project relicensing, a knowledge gap remains regarding these organisms and habitats within the Project Area. Because the Byllesby-Buck Project is located in a remote area of the New River, knowledge of the New River in the Byllesby-Buck Project area is limited. The lack of broad faunal and aquatic plant surveys with corresponding reference sites outside the area of Project Influence leaves a critical informational need unfilled. Reasonable efficiencies could be achieved by performing these surveys in concert with one another.

Project Nexus:
The nexus between Project operations and effects on Project Area fauna and foundational aquatic plants result from Project flows, turbidity, sedimentation and maintenance dredging operations, as well as temperature and other water quality effects from the Project. Study results would inform PM&E measures to benefit aquatic resources within the Project Area.

Proposed Methodology:
Acceptable study methodology for the biological survey component was employed in the Biological Survey Report for the Fries Project, published in the Fries Project (Number 2883-Final License Application. Acceptable study methodology for the aquatic vegetation survey component is available from multiple publications, including a recent survey by Weberg et. al. 2015, referenced below.

Matthew A. Weberg, Brian R. Murphy, Andrew L. Rypel and John R. Copeland. 2015. A Survey of the New River Aquatic Plant Community in Response to Recent Triploid Grass Carp Introductions into Claytor Lake, Virginia. Southeastern Naturalist, 14(2):308-318.

Level of Effort and Cost:
The level of effort and cost associated with this proposed survey are not cost prohibitive. Reasonable efficiencies could be achieved by performing these surveys in concert with one another as much as possible, given the target species. No alternative studies have been proposed to meet the stated information needs presented by this study request. In fact, the study proposed was determined to be unnecessary by the applicant. VDGIF contends that this need for this study is critical due to the lack of current information on organisms and habitat in the Project Area.

Comprehensive Sediment Study to Develop a Sediment Management Plan

Goals and Objectives:
- Determine volume of sediment deposited in the impounded reaches to-date.
- Determine average annual rate of deposition in the impounded reaches.
- Determine the projected remaining lifespan of the impoundments at current sedimentation rates.
- Assess the magnitude and spatial extent of the coarse-substrate deficit in the bypass reaches and mainstem channels downstream of the dams and powerhouses relative to the historic rate of transport and sediment-size distribution prior to construction of the dams and the resultant disruption to sediment transport processes.
- Analyze ecological, recreational, and economic impacts resulting from sediment accumulation upstream of the dams and sediment deficit downstream of the dams.
- Evaluate potential sediment-budget impact mitigation opportunities including removal of accumulated sediment in the impounded reaches and augmentation of gravel/coarse sediment downstream of the dams and powerhouses.

Relevant Resource Management Goals:
VDGIF is tasked with managing Virginia's aquatic populations and promoting their long-term vitality. Sediment supply, whether excess fine sediment or deficit of coarse sediment, in aquatic systems is a critical factor in the health of all macroinvertebrate, mussel, and fish populations (Merz and Chan, 2005; McManamay et al., 2010).

The impoundment of the New River by Byllesby and Buck Dams in 1912 disrupted the natural sediment transport mechanisms of the river, trapping almost all coarse sediment (often defined as greater than 8 mm in diameter) supplied by the upstream watershed, resulting in aggradation of the bed along the impounded reaches and imposing a coarse-sediment deficit in the river channel downstream of the dams and powerhouses in the bypass reaches and mainstem river. The Pre-Application Document (PAD) contains very little analytical information on sedimentation in these reservoirs in spite of the fact that dredging operations have occurred twice in the past 30 years. In addition, the applicant proposes a Shoreline Stability Assessment in the PAD, but fails to include any assessment of sedimentation impacts, requiring a study request for addressing our agency concerns about the need for a sediment management plan for the Project.

As with most dammed river reaches, extensive geomorphic and ecologic impacts occur upstream and downstream of the dams (Bunte, 2004; Kondolf, 1997; Merz and Chan, 2005; McManamay et al., 2010). A comprehensive sediment study of the impacted reaches would 1) determine the extent of aggradation/sedimentation of the upstream channel and the extent of downstream bed-material deficit, and 2) provide an estimate of volume and size distribution of material that would be needed to removed from or augmented to the channel to mitigate for these impacts. Such mitigation efforts would benefit many of the aquatic populations that VDGIF is charged with managing, which in turn would drive increased recreational fishing opportunities and resultant economic benefits to the community.

Background and Existing Information:
The PAD provides no data on the sedimentation of the impounded reaches other than reviewing recent dredging operations and discussing Claytor Lake as the likely long-term sediment storage location for the Upper New River. However, due to years of siltation, substrates, particularly in the Byllesby impoundment, are dominated by silt, sand and other fine sediments, and several islands have been created from this accumulated sediment. The PAD contains no mention of a sediment management plan or any information on the magnitude and extent of coarse-sediment deficit downstream of the dams.

Existing information that could aid in characterizing these conditions includes topographic maps, geologic maps, and aerial photographs, but additional data need to be collected to assess the full impacts to sediment transport in the river due to the impoundments. There are numerous, peer-reviewed, commonly used methods for sediment yield analysis which have been used for similar studies including other FERC-relicensing projects (McBain and Trush, 2002; Snyder et al., 2004; McPherson and Harmon, 2000). Extensive data exists in the literature that can be used as a guide to developing a protocol to assess the current sediment-transport condition and for formulating a mitigation plan that could include upstream dredging and downstream coarse material augmentation (Bunte, 2004; Merz and Chan, 2005; McManamay et al., 2010; Kondolf, 1997).

Project Nexus:
The construction of Byllesby and Buck Dams and the lack of a sediment management plan for over 100 years has had obvious impacts on the sediment regime of the New River, with channel aggradation upstream and channel degradation downstream, resulting in impacts on fisheries and other aquatic life. Mitigating the ecological and geomorphic impacts of this impact requires gathering sediment data upstream and downstream of the dams to develop a sediment management plan incorporating both upstream and downstream components.

Proposed Methodology:

- Estimating sediment volume accumulated in impounded reaches upstream from Byllesby and Buck Dams:
    - Sediment deposition could be estimated using topographic differencing techniques comparing pre-dam topography (estimated based on channel geomorphology outside of the impacted reach) to contemporary bathymetry (Snyder et al., 2004; McPherson and Harmon, 2000) of the Project Area.

Mapping will be performed by boat-based bathymetry (e.g., Real Time Kinematic GPS). Sediment coring in the depositional material could be conducted to confirm estimates of historic bed elevations.
- Topographic differencing could be analyzed using either GIS or cross-section overlays, depending on the type and format of the data. A representative mass conversion could be applied once the volumetric difference has been estimated.
- From these data, total sediment yield to the impounded reaches to-date could be estimated, as well as a projection of the predicted lifespan of the impoundments at current sedimentation rates. Based on these calculations, a sediment-management plan could be developed that incorporates a cost-benefit analysis for 1) scheduled, significant dredging and 2) coarse sediment augmentation.

- Estimating extent and magnitude of coarse-sediment deficit below Byllesby and Buck Dams:
    - Sediment size distribution could be estimated by collecting pebble count data in a reference reach of New River located more than 1.5 miles upstream so as to be outside of the impact area of the dam.
    - Similar data could be collected within the area immediately downstream of the dams and powerhouses and continuing downstream to a point at which the bedload has adjusted to the reference condition by the tributary and bank erosion contributions of sediment in the intervening river reaches.
    - These sediment size distribution data could be compared to determine the magnitude and downstream extent of the sediment deficit downstream of the dams and be used to guide a cost-benefit analysis and proposal for coarse-substrate augmentation quantities and size distribution in order to mitigate for downstream ecological impacts to the sediment regime from the impoundments. One approach to accomplishing this would be periodic (e.g., semi-annually) augmentation of the channel below the dams with the average bed material (appropriate sediment-size distribution and volume) trapped by the impoundment in that given period of time. This augmentation could be done within the bypass reaches as well as the mainstem reaches to restore appropriate habitat conditions.

Level of Effort and Cost (estimate dependent on methods and models):

Office-based and field-based data collection	$100,000
Analysis of Data	$50,000
Development of sediment management/gravel augmentation plan	$25,000
Total	$175,000

References:

Bunte, K. 2004. Gravel Mitigation and Augmentation Below Hydroelectric Dams: A Geomorphological Perspective. State of the Science Review submitted to Stream Systems Technology Center, USDA Forest Service, Rocky Mountain Research Station.

Kondolf, G.M. 1997. Hungry Water: Effects of Dams and Gravel Mining on River Channels. *Environmental Management* **21**: 533-551.

McBain and Trush, Inc. 2002. Sediment Yield Analysis for the Oak Grove and Upper Mainstem Clackamas River Above North Fork Reservoir. Prepared for Portland General Electric and the Fish and Aquatics Workgroup of the Clackamas River FERC Relicensing Project.

McManamay, R. A.; D. J. Orth; C. A. Dolloff; and M. A Cantrell. 2010. Gravel Addition as a Habitat Restoration Technique for Tailwaters. *North American Journal of Fisheries Management* 30: 1238-1257.

McPherson, K. R. and J.G. Harmon. 2000. Storage Capacity and Sedimentation of Loch Lomond Reservoir, Santa Cruz, CA, 1998. USGS Water-Resources Investigations, Report 00-4016.

Merz, J. E. and L. K. O Chan. 2005. Effects of Gravel Augmentation in Macroinvertebrate Assemblages in a Regulated California River. *River Research and Applications* 21: 61-74.

Snyder, N. P.; D. M. Rubin; C. N. Alpers; J. R. Childs; J. A. Curtis; L.E. Flint; and S. A. Wright. 2004. Estimating Accumulation Rates and Physical Properties of Sediment Behind a Dam: Englebright Lake, Yuba River, California. Water Resources Research, Vol. 40, W11301.19

Thank you for the opportunity to provide comments on the PAD and SD1 and to submit requests for studies for the Byllesby-Buck Hydroelectric Project.

In closing, if the decision is made by controlling authorities that the Byllesby-Buck Project will be decommissioned or removed, we respectfully request the opportunity to propose additional studies addressing information needs germane to that decision.

If you have questions regarding our comments and study requests, please contact me at the address and phone number listed below.

Sincerely,

William B. Kittrell, Jr.

William B. Kittrell, Jr.
Regional Aquatic Resources Manager
1796 Highway Sixteen
Marion, VA 24354
(276) 783-4860
Email: bill.kittrell@dgif.virginia.gov

WBK/jrc

Cc: E. Aschenbach
M. Bednarski
J. R. Copeland
R. Fernald
M. Pinder
R. Southwick
B. Watson

Dynamics of Lotic Ecosystems

Edited by

Thomas D. Fontaine, III
Savannah River Ecology Laboratory
University of Georgia

Steven M. Bartell
Environmental Sciences Division
Oak Ridge National Laboratory

ANN ARBOR SCIENCE
THE BUTTERWORTH GROUP

13. AQUATIC MACROPHYTE CONTRIBUTION TO THE NEW RIVER ORGANIC MATTER BUDGET

B. H. Hill* and J. R. Webster

Department of Biology
Virginia Polytechnic Institute and State University
Blacksburg, Virginia

ABSTRACT

The contribution of aquatic macrophytes to the energy budget of a 135-km reach of the New River was estimated. Production rates were measured by the harvest method and extrapolated to the entire reach on the basis of measurements of cover made by aerial photography. The estimated macrophyte contribution was compared with measurements of periphyton production and model estimated allochthonous inputs. Macrophytes contributed 13.1% of the total input and 28% of the input generated within the reach. Macrophyte input to the New River trophic dynamics occurs as an autumnal pulse of rapidly decomposed detritus. This pulse forms an important link between spring-summer periphyton production and fall-winter allochthonous-based production.

INTRODUCTION

Recent studies of energy flow in lotic ecosystems indicate that streams are strongly dependent on watershed-derived organic matter (Cummins, 1974; Hynes, 1975; Vannote et al., 1980). However, appreciable in situ production of organic matter can occur under favorable conditions of insolation and nutrient availability (Minshall, 1978). Such conditions are

*Present address: Graduate Program in Environmental Sciences, University of Texas at Dallas, P.O. Box 688, Richardson, TX 75080.

likely to be met in higher order streams where shading by riparian vegetation is minimal and nutrient levels are generally high (Vannote et al., 1980). In such streams the ratio of photosynthesis to respiration may be greater than one (Minshall, 1978).

Generally the first producers to appear along the length of a stream system are attached periphyton. As stream size increases, autotrophic production by attached benthic algae often decreases in proportion to contributions by other primary producers. Assuming that planktonic forms are rare in swift-flowing, medium-sized rivers (Hynes, 1970; Wetzel, 1975a), the other important primary producers are aquatic macrophytes. Hynes and Wetzel stated that macrophytes (which include bryophytes, macroalgae, and angiosperms) are, as a whole, poorly adapted to lotic conditions. In spite of this, macrophytes can contribute significantly to energy budgets of some streams. Previous studies have shown that aquatic macrophytes contribute between 1.2 and 30% of stream primary production (Odum, 1957; King and Ball, 1967; Mann et al., 1972; Westlake et al., 1972; Fisher and Carpenter, 1976).

Since aquatic macrophytes are not extensively grazed in most aquatic systems (Westlake, 1965; Fisher and Carpenter, 1976), the only avenues for macrophyte input into stream trophic dynamics are excretion of dissolved organic matter (DOM) by living macrophytes and decay of senescent macrophyte tissue. The excretion of DOM by aquatic macrophytes has been extensively studied in lake ecosystems (e.g., Wetzel, 1975b), but little is known of this phenomenon in lotic ecosysems. Apparently, the major contribution by aquatic macrophytes to stream ecosystems comes via death and decay. Aquatic vegetation has been found to decay considerably faster than terrestrial vegetation (Fisher and Carpenter, 1976; Godshalk and Wetzel, 1978; Hill, 1979). Thus, although autumn-shed tree leaves may be an organic energy supply for many months (e.g., Petersen and Cummins, 1974), macrophytic detritus occurs as an autumn pulse in the energy budget.

The purpose of this study was to estimate the relative contribution of aquatic macrophytes to the organic matter budget of the New River. We hypothesized that aquatic macrophytes, although perhaps only secondary as an annual energy source to streams, may contribute a significant organic matter pulse in late summer and autumn and can provide a readily usable carbon source between high summer production by periphyton and the breakdown of autumn-shed allochthonous litter.

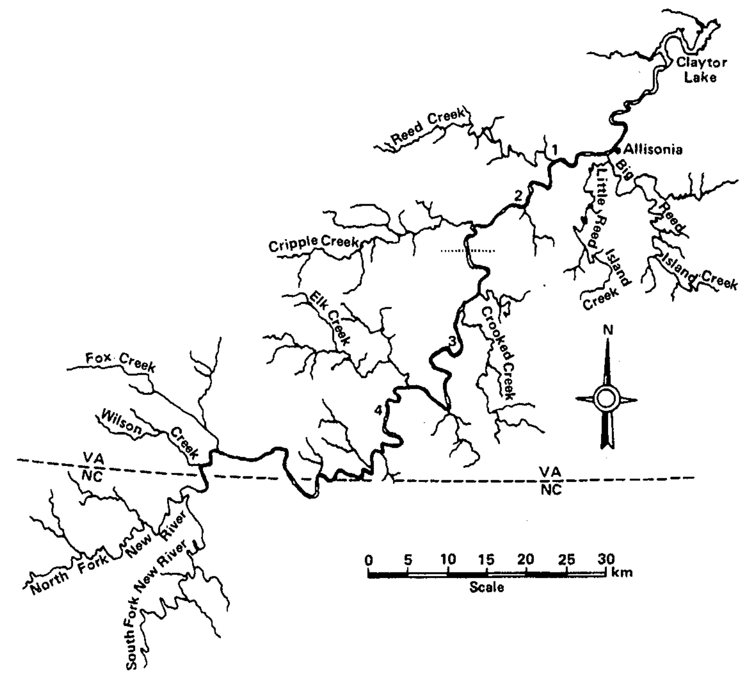


Figure 1. Map of the New River study area. Numbers refer to the sampling locations. The dotted line at the center of the figure separates hardwater (downstream) and softwater (upstream) sections of the river.

METHODS

Site Description

The New River originates in the Appalachian highlands of North Carolina and flows north through Virginia and West Virginia to the Ohio River. It is characterized by a narrow floodplain, steep gradient (2.33 m/km), average), and high velocity (Kanawha River Basin Coordinating Committee, 1971). The river passes through two distinct geologic formations, gneiss and limestone/dolomite, which divide it into soft and hardwater regions. The section of the New River considered in this study extends from the confluence of the North and South Forks of the New River (forming a sixth-order stream) downstream 135 km to Allisonia, VA, at the upper end of Claytor Lake (Figure 1). Average river width in this reach is 167 m, and depths are often less than 1 m. Riparian vegetation covers about 47% of the river bank.

Distribution and Production of Aquatic Macrophytes

The distribution and extent of aquatic macrophyte cover in the study area was determined by aerial photography. The Montana method of 35-mm aerial photography (Meyer and Grumstrup, 1978) was used with Ektachrome daylight color transparency film. The film was exposed on October 16, 1979, at an altitude of 305 m above the river surface. After processing, the slides were projected onto a gridded screen for estimation of percent cover by presence or absence of aquatic macrophytes within the squares of the grid. Total area of macrophyte beds and total river area were determined by measuring these areas on the slides with calibration from U. S. Geological Survey 7.5-minute topographic maps.

Production of *Podostemum ceratophyllum* L., *Justicia americana* (L.) Vahl, and *Potamogeton crispus* L. was determined by harvesting aboveground and belowground biomass at monthly intervals throughout the 1979 growing season. Biomass in 0.25 m^2 plots (0.10 m^2 for *P. ceratophyllum*) was collected (three to five replicates) from four sites (Figure 1), washed, air-dried, weighed, ashed (525°C for 30 min), and reweighed to determine ash-free dry weight (AFDW). Production rates at these sites were determined by differences in biomass on subsequent sampling dates. Losses of biomass caused by physical and biological processes were assumed to be negligible. Data from all four sites were combined to give a single production value for each species to facilitate extrapolation to the whole river.

Periphyton Contributions

Estimates of New River periphyton production were obtained by extrapolating in-stream measurements of ^{14}C uptake by periphyton in the New River at Glen Lyn, VA, 128 km downstream from Allisonia (Figure 1) (Rodgers, 1977). In estimating production from this source, we assumed that periphyton cover was 100% in all areas where aquatic macrophytes were absent and that there were no site differences in periphyton production between Glen Lyn and our study reach. Because of the assumption of 100% coverage, our estimate of the periphyton contribution is undoubtably an overestimate.

Allochthonous Input

Allochthonous particulate organic matter (POM) input as litter fall was estimated by using the New River model developed by Webster et al. (1979). Litter fall was 201.8 g m^{-2} $year^{-1}$ on the stream bank (Hill, 1981), and it decreased linearly to zero at 10 m from the stream bank (Gasith and Hasler, 1976). By solving numerically a partial differential equation relating litter fall to river distance and time, we estimated the upstream and tributary inputs to the study reach and the allochthonous input along the study reach. This estimate of upstream inputs ignores upstream macrophyte and periphyton production. From our observation, ignorance of upstream macrophyte production is probably justified; we have observed few macrophytes in the river upstream from our study reach. We have no information to help us with upstream periphyton production. The model estimate also assumes that allochthonous leaf material is not processed upstream and is, therefore, an overestimate of upstream input. Newbern et al. (1981) estimated that total organic matter transport at a point about halfway through our study reach was 67,400 T/year, of which 24,322 T/year was particulate. This latter value is more than twice the model estimate, 10,962 T/year (see Table 3), which we are using.

Table 1. Mean Monthly Aquatic Macrophyte Biomass in the New River*

Species	June	July	August
Justicia americana			
Aboveground	255.5 ± 111.9	341.5 ± 78.5	447.8 ± 123.4
Belowground	886.9 ± 398.8	1568.6 ± 550.1	2076.7 ± 460.0
Combined	1313.8 ± 328.7	1910.1 ± 615.5	2524.5 ± 515.0
Podostemum ceratophyllum	157.0 ± 50.4	251.8 ± 58.4	318.6 ± 156.5
Potamogeton crispus	350.3 ± 87.9	300.3 ± 94.1	269.2 ± 38.0

*Biomass given in g AFDW/m^2 ± SE.

Table 2. Aquatic Macrophyte Contribution to the New River Study Area

Species	Input, T/AFDW/yr
Podostemum ceratophyllum	1154
Justicia americana	179
Typha latifolia	97
Potamogeton crispus	3
Elodea canadensis	2
Total macrophyte contribution	1435

Table 3. Particulate Organic Matter Inputs to a 135 km Reach of the New River

Source	Input, (T AFDW/yr)	Percent of total input
Allochthonous		
Upstream and tributary	5,893	53.8
Within study area	64	0.5
Autochthonous		
Periphyton	3,570	32.6
Aquatic macrophytes	1,435	13.1
Total POM input	10,962	

Table 4. Breakdown Rates, Sample Size (n), and Coefficient of Determination (r^2) for Five Species of Aquatic Macrophytes in the New River

Species	n	Breakdown rate*	r^2
Podostemum ceratophyllum	26	0.037 ± 0.009	0.74
Elodea canadensis	28	0.026 ± 0.004	0.84
Potamogeton crispus	28	0.021 ± 0.007	0.59
Justicia americana	28	0.016 ± 0.003	0.79
Typha latifolia	28	0.007 ± 0.002	0.64

*Values are rate/d ± SE.

Breakdown of Aquatic Macrophytes

The rate at which aquatic macrophyte organic matter was broken down was measured by the loss of weight from litter bags. Two to five g (air-dried weight) of five species of aquatic macrophytes (*P. ceratophyllum, J. americana, Typha latifolia* L., *P. crispus,* and *Elodea canadensis* Michx.) were placed in nylon mesh bags (15 by 15 cm, with 3-mm octagonal openings). Five bags of each species were placed between two layers of wire mesh to hold the samples to the river bed. Six sets of samples were anchored at each of four sites, and one set was returned immediately to the laboratory to determine handling loss. The others were removed after 2 days and 1, 2, 4, 6, and 8 weeks. Retrieved samples were air-dried, weighed, ashed, and reweighed to determine loss of AFDW. Breakdown rate coefficients were calculated by using linear regression of log-transformed data (Jenny et al., 1949; Olson, 1963). Analysis of covariance (Sokal and Rohlf, 1969) was used to compare breakdown rates.

RESULTS

Aerial photography indicated that aquatic macrophytes covered about 27% (590 ha) of the New River study area. *Podostemum ceratophyllum*, the dominant aquatic macrophyte in the New River, accounted for 25% of the macrophyte cover. Other species measured were *T. latifolia* (1.4%), *J. americana* (0.9%), *P. crispus* (0.03%), and *E. canadensis* (0.03%). Of these species, only *P. ceratophyllum* and *E. canadensis* occurred throughout the study area. *Justicia* and *P. crispus* were restricted to the hardwater section of the river, and *T. latifolia* occurred mostly in two small impounded areas.

Aquatic macrophyte biomass increased rapidly from late spring to midsummer and then appeared to level off (Table 1). Average production rates were: *J. americana*, 23.3 g AFDW m^{-2} day^{-1} (4.7 g AFDW m^{-2} day^{-1} for aboveground biomass only); *P. ceratophyllum*, 3.4 g AFDW m^{-2} day^{-1}; and *P. crispus*, 2.9 g AFDW m^{-2} day^{-1}. Maximum standing crops of these three species were 2500 (450 aboveground), 320, and 300 g AFDW/m^2, respectively. Standing crops for *T. latifolia* and *E. canadensis* were estimated from reported values (McNaughton, 1966; Sculthorpe, 1967; Klopatek and Stearns, 1978) as 2800 (500 aboveground) and 300 g AFDW/m^2, respectively.

The contribution of each macrophyte species to the New River study area was estimated by multiplying the area of coverage by growing season aboveground production or maximum standing crop (*T. latifolia* and *E. canadensis*) (Table 2). Belowground production of *J. americana* and *T. latifolia* was estimated by assuming a belowground biomass turnover of 4.5 years, a rate midway between the values suggested by Westlake (1965) and Sculthorpe (1967). The values in Table 2 can only be considered approximate, especially those for *J. americana* and *T. latifolia*, because of our lack of knowledge concerning belowground dynamics. Because of its wide distribution in the New River, *P. ceratophyllum* was the greatest source of aquatic macrophyte POM, contributing 80% of the macrophyte input. This was followed by *J. americana* (12%), *T. latifolia* (7.7%), *P. crispus* (< 1%), and *E. canadensis* (< 1%) (from Table 2).

Annual periphyton production averaged 0.60 g AFDW m^{-2} day^{-1} (Rodgers, 1977). Extrapolating this value to our study area yielded an estimated organic matter input from this source of 3570 T/year, or roughly twice that of aquatic macrophytes. Upstream and tributary litterfall inputs were estimated to be 5893 T/year, and in situ allochthonous input contributed 64 T/year to our study area (Table 3).

Breakdown of aquatic macrophytes proceeded rapidly at all sites. Weight loss from litter bags was greatest for *P. ceratophyllum*. Since there were no overall site effects ($p < 0.05$), all sites were combined to give an average breakdown rate for each species (Table 4).

DISCUSSION

From our estimates, aquatic macrophytes account for at least 13.1% of the total input of particulate organic matter to our study area on the New River (Table 2). They are responsible for nearly one-third (28%) of the POM generated within the study reach, however (autochthonous production plus direct riparian inputs). We feel that the latter number is more significant for two reasons. First, our estimate of upstream and tributary inputs is an overestimate because it assumes no instream utilization. A large portion of the POM entering the New River upstream of our study area is, in fact, used before it enteres the study area. Second, the material entering from upstream is low quality, partly because of upstream processing but also because terrestrial leaves generally have lower quality than aquatic macrophyte tissue. Because aquatic macrophytes consist mostly of cellulose and other easily degraded compounds, with little lignin (Sculthorpe, 1967), they break down rapidly (Table 4) in comparison with terrestrial leaves (e.g., Petersen and Cummins, 1974).

The timing of the availability of aquatic macrophytes to aquatic food chains is the key to their importance in the energy dynamics of mid-sized streams. Since aquatic macrophytes are not generally used while living, biomass accumulates through the growing season. In autumn, when the plants die, this material is released as a pulse that is rapidly used by aquatic detritivores. Periphyton production occurs throughout spring, summer, and early fall and probably is the most important trophic base during this period. Allochthonous leaf input occurs in fall and is used by detritivores after a period of conditioning (e.g., Barlocher and Kendrick, 1975). Because some leaves condition and breakdown rapidly and others condition and breakdown slowly, there is a continuum of leaf availability lasting through winter and spring (Petersen and Cummins, 1974).

Vannote et al. (1980) speculated that natural stream ecosystems should tend toward a temporal uniformity of energy flow. In this regard Fisher and Carpenter (1976) and Hill (1979) suggested that the autumn pulse of aquatic macrophyte detritus may be the major energy source during the period when periphyton production is decreasing with decreasing insolation and before allochthonous litter input has become important.

Therefore the role of aquatic macrophytes in rivers should be viewed not only with respect to their organic matter pool or annual production but also with respect to the temporal aspects of stream energy budgets.

REFERENCES

Barlocher, F., and B. Kendrick, 1975, Leaf-Conditioning by Microorganisms, *Oecologia,* 20: 359-362.

Cummins, K. W., 1974, Structure and Function of Stream Ecosystems, *BioScience,* 24: 631-641.

Fisher, S. G., and S. R. Carpenter, 1976, Ecosystem and Macrophyte Primary Productivity of the Fort River, Massachusetts, *Hydrobiologia,* 47: 175-187.

Gasith, A., and A. D. Hasler, 1976, Airborn Litterfall as a Source of Organic Matter in Lakes, *Limnol. Oceanogr.,* 21: 253-258.

Godshalk, G. L., and R. G. Wetzel, 1978, Decomposition of Aquatic Angiosperms. II. Particulate Components, *Aquat. Bot.,* 5: 301-327.

Hill, B. H., 1979, Uptake and Release of Nutrients by Aquatic Macrophytes, *Aquat. Bot.,* 7: 87-93.

——, 1981, Organic Matter Inputs to Stream Ecosystems: Contributions of Aquatic Macrophytes to the New River, Ph. D. Thesis, Virginia Polytechnic Institute and State University, Blacksburg.

Hynes, H. B. N., 1970, *The Ecology of Running Waters,* University of Toronto Press, Toronto.

——, 1975, The Stream and Its Valley, *Verh. Internat. Verein. Limnol.,* 19: 1-15.

Jenny, H., S. P. Gessel, and F. T. Bingham, 1949, Comparative Study of Decomposition Rates of Organic Matter in Temperate and Tropical Regions, *Soil Sci.,* 68: 419-432.

Kanawha River Basin Coordinating Committee, 1971, *Kanawha River Comprehensive Basin Study.* Vol. I, Main Report, U. S. Department of Agriculture, Washington, DC.

King, D. L., and R. C. Ball, 1967, Comparative Energetics of Polluted Streams, *Limnol. Oceanogr.,* 12: 27-33.

Klopatek, J. M, and F. W. Stearns, 1978, Primary Productivity of Emergent Macrophytes in a Wisconsin Freshwater Marsh Ecosystem, *Am. Midl. Nat.,* 100: 320-332.

Mann, K. H., R. H. Britton, A. Kowalczewski, J. J. Lack, C. P. Matthews, and I. McDonald, 1972, Productivity and Energy Flow at all Trophic Levels in the River Thames, England, in Z. Kajak and A. Hillbrict-Ilkowska (Eds.), *Productivity Problems of Freshwaters,* IBP/UNESCO Symposium, pp. 579-596, PWN Polish Scientific Publishers, Warszawa-Krakow.

McNaughton, S. J., 1966, Ecotype Function in the Typha Community Type, *Ecol. Monogr.,* 36: 297-325.

Meyer, M. P., and P. G. Grumstrup, 1978, *Operating Manual for the Montana 35 mm Aerial Photography System,* Sec. Rev., Remote Sensing Laboratory, College of Forestry and Agricultural Experiment Station, University of Minnesota, St. Paul.

Minshall, G. W., 1978, Autotrophy in Stream Ecosystems, *BioScience,* 28: 767-771.

Newbern, L. A., J. R. Webster, E. F. Benfield, and J. H. Kennedy 1981, Organic Matter Transport in an Appalachian Mountain River, Virginia, U.S.A., *Hydrobiologia,* 83: 73-83.

Odum, H. T., 1957, Trophic Structure and Productivity of Silver Springs, Florida, *Ecol. Monogr.,* 27: 55-112.

Olson, J. S., 1963, Energy Storage and the Balance Between Producers and Decomposers in Ecological Systems, *Ecology,* 44: 322-332.

Petersen, R. C., and K. W. Cummins, 1974, Leaf Processing in a Woodland Stream, *Freshwater Biol.,* 4: 343-368.

Rodgers, J. H., 1977, Aufwuchs Communities of Lotic Systems—Nontaxonomic Structure and Function, Ph.D. Thesis, Virginia Polytechnic Institute and State University, Blacksburg.

Sculthorpe, C. D., 1967, *The Biology of Aquatic Vascular Plants,* Edward Arnold, Ltd., London.

Sokal, R. R., and F. J. Rohlf, 1969, *Biometry,* W. H. Freeman and Co., San Francisco.

Vannote, R. L., G. W. Minshall, K. W. Cummins, J. R. Sedell, and C. E. Cushing, 1980, The River Continuum Concept, *Can. J. Fish. Aquat. Sci.,* 37: 130-137.

Webster, J. R., E. F. Benfield, and J. Cairns, Jr., 1979, Model Predictions of Effects of Impoundment on Particulate Organic Matter Transport in a River System, in J. V. Ward and J. A. Stanford (Eds.), *The Ecology of Regulated Streams,* pp. 339-364, Plenum Press, New York.

Westlake, D. F., 1965, Some Basic Data for the Investigation of the Productivity of Aquatic Vascular Plants, *Mem. Ist. Ital. Idrobiol.,* 18: 229-248.

———, H. Casey, H. Dawson, M. Ladle, R. K. H. Mann, and A. F. H. Marker, 1972, The Chalk Stream Ecosystem, in Z. Kajak and A. Hillbrict-Ilkowska (Eds.), *Productivity Problems of Freshwater,* IBP/UNESCO Symposium, pp. 615-635, PWN Polish Scientific Publishers, Warszawa-Krakow.

Wetzel, R. G., 1975a, Primary production, in B. A. Whitton (Ed.), *River Ecology,* pp. 230-247, University of California Press, Berkeley.

———, 1975b, *Limnology,* W. B. Saunders Co., Philadelphia.

230 Collingwood, P.O. Box 1425, Ann Arbor, Michigan 48106

Library of Congress Catalog Card Number 82-048641
ISBN 0-250-40612-8

Manufactured in the United States of America

Butterworths, Ltd., Borough Green, Sevenoaks
Kent TN15 8PH, England

Periphyton production in an Appalachian river

B. H. Hill* & J. R. Webster
Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, U.S.A.
** Present address: Graduate Program in Environmental Sciences, University of Texas at Dallas, P.O. Box 688, Richardson, TX 75080, U.S.A.*

Keywords: periphyton production, ^{14}C uptake, stream production, HCO_3^- utilization, organic matter budgets

Abstract

Periphyton primary production was measured by ^{14}C uptake on natural substrates in two sections of the New River, Virginia, U.S.A. Production ranged from 6.71 ± 0.43 mg C g^{-1} h^{-1} in summer to 1.47 ± 0.22 mg C g^{-1} h^{-1} in late autumn in the hardwater reach and from 1.90 ± 0.10 mg C g^{-1} h^{-1} to 0.12 ± 0.08 mg C g^{-1} h^{-1} in the softwater reach. Production in the hardwater reach was 3–5 times greater than in the softwater reach and significantly correlated with dissolved inorganic carbon (DIC) concentration ($r^2 = 0.506$). No significant correlation was found between periphyton production and photosynthetically active radiation (PhAR). Extrapolation of periphyton production to a 135 km reach of the New River yielded an estimated annual input of 2 252 T AFDW from this source. Estimates of allochthonous (excluding upstream contributions) and aquatic macrophyte inputs to this same reach were 64 T AFDW and 2 001 T AFDW, respectively. While periphyton is not a large source of organic matter, its high food quality and digestibility make it an important component of the New River energy dynamics.

Introduction

While it is widely accepted that most stream ecosystems are heterotrophic, considerable autotrophic production can occur in some streams (e.g., Minshall 1978). Periphyton, generally the most abundant primary producer in stream ecosystems, is often ignored by stream ecologists studying organic matter dynamics. Wetzel (1975a) pointed out the error in this judgement and stated that studies of detritus based ecosystems must also include autochthonous production, as well as allochthonous production, to accurately reflect stream energy budgets.

Rivers of the Appalachian region are usually wide, shallow streams flowing over stable bedrock. Such conditions support high periphyton production. There have been few periphyton production studies of mid-order (4–6 order) streams (e.g., McConnell & Sigler 1959; Duffer & Dorris 1966; King & Ball 1966; Thomas & O'Connell 1966; Flemer 1974), and all have used either biomass accumulation on artificial substrates or gas exchange methods to determine production. Both methods have considerable limitations (Wetzel 1975a). Measurement of ^{14}C uptake by periphyton enclosed in recirculating chambers has greatly improved primary production studies, particularly in systems of low productivity (Hornick *et al.* 1981).

The present study was undertaken to estimate periphyton production in softwater and relatively hardwater reaches of a mid-sized river ecosystem and to extrapolate production data to yield an annual estimate of periphyton inputs to this ecosystem.

Methods

The New River originates in the Appalachian

Hydrobiologia 97, 275–280 (1982). 0018-8158/82/0973/$01.20.

highlands of northwestern North Carolina, U.S.A., and flows northward through southwestern Virginia and West Virginia to join the Ohio River. The river is characterized by a steep gradient, swift flow, a wide, shallow, bedrock channel, and a narrow floodplain. The river flows over two geologic formations, gneiss and limestone/dolomite, which divide the river into softwater and relatively hardwater (14.8 and 44.2 mg $CaCO_3$ l^{-1}, respectively, Klarberg 1977) reaches. The section of the New River considered in this study extends from the confluence of the North and South Forks of the New River in North Carolina, where the river becomes sixth-order, downstream 135 km to the head of Claytor Lake, Virginia (Fig. 1).

Four sites were located within the overall study area, two each in the soft and hardwater reaches. Site 1, located near the downstream edge of the study area, is characterized by hardwater, sand and bedrock substrate, 175 m wide channel, and average depth of about 1.5 m during non-storm flows. Most periphyton at this site was located in a bedrock riffle with depths less than 0.5 m. Site 2, also located in the hardwater reach, has a bedrock and sand substrate, 200 m wide channel, and water depth less than 0.5 m. This site is dominated by a

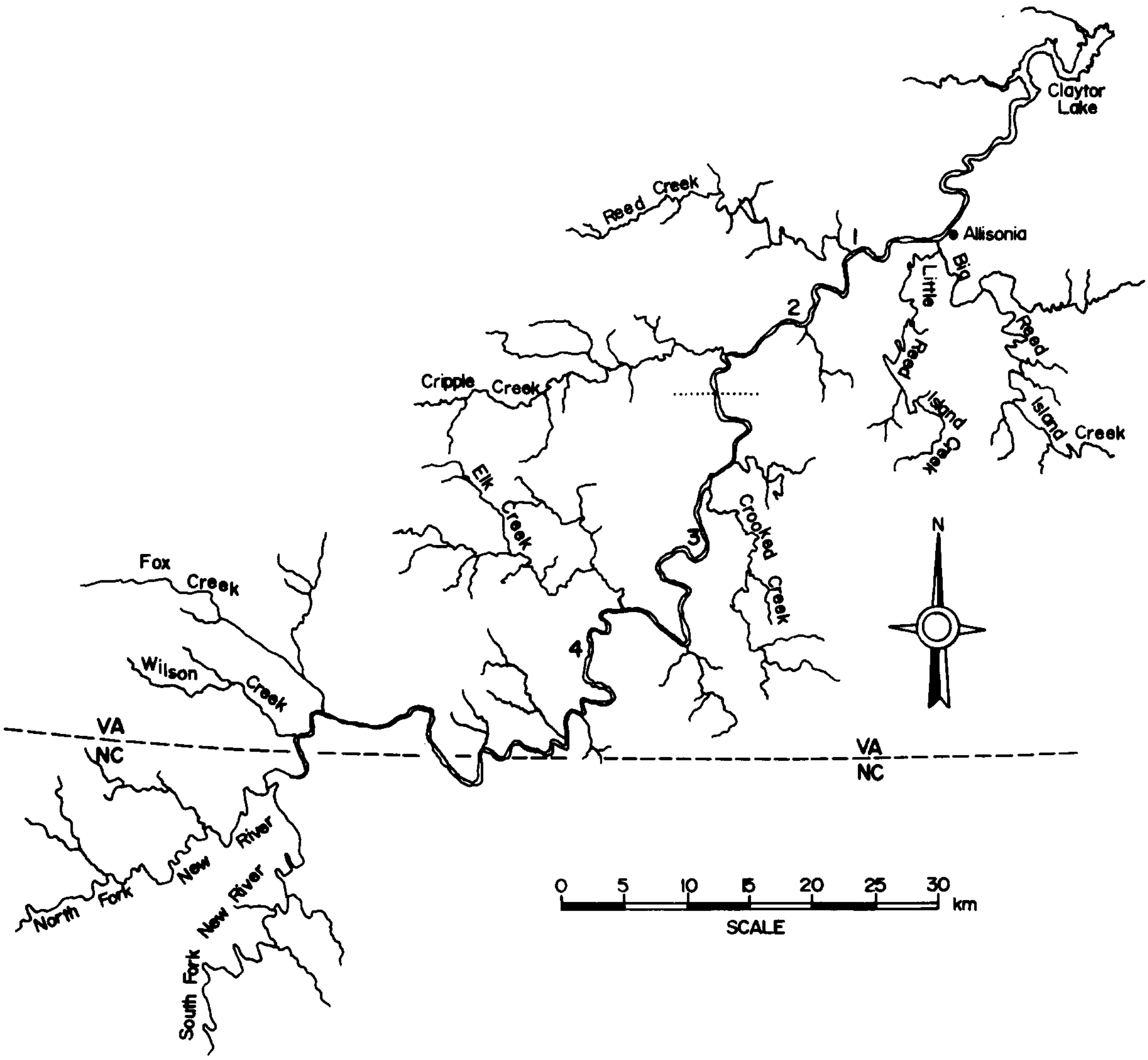


Fig. 1. Map of the New River showing sampling sites and change from softwater to hardwater reaches (dotted line in center of figure).

large bedrock riffle. Site 3, located in the softwater reach, is characterized by bedrock substrate, channel width of 100 m, and an average depth of 0.5 m. Site 4, also located in the softwater reach, has a sand/cobble substrate and an average depth of 0.5 m. Average channel width for the New River study area is 167 m. Water depth averages about 0.5 m.

Periphyton (used here to mean epilithic algae) production at the four sites was measured as ^{14}C uptake by enclosed natural substrates. Measurements were taken twice monthly from June through early November 1980. Randomly selected rock substrates, with periphyton attached, were placed in 1.9 liter, recirculating (battery powered submersible pumps, 300 ml min^{-1}), polystyrene chambers (Hornick *et al.* 1981). The chambers were filled with river water, sealed, and placed in the river at the approximate depth from which the rocks were taken (usually 0.25–0.50 m). Ninety minute, midday incubations were initiated by injecting 5 μCi ^{14}C-sodium bicarbonate into the chambers. Following the incubations, substrates were removed from the chambers, placed in plastic bags, packed on ice, and returned to the laboratory for processing. Depletion of ^{14}C within the chambers was checked by withdrawal of 1 ml samples of chamber water which were transferred to scintillation cocktail. In no instance was ^{14}C depleted within the chambers.

In the laboratory, three 7 cm^2 periphyton subsamples were scraped from each substrate from an area contained by a foam-bottomed cylinder (Hornick *et al.* 1981). Loosened material from two of the scrapings was washed into 7 ml shell vials and fumed with concentrated HCl in a 100 °C water bath to eliminate residual labelled inorganic carbon (Wetzel 1965). Samples were wet oxidized with cold potassium dichromate (Shimshi 1969), and evolved $^{14}CO_2$ was trapped in 0.25 N NaOH and transferred to Aquasol scintillation cocktail. Oxidation efficiency, checked by oxidation of benzoic acid of known activity, was 85%. Counting efficiency, measured by the external channels ratio method and by internal standards, was 96%. Production rate of the samples was calculated using the formula of Vollenweider (1974). Loosened material from the third scraping was dried, weighed, ashed (525 °C, 30 min), and reweighed to determine ash free dry weight (AFDW) of the samples.

Temperature, pH, and alkalinity (titration with 0.2 N H_2SO_4, methyl purple endpoint, 4.5 pH) of river water were determined on each sampling date to estimate dissolved inorganic carbon (DIC). Photosynthetically active radiation (PhAR, 390–710 nm) was measured on eight dates during the study period using a PhAR quantum sensor.

Results

Periphyton production in the New River increased at most sites until late August or early September before declining sharply in the November samples (Fig. 2 and Table 1). Average summer production ($\pm$SE) was: Site 1, 4.17 $\pm$ 0.95 mg C g^{-1} h^{-1} Site 2, 6.35 $\pm$ 0.97 mg C g^{-1} h^{-1} Site 3, 1.22 $\pm$ 0.20 mg C g^{-1} h^{-1} Site 4, 1.16 $\pm$ 0.17 mg C g^{-1} h^{-1}. Production was generally 3–5 times greater in the hardwater reach of the New River.

Abiotic variables potentially affecting New River periphyton production are given in Table 2. Temperature, PhAR, and pH were similar in both the softwater and hardwater reaches of the New River. Alkalinity, and thus DIC, showed marked differences between the two reaches, with values in the hardwater reach averaging 5 times those of the softwater reach. Average nitrogen and phosphorus concentrations were 1.22 mg NO_3-N l^{-1} and 0.071 mg PO_4-P l^{-1}, respectively (Wright 1976). While Wright (1976) showed that New River periphyton was nutrient limited in static, 6-hour incubations, the constant replenishment of waters containing these concentrations of nitrogen and phosphorus precludes the possibility of limitation

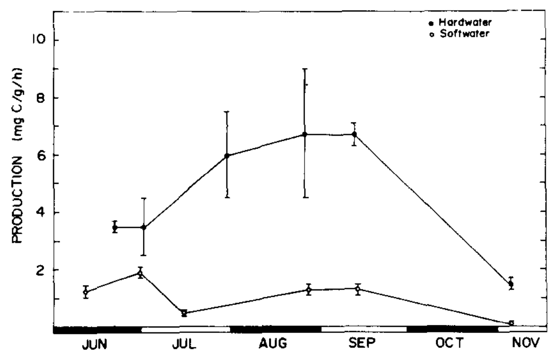


Fig. 2. Periphyton production, as ^{14}C uptake, in the River during 1980. Sites 1 and 2, and 3 and 4 were combined to yield hardwater and softwater estimates, respectively.

Table 1. Periphyton production in the New River during the 1980 sampling season (mg C/g/h) (±SE).

Date	Site 1	Site 2	Site 3	Site 4
11, 21 June	1.41 ± 0.10	5.54 ± 3.56	0.92 ± 0.28	1.54 ± 0.17
1, 2 July	1.73 ± 0.28	5.27 ± 0.05	1.90 ± 0.10	
17 July			0.51 ± 0.15	0.60 ± 0.02
30 July	8.60 ± 0.59	3.31 ± 0.40		
26, 27 Aug.	10.51 ± 0.55	2.83 ± 0.22	1.52 ± 0.42	1.08 ± 0.28
12, 13 Sept.	7.12 ± 0.65	6.31 ± 0.60	1.64 ± 0.41	0.99 ± 0.28
5, 6 Nov.	1.85 ± 0.02	1.10 ± 0.13	0.12 ± 0.01	0.13 ± 0.01

Table 2. Abiotic variables affecting periphyton production in the New River (June–September 1980).

Variable	Mean ± SE	Range	n
pH			
softwater	7.5 ± 0.2	7.0–7.8	11
hardwater	7.7 ± 0.4	7.2–8.2	13
Alkalinity (mg $CaCO_3$/l)			
softwater	7.5 ± 0.8	6.0–0.8	11
hardwater	37.3 ± 2.8	34.0–42.0	13
Dissolved inorganic carbon (mg/l)			
softwater	2.0 ± 0.2	1.5–2.3	11
hardwater	9.5 ± 0.9	8.2–11.3	13
Temperature (°C)	24.8 ± 2.0	20.0–30.0	24
PhAR (μEin/m^2/s)	1830.2 ± 334.5	1078.1–2222.5	24

of periphyton production due to macronutrient deficiencies.

Product moment correlations (Sokal & Rohlf 1974) were significant (t-test, $p < 0.05$) for comparisons of production and DIC (Fig. 3), alkalinity, and temperature. No significant correlations (t-test, $p > 0.05$) were found for comparisons of pH and PhAR with productivity.

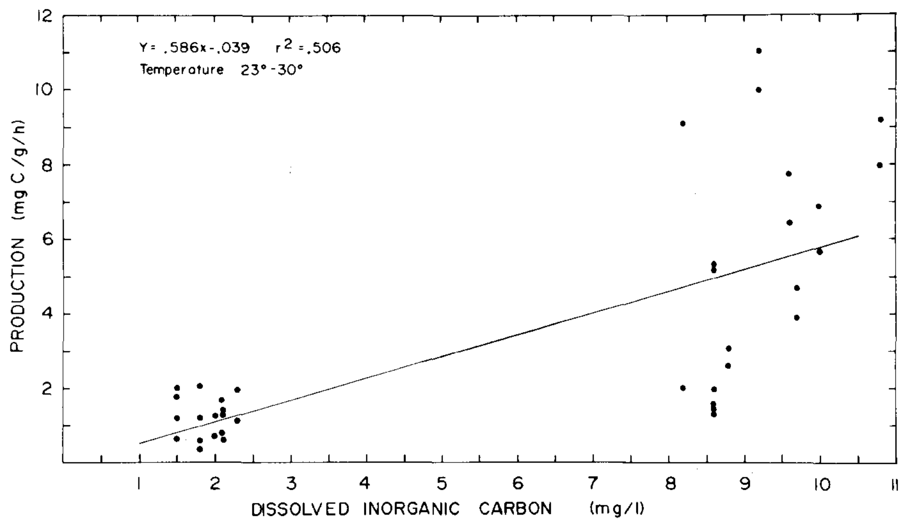


Fig. 3. Periphyton production in response to available dissolved inorganic carbon in the New River during 1980.

Discussion

Periphyton production in the New River is divided into two distinct productivity classes which correlate significantly with DIC. The relationship between DIC and primary production in lakes has long been recognized (e.g., Birge & Juday 1911), but has received little attention from stream ecologists. Wright & Mills (1967) found increased net photosynthesis with increased free CO_2 in a stream community dominated by aquatic macrophytes. The phenomenon of increased secondary production in hardwater streams is well documented (e.g., Hynes 1970). Availability of DIC in the New River is related to the geology of the underlying bedrock. In the upstream, softwater reach of the river, DIC is about 5 times less than in the hardwater reach and this is reflected by production which is about 5 times less than concomitant rates in the hardwater reach. Since labelled bicarbonate was not depleted within the production chambers, the limited production of the softwater periphyton suggest that New River periphyton may be unable to use HCO_3^-, and use only dissolved CO_2, as a carbon source in photosynthesis. Limitation due to CO_2 depletion appears to be the result of photosynthetic uptake of CO_2 occurring faster than dehydroxylation of HCO_3^- to CO_2 (Gavis & Ferguson 1975; Burris *et al.* 1981). This is particularly a problem at higher pH where the chemical equilibrium of inorganic carbon species is shifted towards HCO_3^- (Wetzel 1975). At the near neutral to slightly alkaline pH of the New River, dissolved CO_2 appears to be dependent on the size of the HCO_3^- pool, as well as the rate of dehydroxylation of HCO_3^- to CO_2, and explains the greater periphyton production in the hardwater reach.

Use of ^{14}C to measure primary production is widely accepted, though the argument over whether the method measures gross or net primary production is unresolved. Most investigators (e.g., Wetzel 1975a; Petersen 1980) agree that ^{14}C uptake is close to net primary production in incubations less than several hours. Use of the ^{14}C method for periphyton production in the New River (9.3–1,059.0 mg C m^{-2} d^{-1}) gave rates similar to those reported for some stream ecosystems (Wetzel 1975a; Fisher & Carpenter 1976; Hornick *et al.* 1981) though somewhat lower than rates reported for most rivers (King & Ball 1966; Flemer 1974; Duffer & Dorris 1966; Berrie 1972; Thomas & O'Connell 1966; McConnell & Sigler 1959; Cushing 1967). The lower periphyton production in New River, compared to the rivers sited above, may be due to differences in levels of nutrient enrichment, for example the Red Cedar River (King & Ball 1966) is highly enriched, or to differences in site conditions or methods.

Average annual periphyton production in the New River was determined from production measurements for June through November 1980. Periphyton production from December through May was estimated by extrapolating between November and June values. Extrapolation of average annual periphyton production, weighted for production in the softwater (70% of the study area) and hardwater reaches, was based on an average width of 167 m throughout the 135 km study area. Estimated periphyton net primary production input to the New River was 2251.9 T AFDW (825.5 T from the softwater reach, 1423.4 T from the hardwater reach) to the New River. This estimate assumes 100% periphyton cover in all areas not inhabited by aquatic macrophytes (Hill & Webster 1982), an assumption that is reasonable in light of the shallow mean depth of the New River. However, the occurrence of large sandy areas would decrease annual input from periphyton because of reduced substrate available for periphyton colonization.

We can compare this estimate of periphyton input to the 135 km reach of the New River with estimates for other sources. Hill (1981) estimated aquatic macrophyte production by the harvest method for emergent macrophytes and by ^{14}C uptake for submerged macrophytes. Allochthonous input was estimated by measuring leaffall from riparian vegetation (Hill 1981) and includes only input directly to the study reach, not transport from tributaries or upstream. Periphyton input to the New River was 19.5% of total inputs, aquatic macrophyte and allochthonous input represented 20.5% and 60.4%, respectively (Hill 1981). It has been suggested that, while periphyton POM input and production is small in stream ecosystems, it is higher in food quality and digestibility than allochthonous POM (McCollough *et al.* 1979a, 1979b; Naiman & Sedell 1979; Ward & Cummins 1979; Benke & Wallace 1980; Hornick *et al.* 1981). While this input of organic matter is smaller than estimated allochthonous organic matter inputs, its high food quality and digestibility make it an important component of the New River organic matter dynamics.

References

Berrie, A. D., 1972. Productivity of the River Thames at Reading. In: Edwards, R. W. & Garrod, D. J. (eds.) Conservation and Productivity of Natural Waters, pp. 69-86. Symp. Zool. Soc., London.

Birge, E. A. & Juday, C., 1911. The inland lakes of Wisconsin. The dissolved gases of the water and their biological significance. Bull. Wis. geol. nat. Hist. Surv. 22: 1-259.

Burris, J. E., Wedge, R. & Lane, A., 1981. Carbon dioxide limitation of photosynthesis of freshwater phytoplankton. J. freshwat. Ecol. 1: 81-96.

Cummins, K. W. & Wuycheck, J. C., 1971. Caloric equivalents for investigations in ecological energetics. Mitt. int. Verein. Limnol. 18: 1-158.

Cushing, C. E., 1967. Periphyton productivity and radionuclide accumulation in the Columbia River, Washington. Hydrobiologia 24: 125-139.

Duffer, W. R. & Dorris, T. C., 1966. Primary productivity in a southern great plains stream. Limnol. Oceanogr. 11: 143-151.

Fisher, S. G. & Carpenter, S. R., 1976. Ecosystem and macrophyte primary production in the Fort River, Massachusetts. Hydrobiologia 47: 175-187.

Flemer, D. A., 1974. Primary productivity in the North Branch of the Raritan River, New Jersey. Hydrobiologia 35: 273-293.

Gavis, J. & Ferguson, J. F., 1975. Kinetics of carbon dioxide uptake by phytoplankton and high pH. Limnol. Oceanogr. 20: 211-221.

Hill, B. H., 1981. Organic matter inputs to stream ecosystems: contributions of aquatic macrophytes to the New River. Ph.D. Thessis, Virginia Polytechnic Institute and State University, Blacksburg. 149 pp.

Hill, B. H. & Webster, J. R., 1982. Aquatic macrophyte contribution to the New River organic matter budget, pp. 273-282. In: (Bartell, S. M. & Fontaine, T. D., III (eds.) Dynamics of Lotic Ecosystems. Symposium, Savannah River Ecology Laboratory, Augusta, Georgia.

Hornick, L. E., Webster, J. R. & Benfield, E. F., 1981. Periphyton production in an Appalachian mountain trout stream. Am. Midl. Nat. 106: 22-36.

Hynes, H. B. N., 1970. The Ecology of Running Waters, University of Toronto Press, Toronto.

King, D. L. & Ball, R. C., 1966. A qualitative and quantitative measure of aufwuchs production. Trans. Am. microsc. Soc. 85: 232-240.

Klarberg, D. P., 1977. Investigations of the macrobenthos and physicochemistry of the upper New River basin. Ph.D. Thesis, Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg. 464 pp.

McConnell, W. J. & Sigler, W. F., 1959. Chlorophyll and productivity in a mountain river. Limnol. Oceanogr. 4: 335-351.

McCollough, D. A., Minshall, G. W. & Cushing, C. E., 1979a. Bioenergetics of lotic filter-feeding insects Simulium spp. (Diptera) and Hydropsyche occidentalis (Tricoptera) and their function in controlling organic transport in streams. Ecology 60: 585-596.

McCollough, D. A., Minshall, G. W. & Cushing, C. E., 1979b. Bioenergetics of a stream collector organism, Tricorythodes minutes (Insecta: Ephemeroptera) Limnol. Oceanogr. 24: 45-58.

Naiman, R. J. & Sedell, J. R., 1979. Characterization of particulate organic matter transport by some Cascade Mountain streams. J. Fish. Res. Bd Can. 36: 17-31.

Petersen, B. J., 1980. Aquatic primary productivity and the ^{14}C-CO_2 method: a history of the productivity problem. Ann. Rev. Ecol. Syst. 11: 359-385.

Shimshi, D., 1969. A rapid field method for measuring photosynthesis with labelled carbon dioxide. J. exp. Bot. 20: 381-401.

Sokal, R. R. & Rohlf, F. J., 1974. Biometry. Freeman, W. H., San Francisco.

Thomas, N. A. & O'Connell, R. L., 1966. A method for measuring primary production by stream benthos. Limnol. Oceanogr. 11: 386-392.

Vollenweider, R. A. (ed.), 1974. A Manual of Method for Measuring Primary Production in Aquatic Environments, IBP Handbook No. 12, 2nd edn., Blackwell, Oxford. 285 pp.

Ward, G. M. & Cummins, K. W., 1979. Effects of food quality on growth of a stream detritivore, Paratendipes albimanus (Meigen) (Diptera: Chironomidae). Ecology 60: 57-64.

Wetzel, R. G., 1965. Necessity of decontamination of filters in ^{14}C measured rates of photosynthesis in freshwaters. Ecology 56: 540-541.

Wetzel, R. G., 1975a. Primary production. In: Whitton, B. A. (ed.) River Ecology, Univ. of Calif. Press, Berkeley.

Wetzel, R. G., 1975b. Limnology. Saunders, W. B., Philadelphia. 743 pp.

Wright, J. C. & Mills, J. K., 1967. Productivity studies of the Madison River, Yellowstone National Park. Limnol. Oceanogr. 12: 568-577.

Wright. J. R., 1976. Chemical limnology, algal growth potential, and nutrient limiting factors of the upper New River, and predictions concerning trophic status for the proposed Blue Ridge reservoirs. Ph.D. Thesis, Dept. of Biology, Virginia Polytechnic Institute and State University, Blacksburg.

Received 6 October 1981.

American Journal of Botany

Productivity of Podostemum ceratophyllum in the New River, Virginia
Author(s): B. H. Hill and J. R. Webster
Source: *American Journal of Botany*, Vol. 71, No. 1 (Jan., 1984), pp. 130-136
Published by: Botanical Society of America
Stable URL: http://www.jstor.org/stable/2443632

Amer. J. Bot. 71(1): 130–136. 1984.

PRODUCTIVITY OF PODOSTEMUM CERATOPHYLLUM IN THE NEW RIVER, VIRGINIA[1]

B. H. HILL[2] AND J. R. WEBSTER

Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061

ABSTRACT

Productivity of *Podostemum ceratophyllum*, the dominant aquatic macrophyte in the New River, was measured at four sites representing soft- and hardwater reaches of the river. Available dissolved inorganic carbon (DIC) was 4–5 times greater in the hardwater reach. The difference in available DIC was reflected in standing crop and productivity of *P. ceratophyllum*. Maximum standing crops of *P. ceratophyllum* at the two hardwater sites (Sites 1 and 2) were 244.8 ± 30.7 g ash-free dry wt (AFDW) m^{-2} and 193.8 ± 18.7 g AFDW m^{-2} compared to 128.5 ± 14.9 g AFDW m^{-2} and 101.3 ± 6.9 g AFDW m^{-2} for the softwater sites (Sites 3 and 4). Productivity, based on differences in standing crops, was: Site 1, 1.08 ± 0.12 g C m^{-2} d^{-1}; Site 2, 0.86 ± 0.08 g C m^{-2} d^{-1}; Site 3, 0.58 ± 0.06 g C m^{-2} d^{-1}; Site 4, 0.45 ± 0.03 g C m^{-2} d^{-1}. Corresponding values for productivity as ^{14}C uptake were: 2.77 ± 0.44 g C m^{-2} d^{-1}; 2.10 ± 0.45 g C m^{-2} d^{-1}; 0.34 ± 0.04 g C m^{-2} d^{-1}; 0.28 ± 0.03 g C m^{-2} d^{-1}. Productivity/biomass (P/B) based on ^{14}C uptake and standing crop revealed that *P. ceratophyllum* productivity was inhibited at the softwater sites perhaps due to carbon limitation. Because of its abundance and its high productivity, *P. ceratophyllum* is hypothesized to contribute significantly to the New River organic matter budget.

LIKE MANY RIVERS of the Appalachian region, the New River supports a large, productive aquatic macrophyte community. The dominant aquatic macrophyte in the New River is *Podostemum ceratophyllum,* a species well suited to the swift-flowing, shallow, bedrock riffles common to rivers of this region. Because of its abundance, productivity of *P. ceratophyllum* dominates the primary productivity and particulate organic matter (POM) input from aquatic macrophytes to the New River. (Hill and Webster, 1983).

Standing crop and ^{14}C uptake studies of aquatic macrophyte productivity are well documented for lake ecosystems (e.g., Wetzel, 1964a, b; Wetzel and Hough, 1973; Adams and McCracken, 1974; McCracken et al., 1975; Adams, Guilizzoni and Adams, 1978; Adams, Titus, and McCracken, 1974). Aquatic macrophyte productivity, especially as ^{14}C uptake, in lotic ecosystems has received far less attention.

Use of chambers for aquatic macrophyte productivity studies is not meant to mimic field conditions but rather to allow the investigator controlled conditions in the field. However, there are some problems associated with the use of chambers that may obscure the actual productivity of aquatic macrophytes (Wetzel, 1974; Moeller, 1978). Such problems as oxygen accumulation, dissolved inorganic carbon (DIC) depletion, and other environmental changes within the chambers may inhibit photosynthesis of enclosed aquatic macrophytes.

This study was undertaken to compare productivity estimates for *P. ceratophyllum* based on differences in standing crop and ^{14}C uptake and to determine potential POM contribution from *P. ceratophyllum* to the New River. *Podostemum ceratophyllum* Michx. (Podostemaceae: Angiospermae) is a small aquatic plant characteristic of riffles in tropical and subtropical rivers and extending into temperate regions of North America as far north as New Brunswick and Ontario. This plant lacks roots, but attaches itself to substrate with holdfasts, an adaptation which allows the plant to attach to large cobbles, boulders, and bedrock in swift riffles.

The New River originates in the Appalachian highlands of western North Carolina and flows northward through Virginia and West Virginia. The river is characterized by a narrow floodplain, swift flow, and steep gradient. It flows in the channel of the ancient River Teays, reported to be the second oldest river in the world (Janssen, 1953). This ancient channel of exposed bedrock remains relatively free of silt because of the swift flow and is quite shallow for its width. The river passes through two geologic provinces, gneiss and limestone/do-

[1] Received for publication 5 February 1983; revision accepted 24 May 1983.

[2] Present address and author to whom correspondence should be addressed: Environmental Sciences Program, University of Texas at Dallas, P.O. Box 688, Richardson, TX 75080.

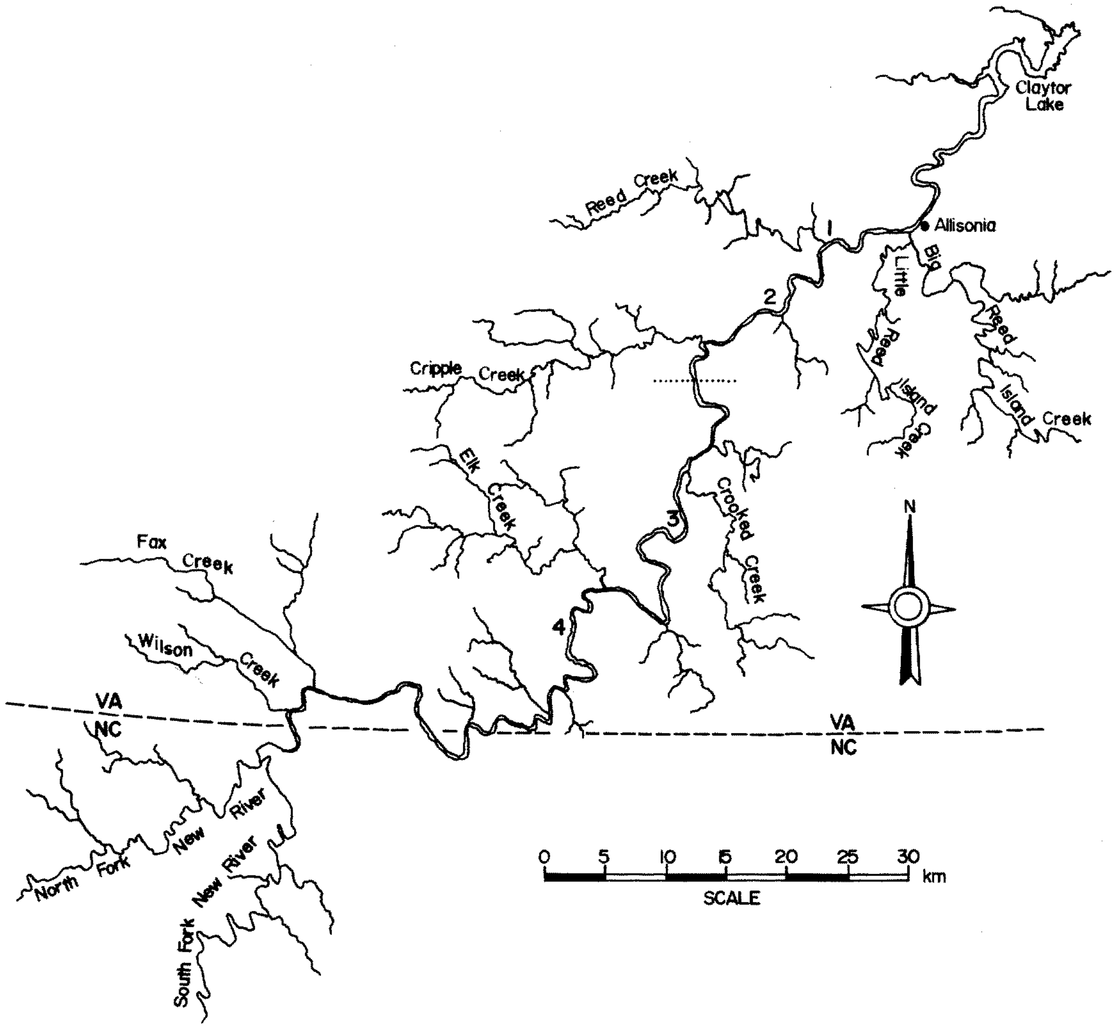


Fig. 1. Map of the New River showing sampling sites and the change from the softwater to hardwater (dotted line in center of figure) regions.

lomite, which divide the river into distinct softwater (upstream) and relatively hardwater (downstream) reaches. The softwater and hardwater reaches represent 66% and 34% of the study area, respectively. The section of the New River considered in this study extends from the confluence of the North and South Forks of the New River in North Carolina, forming a sixth-order stream, downstream 135 km to Allisonia, Virginia, at the head of Claytor Lake (Fig. 1).

Four sites were located within the overall study area, two each in the soft and hardwater reaches of the New River (Fig. 1). Site 1, located near the downstream end of the study area, is characterized by hardwater, sand and bedrock substrate, a 175-m-wide channel, and an average depth of 1.5 m. Most *Podostemum* growth at this site occurred in a bedrock riffle with depths less than 0.5 m. Site 2, also located in the hardwater reach, has a bedrock and sand substrate, 200-m channel width, and water depth less than 0.5 m. This site is dominated by a large bedrock riffle. Site 3, located in the softwater reach, was characterized by bedrock substrate, channel width of 100 m, and an average depth of 0.5 m. Site 4, also located in the softwater reach, has a sand/cobble substrate and an average depth of 0.5 m. Channel width at this site was 100 m. Average channel width and water depth for the New River study area are 167 m and about 0.5 m, respectively.

METHODS—Harvests of *P. ceratophyllum* biomass at the four sites were undertaken at monthly intervals from May through early November 1980. Sampling sites were selected randomly from areas in which the plants occurred. The plant samples were collected by scraping the plant from the rock substrate contained by a 0.10 m^2 box sampler. Replicate samples (n = 5) from each site were returned to the laboratory, air dried (22 C, 5 days), weighed, and subsampled. Subsamples were weighed, ashed (525 C, 30 min), and reweighed to determine ash free dry weight (AFDW).

Carbon-14 uptake by *P. ceratophyllum* was measured at the four sites during the 1980 growing season. Uptake of ^{14}C was measured during replicate (n = 5) 90 minute incubations in recirculating (battery powered submersible pumps, 300 ml min^{-1}), 1.9-l polystyrene chambers (Hornick, Webster and Benfield, 1981). Rock substrates with healthy *P. ceratophyllum* were placed in the chambers, filled with river water, sealed, and placed on the river bed at approximately the depth from which they were removed (about 0.25–0.5 m). Incubations were initiated by injecting 5 μCi $NaH^{14}CO_3$ into each chamber. Following each incubation, but before opening the chambers, 1-ml samples of the water within the chambers were removed with a syringe and transferred to scintillation cocktail to test for inorganic carbon depletion. The chambers were then opened and *P. ceratophyllum* was removed, placed in plastic bags, and packed on ice until returned to the laboratory. In the laboratory, samples were either frozen or processed immediately. Sample processing included removal of three equal subsamples of *P. ceratophyllum* from each rock substrate. One subsample was placed in an aluminum drying pan, air dried, weighed, and ashed to determine AFDW. The two remaining subsamples were placed in shell vials and fumed with concentrated HCl for 1 hour to remove any residual inorganic ^{14}C (Wetzel, 1965). After fuming, samples were frozen then wet oxidized with cold potassium dichromate (Shimshi, 1969), and evolved $^{14}CO_2$ was trapped in 0.25 N NaOH and transferred to the scintillation cocktail for counting. Oxidation efficiency, checked by oxidation of benzoic acid of known activity, was 85%. Counting efficiency, measured by the external channels ratio method and by internal standards, was 96%. Productivity of the samples was calculated using the formula of Vollenweider (1974).

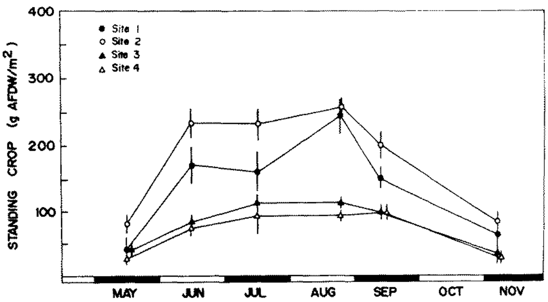


Fig. 2. Standing crop of *Podostemum ceratophyllum* in the New River during 1980. Vertical bars indicate ±SE.

A diurnal productivity curve for *P. ceratophyllum* was determined using a series of 90-min incubations, as above, from before sunrise to after sunset on 12 August 1980, at Site 2.

Temperature, pH, and alkalinity (titration with 0.2 N H_2SO_4, methyl purple endpoint, pH 4.5) of the river water were determined for each site on each sampling date to estimate dissolved inorganic carbon (DIC). Photosynthetically active radiation (PAR 390–710 nm) was measured on site on eight dates during the study period as a check against the PAR data collected on the VPI & SU campus 50 km north of Site 1.

RESULTS—Standing crop of *P. ceratophyllum* increased from mid-May until late August before starting to decline (Fig. 2). Maximum standing crops and productivity of *P. ceratophyllum* are given in Table 1. Productivity of

TABLE 1. *Standing crop and productivity of* Podostemum ceratophyllum *in the New River (±SE). Vertical bars after productivity values indicate no significant differences (P > 0.05) between sites*

Site (Date)	Maximum productivity: Standing crop (g AFDW m^{-2})	Standing crop (g C m^{-2} d^{-1})	^{14}C uptake (g C m^{-2} d^{-1})
1 (27 Aug)	244.8 ± 30.7	1.08 ± 0.12 |	2.77 ± 0.44 |
2 (27 Aug)	193.8 ± 18.7	0.86 ± 0.08 |	2.10 ± 0.45 |
3 (26 Aug)	128.5 ± 14.9	0.58 ± 0.06 |	0.34 ± 0.04 |
4 (26 Aug)	101.3 ± 6.9	0.45 ± 0.03 |	0.28 ± 0.03 |

TABLE 2. *Abiotic variables effecting* Podostemum ceratophyllum *productivity in the New River (June–September 1980)*

Variable	Mean ± SE	Range	*n*
pH			
Softwater	7.5 ± 0.2	7.0–8.0	11
Hardwater	7.7 ± 0.4	7.2–8.2	13
ALKALINITY (mg $CaCO_3$/l)			
Softwater	7.5 ± 0.8	6.0–8.0	11
Hardwater	37.3 ± 2.8	34.0–42.0	13
DISSOLVED INORGANIC CARBON (mg/l)			
Softwater	2.0 ± 0.2	1.5–2.3	11
Hardwater	9.5 ± 0.9	8.2–11.3	13
TEMPERATURE			
(C)	24.8 ± 2.0	20.0–30.0	24
PAR			
(μEin/m²/s)	1830.2 ± 334.5	1078.1–2222.5	24

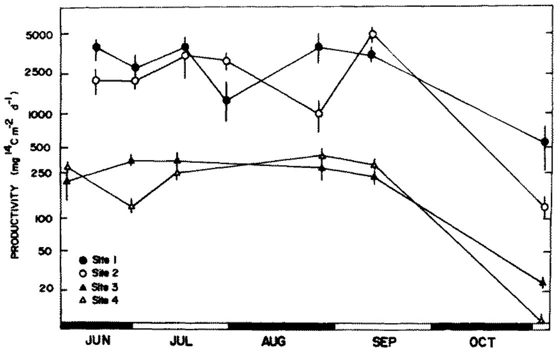


Fig. 3. Production (as ^{14}C uptake) by *Podostemum ceratophyllum* in the New River during 1980. Vertical bars indicate ±SE.

P. ceratophyllum based on ^{14}C uptake was fairly constant from mid-June to early September, but dropped off markedly by early November (Fig. 3). Productivity during August at the four sites is given in Table 1.

Productivity of *P. ceratophyllum* through the course of a day followed typical diurnal productivity patterns closely associated with PAR (Fig. 4), however, there was an absence of an afternoon depression often reported for other aquatic macrophyte species (Wetzel, 1975). Maximum productivity in this study actually occurred in the afternoon. Production followed PAR closely but lagged in response by about 4 hours.

Extrapolation of ^{14}C uptake data to daily values, adjusted for daylength and the diurnal productivity curve, were compared to measured standing crop on four dates between 15 June and 12 September 1980. Ratios of productivity to standing crop biomass (P/B) from the harvest studies ranged from 2.38:1 to 7.88:1 in the hardwater reach and from 0.46:1 to 1.14:1 in the softwater reach. The low values in the softwater samples suggest that some chamber effect, perhaps DIC limitation, caused low estimates of carbon assimilation. Highest P/B were measured in the September samples and reflect the active photosynthesis of healthy tissue and the sloughing of senescent tissue, causing net biomass loss in spite of high productivity. Differences between ^{14}C productivity and biomass productivity estimates make comparison of studies using these methods difficult. The higher productivity estimated by ^{14}C uptake suggests that this method does not measure net primary productivity, but measures rates closer to gross primary productivity. However, productivity based on biomass change appears to underestimate net primary productivity by losses of plant tissue to consumption by grazers and by fragmentation and sloughing.

Average values for pH, alkalinity, DIC, temperature, and PAR are given in Table 2. No differences between softwater and hardwater reaches were found for pH, temperature, or PAR. Significant differences (t-test, $P < 0.05$) were found for DIC and alkalinity between the softwater and hardwater reaches, with values in the hardwater reach 4–5 times greater than in the softwater reach.

Production of *P. ceratophyllum* was tested for significant correlation with the abiotic variables. At the hardwater sites (1 and 2) productivity was significantly correlated (t-test,

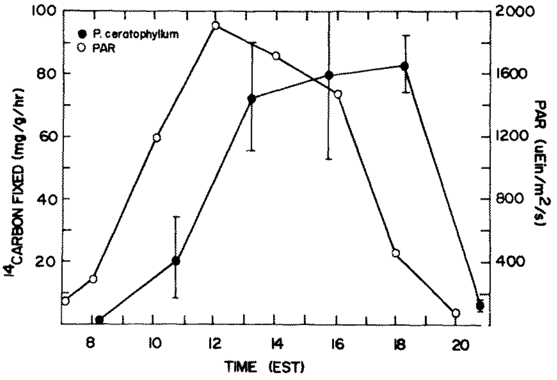


Fig. 4. Diurnal production of *Podostemum ceratophyllum*, and photosynthetically active radiation (PAR) on 28 August 1980 (measured at Site 2) (each point plotted as the mid-point of 90 minute incubations). Vertical bars indicate ±SE.

$P < 0.05$) with alkalinity. Correlations in the softwater reach were significant for PAR. Linear regression of productivity along a DIC gradient showed only a poor response ($r^2 = 0.33$) of *P. ceratophyllum* to increasing DIC availability.

DISCUSSION—Data on *P. ceratophyllum* productivity are found only for studies from the Appalachian region (Nelson and Scott, 1962; Rodgers et al., 1983). Based on differences in standing crops between May and August, productivity of *P. ceratophyllum* in our study ($0.45 \pm 0.03 - 1.8 \pm 0.12$ g C m^{-2} d^{-1}) was 1.9 to 4.6 times greater than estimates of *P. ceratophyllum* productivity (0.235 g C m^{-2} d^{-1}) for the Middle Oconee River, Georgia (Nelson and Scott, 1962). Rodgers et al. (1983) reported changes in *P. ceratophyllum* standing crops for the Watauga River, Tennessee and for the New River, Virginia, at a site 128 km downstream from our study area. Using their data for standing crops in June and September (a period of about 91 days) *P. ceratophyllum* productivity is estimated as 0.40 g C m^{-2} d^{-1} for the Watauga River and 0.05 g C m^{-2} d^{-1} for the New River. These values are 1.1 to 21.6 times lower than the productivity values we are reporting for our study. The extremely low *Podostemum* productivity reported by Rodgers et al. (1983) for the New River is probably due to increased scouring caused by daily pulses of discharge from an upstream hydroelectric dam.

Podostemum productivity is comparable to productivity by other submerged aquatic macrophytes in streams and lakes. Owens and Edwards (1961, 1962) reported productivity of 0.04–2.30 g C m^{-2} d^{-1} for *Ranunculus fluitans, Callitriche* sp., *Potamogeton lucens,* and *P. densus.* Adams and McCracken (1974) reported *Myriophyllum spicatum* productivity as 1.77 g C m^{-2} d^{-1}; Fisher and Carpenter (1976) reported productivity at 0.36 g C m^{-2} d^{-1} for *Potamogeton crispus*; and Hannan and Dorris (1970) reported a productivity of 1.24 g C m^{-2} d^{-1} for a stream community composed of 15 species of submerged macrophytes.

The differential productivity of *P. ceratophyllum* in the soft and hardwater reaches of our study area appears to be in response to water hardness and available DIC. This is not uncommon among aquatic plants (Raven, 1976; Hutchinson, 1975; Adams et al., 1978) and is either attributable to higher concentrations of bicarbonate or greater availability of free CO_2, because of the chemical equilibrium of the different carbon species. At the mean pH of 7.6, the percent of DIC as CO_2 and HCO_3^- is 9.8 and 90.2, respectively (Wetzel, 1975). Thus the difference in DIC, especially to a plant that uses only CO_2 in photosynthesis becomes critical. Since *P. ceratophyllum* uses only free CO_2 (Hill, 1981; Hill, Webster and Linkins, in press), the availability of DIC to the species is reduced from 2.0 to 0.20 mg l^{-1} and 9.5 to 0.93 mg l^{-1} of total inorganic carbon, respectively for the soft and hardwater reaches. Productivity is almost 3 times greater in the hardwater reach, comparable to the differences in DIC. Because of the limiting free CO_2 availability at the softwater sites correlation of *P. ceratophyllum* productivity to free CO_2 was not significant ($r = 0.397$).

Measurement of *P. ceratophyllum* productivity in the New River is complicated by two factors. First, the plant grows in swift-flowing riffles where losses of biomass due to fragmentation and scouring may be considerable. This is reflected by the high P/B ratios in the hardwater reach of the river. Second, the plant appears to use only free CO_2 (Hill, 1981; Hill et al., in press) in photosynthesis, and thus may be carbon limited in the chamber studies of productivity in the softwater reach, as indicated by P/B less than 1.

Estimation of productivity based on biomass changes over time has the inherent weakness of underestimating productivity because of loss of plant tissue due to sloughing, grazing, fragmentation, and/or scouring between sampling times. Underestimation of net productivity because of this error may be considerable if times between sampling are lengthy (Fisher and Carpenter, 1976). P/B ratios are generally near 2 for aquatic macrophytes (Nelson and Scott, 1962; Adams and McCracken, 1974), but were nearer to 4 for *P. ceratophyllum* in the hardwater reach, suggesting that losses of plant tissue from this species, due to scouring and fragmentation, may be considerable.

The inability of *P. ceratophyllum* to use HCO_3^- as an inorganic carbon source (Hill, 1981; Hill et al., in press) is unusual among submerged aquatic angiosperms, but not unexpected of plants growing in riffles (Gessner, 1959; Raven, 1970). While no previous reports of DIC use in *Podostemum* are available, another member of the Podostemaceae, *Apinagia,* has been shown to use only free CO_2 (Gessner, 1959). The inability to use HCO_3^- has been viewed as a competitive disadvantage in hardwater lakes (Moeller, 1978), however, this does not appear to be the case in swift-flowing, turbulent rivers which are well mixed and saturated with CO_2. Aquatic mosses, the typical primary producers in swift-flowing waters, use only free CO_2 (Bain and Proctor, 1980).

Podostemum productivity was, on a per gram basis, lower than similar productivity estimates for periphyton (Hill and Webster, 1982, 1983) and reflects the greater metabolic and turnover rate of periphyton. On an areal basis, production of *P. ceratophyllum*, because of its growth out from the substrate, is as much as 10 times higher than periphyton productivity. Aquatic macrophyte and periphyton contributions to the New River organic matter budget are nearly equal (Hill and Webster, 1983).

It is generally assumed by stream ecologists that aquatic macrophytes play only a minor role in the middle reaches (4–6 orders) of streams, and overall are rarely significant to the entire stream ecosystem (Cummins, 1974; Vannote et al., 1980). Since aquatic macrophytes are not extensively grazed in most ecosystems (Westlake, 1965; Sculthorpe, 1967; Fisher and Carpenter, 1976; Rodgers et al., 1983) biomass accumulates throughout the growing season. Thus maximum aquatic macrophyte standing crop may be an adequate estimate of POM contributions from these plants to stream ecosystems. While the contribution of aquatic macrophytes to stream energy budgets may be small, it has been hypothesized that the timing of this POM input may make them an important link in the organic matter dynamics of stream ecosystems in which they occur (Hill and Webster, 1983). Such may be the case with *P. ceratophyllum* in the New River.

LITERATURE CITED

ADAMS, M. S., P. GUILIZZONI, AND S. ADAMS. 1978. Relationship of dissolved inorganic carbon to macrophyte photosynthesis in some Italian lakes. Limnol. Oceanogr. 23: 912–919.

ADAMS, M. S., AND M. D. MCCRACKEN. 1974. Seasonal productivity of the *Myriophyllum* component of the littoral of Lake Wingra, Wisconson. J. Ecol. 62: 457–467.

ADAMS, M. S., J. TITUS, AND M. MCCRACKEN. 1974. Depth distribution of photosynthetic activity in a *Myriophyllum spicatum* community in Lake Wingra. Limnol. Oceanogr. 19: 377–389.

BAIN, J. T., AND M. C. F. PROCTOR. 1980. The requirement of aquatic bryophytes for free CO_2 as an inorganic carbon source: some experimental evidence. New Phytol. 86: 393–400.

CUMMINS, K. W. 1974. Structure and function of stream ecosystems. BioScience 24: 631–641.

FISHER, S. G., AND S. R. CARPENTER. 1976. Ecosystem and macrophyte primary production of the Fort River, Massachusetts. Hydrobiologia 47: 175–187.

GESSNER, R. 1959. Hydrobotanik, Vol. II. VEB Deutsch. Verlag Wissensch., Berlin.

HANNAN, H. H., AND T. C. DORRIS. 1970. Succession of a macrophyte community in a constant temperature river. Limnol. Oceanogr. 15: 442–453.

HILL, B. H. 1981. Organic matter inputs to stream ecosystems: contributions of aquatic macrophytes to the New River. Ph.D. thesis, Virginia Polytechnic Institute and State University, Blacksburg.

HILL, B. H., AND J. R. WEBSTER. 1982. Periphyton production in an Appalachian river. Hydrobiologia 97: 275–280.

HILL, B. H., AND J. R. WEBSTER. 1983. Aquatic macrophyte contributions to the New River organic matter budget. *In* T. D. Fontaine III and S. M. Bartell [eds.], Dynamics of lotic ecosystems, pp. 273–282. Ann Arbor Science Publishers, Ann Arbor, Mich.

HILL, B. H., J. R. WEBSTER, AND A. E. LINKINS. In Press. Problems in the use of closed chambers for measuring photosynthesis by a lotic macrophyte. *In* Ecological assessment of macrophyton-collection, use, and meaning of data. ASTM Symposium, Ft. Lauderdale, Fla., 15 January 1983.

HORNICK, L. E., J. R. WEBSTER, AND E. F. BENFIELD. 1981. Periphyton production in an Appalachian mountain trout stream. Amer. Midl. Nat. 106: 22–36.

HUTCHINSON, G. E. 1975. A treatise on limnology, Vol. III, Limnological botany. John Wiley and Sons, New York.

JANSSEN, R. E. 1953. The Teays River, ancient precursor of the east. Sci. Monthly (Dec): 306–314.

MCCRACKEN, M. D., M. S. ADAMS, J. TITUS, AND W. STONE. 1975. Diurnal course of photosynthesis of *Myriophyllum spicatum* and *Oedogonium*. Oikos 26: 355–361.

MOELLER, R. E. 1978. Carbon-uptake by the submerged hydrophyte *Utricularia purpurea*. Aquat. Bot. 5: 209–216.

NELSON, D. J. AND D. C. SCOTT. 1962. Role of detritus in the production of a rock-outcrop community in a piedmont stream. Limnol. Oceanogr. 7: 396–413.

OWENS, M., AND R. W. EDWARDS. 1961. The effects of plants on river conditions. II. Further Crop studies and estimates of net production of macrophytes in a chalk stream. J. Ecol. 49: 119–126.

OWENS, M. AND R. W. EDWARDS. 1962. The effects of plants on river conditions. III. Crop studies and estimates of net production of macrophytes in four streams in southern England. J. Ecol. 50: 157–162.

RAVEN, J. A. 1970. Exogenous inorganic carbon sources in plant photosynthesis. Biol. Rev. 45: 167–221.

RODGERS, J. H., M. E. MCKEVITT, D. O. HAMMERLUND, K. L. DICKSON, AND J. CAIRNS, JR. 1983. Primary production and decomposition of submergent and emergent aquatic plants in two Appalachian rivers. *In* T. D. Fontaine III and S. M. Bartell [eds.], Dynamics of lotic ecosystems, pp. 283–301. Ann Arbor Science Publishers, Ann Arbor, Mich.

SCULTHORPE, C. D. 1967. The biology of aquatic vascular plants. Edward Arnold, Ltd. London.

SHIMSHI, D. 1969. A rapid field method for measuring photosynthesis with labelled carbon dioxide. J. Exp. Bot. 10: 381–401.

VANNOTE, R. L., G. W. MINSHALL, K. W. CUMMINS, J. R. SEDELL, AND C. E. CUSHING. 1980. The river continuum concept. Can. J. Fish. Aquat. Sci. 37: 130–137.

VOLLENWEIDER, R. A. (ed.). 1974. A manual of methods for measuring primary production in aquatic environments. IBP Handbook No. 12, 2nd ed., Blackwell, Oxford.

WESTLAKE, D. F. 1965. Some basic data for investigation of the production of aquatic macrophytes. Mem. Ist. Ital. Idrobiol. 18: 229–248.

WETZEL, R. G. 1964a. Primary production of aquatic macrophytes. Verh. Int. Verein. Limnol. 15: 426–436.

———. 1964b. A comparative study of the primary production of higher aquatic plants, periphyton, and phytoplankton in a large shallow lake. Int. Rev. Ges. Hydrobiol. 49: 1–61.

———. 1965. The necessity of decontamination of filters in ^{14}C measured rates of photosynthesis in freshwaters. Ecology 46: 540–541.

———. 1974. The enclosure of aquatic macrophyte communities. *In* R. A. Vollenweider [ed.], A manual of methods for measuring primary production in aquatic environments, IBP Handbook No. 12, 2nd ed., Blackwell, Oxford.

———. 1975. Limnology. W. B. Saunders and Co., Philadelphia.

———, and R. A. Hough. 1973. Production and role of aquatic macrophytes in lakes. An assessment. Pol. Archw. Hydrobiol. 20: 9–19.

EFFECTS OF FLOW ALTERATION ON

THE AQUATIC MACROPHYTE *PODOSTEMUM CERATOPHYLLUM* (RIVERWEED);

LOCAL RECOVERY POTENTIAL AND REGIONAL MONITORING STRATEGY

by

JENNIFER P. PAHL

(Under the Direction of C. Ronald Carroll)

ABSTRACT

A survey of *Podostemum ceratophyllum* Michx. biomass and recovery rates was conducted in the Middle Oconee River, Athens, GA over a one-year time period under altered hydrology and severe drought. Biomass was found to be an order of magnitude lower than reported by previous studies conducted in non-drought years. An information-theoretic (AIC) modeling approach found variation in biomass within the study site to be related in part to variation in duration of low flow events. Recovery rates in the Middle Oconee River as well as Hunnicutt Creek, a tributary, were similar among sites and under varying hydrologic regimes. Re-colonization from vegetative growth seemed most prominent, and little support was found for seed dispersal as a major mechanism or recovery. Regionally, *P. ceratophyllum* range is likely expansive, and the impact of hydrologic alteration may be equally as widespread. Future monitoring could be accomplished through existing programs, focusing in basins where *P. ceratophyllum* is present and flow modification is prevalent.

INDEX WORDS: *Podostemum ceratophyllum*, hydrologic alteration, drought, Middle Oconee River, re-colonization, monitoring

EFFECTS OF FLOW ALTERATION ON THE AQUATIC MACROPHYTE *PODOSTEMUM CERATOPHYLLUM* (RIVERWEED); LOCAL RECOVERY POTENTIAL AND REGIONAL MONITORING STRATEGY

by

JENNIFER P. PAHL

B.S., The University of Vermont, 2005

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE

ATHENS, GA

2009

EFFECTS OF FLOW ALTERATION ON

THE AQUATIC MACROPHYTE *PODOSTEMUM CERATOPHYLLUM*;

LOCAL RECOVERY POTENTIAL AND REGIONAL MONITORING STRATEGY

by

JENNIFER P. PAHL

Major Professor: C. Ronald Carroll

Committee: Mary Freeman
Catherine Pringle
Amy Rosemond

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
May 2009

ACKNOWLEDGEMENTS

First I would like to thank my major advisor, Dr. Ron Carroll for his endless support. While I struggled to find my footing amidst an infinitely large field of study, Ron was always there to ground me in the tangible but remind me to think big picture. I would also like to thank my committee members, Dr. Amy Rosemond and Dr. Catherine Pringle for their encouragement and expertise in field and lab methods. The work they have done has served as a foundation for my education in the field of stream ecology. I want to specially thank my fourth committee member, Dr. Mary Freeman. Mary's dedication to this work was immeasurable and her approach profoundly shaped my view of scientific research. Thank you Mary!

Of course, none of this work would have been possible without the collaboration of Rachel Katz. Rachel is a wonderful friend and colleague; this partnership enabled me to achieve and learn more than possible on my own. I thank her for pushing me to perform better science and immerse myself in the professional world.

I would like to acknowledge the financial support of the Upper Altamaha Grant (# 271 GRAM 63B/ 1031RE271419) as well as Dr. Mary Freeman of the U.S. Geological Survey. Mr. Jeff Knight (Athens-Clarke County), Kevin Williams (Bear Creek Reservoir) and Brian McCallum (USGS) provided valuable hydrologic data.

Thank you to Christina Baker, Nicole Pontzer, Tyler Kartzinel and Mathew Carroll of the University of Georgia, James Plourde of Purdue University, and Ryan Pahl for providing field assistance. Thanks also to the River Basin Center for fostering an environment of learning and camaraderie.

Finally, I would like to extend a special thank you to my family; my husband Ryan, my parents Daniel and Joanne Plourde, my brother James and my grandparents Ken and Ellie Wall and Fern and Rita Plourde; your support, patience and encouragement has been amazing!

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Page

LIST OF IMAGES

Page

CHAPTER 1

INTRODUCTION

The natural flow regime paradigm (Poff et al. 1997) has been a foundation for understanding stream ecology since the 1990s. It implies that natural variations in flows are required for the life histories of organisms that have evolved to tolerate those conditions. Over the last 50 years however, a significant rise in the number of impoundments (McCully 2001) and surface water withdrawals have profoundly changed the patterns of flow across North American rivers (Rosenberg et al. 2000). Shifting flow regimes can alter the transport of important nutrients, sediment and biota across all planes laterally, longitudinally and vertically within the channel (Silk and Ciruna 2005) and at varying time scales (Poff et al. 1997).

Compounding these hydrologic changes, precipitation patterns in the southeastern United States have drastically reduced the amount of rain over Georgia, North and South Carolina over the last decade. This extreme drought (2007 to present) has resulted in fewer high flow events and prolonged durations of very low flows. Climate change models predict higher winter rainfall in the southeast, accompanied by increased evapotranspiration rates, which will likely yield less summer and fall runoff to streams and rivers (Mulholland et al. 1997). Population projections for the southeast, particularly Georgia indicate continued rapid growth (USCB 2008), which may further increase demand for water resources, resulting in lower base-flows (Mulholland et al. 1997). While these conditions alone may influence the productivity of aquatic organisms within a stream reach, perhaps the most challenging conditions for aquatic biota may occur as anthropogenic perturbations interact with climatically-induced low flows.

In streams that support low-head hydropower dams for example, consistent daily fluctuations in flow resulting from normal dam operations may result in minor discharge changes under normal flow conditions, however, under extreme drought, these fluctuations may affect a larger portion of the streambed over the course of 24 hours. The frequency and duration of these drying events and the duration may influence the productive capacity of stream biota. Short-duration drying events could lead to stress on macrophytes resulting in reduced growth, while long duration may result in mortality. Long-duration drying events that occur frequently will likely result in larger population declines, while infrequent long-duration events may result in initial mortality or extreme stress, but allow for macrophyte re-colonization.

The Middle Oconee River, near Athens, GA provides an example of how climate in combination with water management can alter natural flow regimes. The extreme drought conditions that have persisted since early 2007 through the present have resulted in lower than normal stream flow. Upstream of our study shoals, the Tallassee Shoals Hydropower dam operates as a low-head dam, producing power for the Jackson EMC which supplies the surrounding counties (Davis 2007). A pump-storage facility called Bear Creek Reservoir is operated by the Upper Oconee Basin Water Authority and supplies water to Athens-Clarke County, as well as three other counties (Williams 2007). An additional water withdrawal station downstream of these shoals is operated for municipal water supply by Athens-Clarke County (Knight 2007).

While the three features may influence the hydrology of this reach, the pump storage facility has had a great effect on flows during the drought. Neither the hydroelectric dam (Davis 2007) nor the Athens-Clarke County municipal withdrawal station (Knight 2007), were able to operate during the drought flows experienced over the course of our study. The remaining feature, Bear Creek Reservoir, resulted in daily changes on the order of 5 to 10 cubic feet per second (cfs), but up to 90 cfs under normal conditions. The reservoir was issued a special permit by the Georgia Environmental Division to withdrawal 7 to 15 Million Gallons per Day (13 – 28 cfs) under drought conditions (Williams, 2007). This created areas of the shoal that were continually wetted, continually exposed, and those that experienced fluctuations in flow that may result in short term drying events. The drought conditions increased the extent of the substrate that was fully exposed and possibly the areas experiencing daily changes in flow.

One of the major primary producers and habitat providers in this study shoal is the submerged aquatic macrophyte *Podostemum ceratophyllum* Michx. (*Podostemaceae*) *P. ceratophyllum* thrives in swift water on rocky substrate, and resists flows by attaching to bedrock and boulders with holdfast disks (raphes) rather than roots (Hammond 1937). *P. ceratophyllum* is the dominant macrophyte in riverine shoal habitats in Georgia and is ecologically significant for a number of reasons. *P. ceratophyllum* is an important habitat for many macroinvertebrate and fish species in this region. It is highly productive (Hill and Webster 1984) and has been linked with the highest secondary production of filter feeders (Grubaugh and Wallace 1995, Grubaugh et al. 1997) ever recorded in streams (Huyrn and Wallace 2000).

Hutchens et al. (2004) documented the importance of *P. ceratophyllum* for macroinvertebrate communities, finding that removal of this species resulted in a much lower total macroinvertebrate abundance and biomass. The authors also indicated that the recovery of such communities was extremely slow (Hutchens et al. 2004). *P. ceratophyllum* has also been correlated with increased presence of fish (Argentina 2006, Connelly et al. 1999, Hagler 2006, Marcinek 2003). *P. ceratophyllum* may provide fish, especially small ones, with refuge from predation, and food in the form of macroinvertebrates (Argentina 2006).

Over the past few decades, *P. ceratophyllum* has been in decline in many of the northeastern states due to various impacts such as reduced water quality, siltation or hydrologic alterations (NYSNHP 2008). In Georgia, *P. ceratophyllum* is not listed as endangered or threatened, as it is in the northeastern U.S.; however, recent climatic events may have caused significant stress.

Historically, *P. ceratophyllum* formed lush mats across shoal in the Middle Oconee River, Athens, GA during the growing season and persisted throughout the winter in a more dormant stage (Grubaugh and Wallace 1995). Due to the recent extreme drought of 2007-2009, much of the area that previously supported *P. ceratophyllum* has been exposed and the plant has died. Many of the remaining refuge areas for the plant are subject to fluctuating hydrology on a daily basis due to the upstream water withdrawals. Future human population growth in Georgia may demand more of our water resources, exacerbating the problem of water extraction resulting in low, variable flows.

To understand how the hydrology in the Middle Oconee River is affecting the productive capacity of *Podostemum ceratophyllum* and its ability to recover, the following research questions were addressed: (1) Does *P. ceratophyllum* biomass change seasonally over one year? (2) How has the biomass of *P. ceratophyllum* in this study shoal changed over the past 50 years? (3) How does hydrology influence *P. ceratophyllum* biomass within the shoal habitat? (4) What is the rate of *P. ceratophyllum* re-colonization through seed dispersal and vegetative growth within the shoal? (5) Are other areas of Georgia where *P. ceratophyllum* occurs that are also experiencing hydrologic changes?

To understand these questions, I collaborated with others (R. Katz and M. Freeman) to develop a number of methodologies and analytical strategies: First, we investigated effects of hydrologic stress on *P. ceratophyllum* in conjunction with a number of habitat covariates on standing stock biomass of *P. ceratophyllum.* We used an information theoretic approach to compare models predicting *P. ceratophyllum* biomass and to determine relative support for including the effects of hydrologic variables. We found that the best supported model included a hydrologic stress variable, and indicated that one or more hours of hydrologic stress resulted in loss of *P. ceratophyllum* biomass.

Second, I analyzed the rate at which *P. ceratophyllum* may recover from hydrologic stress or other forms of disturbance such as scour or grazing. To do this, a fixed-plot repeated-measures approach was taken to assess vegetative re-colonization rates as well as seed accrual over time in two locations under varying hydrologic conditions. An independent study looking at seed dispersal was problematic, but did provide insight into the potential resiliency of this species.

Third, we analyzed observed occurrences across north Georgia to establish a preliminary range for *P. ceratophyllum* above the fall line in Georgia. The basins in which these observations occurred were cross-referenced with U.S. Geological Survey stream gages to determine the possible extent of hydrologic alteration by basin (USGS 2008). Basins with *P. ceratophyllum* and high percentages of gages indicating hydrologic alterations such as water withdrawals or hydroelectric impoundments were determined to be priority areas for future monitoring work. These locations will also likely experience high rates of population growth in the future, which may lead to increased stress on water resources (Seager et al. 2007). Monitoring of *P. ceratophyllum* might be facilitated through the Georgia Natural Heritage Program.

CHAPTER 2

HIGH RESOLUTION ASSESSMENT OF ENVIRONMENTAL FACTORS THAT INFLUENCE BIOMASS OF *PODOSTEMUM CERATOPHYLLUM* (RIVERWEED) IN A SIXTH-ORDER PIEDMONT RIVER

ABSTRACT

Hydrologic alteration by impoundment structures and water extraction has significantly impacted aquatic systems for over a century. Some of the most vulnerable habitats are shoals which often occur at areas of high elevation gradients and are ideal sites for energy producing hydropower dams. Shoals in free-flowing rivers are often influenced by upstream alteration to hydrology such as frequent draw-downs or hydro-peaks. These hydrologic changes are amplified during drought conditions, such as those experienced in the Georgia Piedmont during 2007 - 2008. Our study in the Middle Oconee River, Athens, GA, investigated effects of hydrologic alteration at a fine scale with respect to the aquatic macrophyte *Podostemum ceratophyllum* Michx. (*Podostemaceae*). Through information-theoretic analysis (AIC), we found higher support for predictive models of *P. ceratophyllum* biomass that included hydrology factors such as the number of hours in the past 30 days with less than a water depth of 5cm. The relationship between *P. ceratophyllum* biomass and duration of low water depth was negative. We projected that about 2% of our transect may experience these stressed conditions at or above 45 cubic feet per second (cfs), which is the 7Q10. We modeled biomass loss to be close to 8% in 30 days under the average number of hours under 5 cm of water that our samples experienced. We found that *P. ceratophyllum* biomass in 2007-2008 was less than half as large compared to 1956-1957 and 1991-1992 studies, and investigated variations in annual hydrology to help explain this difference.

INTRODUCTION

Over the past fifty years, humans have modified aquatic habitats in significant ways. Surface water withdrawals have increased 20-fold over this time (Revenga et al. 1998 in Silk and Ciruna 2005), and impoundments have influenced 60% of large river systems (McCully 2001). These dams and water extractions alter the natural flow regime (Rosenberg et al. 2000) and change transport of nutrients, sediment and biota within the system (Silk and Ciruna 2005). Not only can hydrologic alteration reduce the overall flow (i.e. via water extractions), it can also change the magnitude, duration, timing and seasonality of biologically important flows (Poff et al. 1997). These alterations can occur at varying time scales, such as hourly, daily, monthly, annually and inter-annually (Gehrke and Harris 2001).

The historic pattern of flow variations in a specific riverine system influences composition of the resident biota. The life-histories of many aquatic organisms rely directly on flow characteristics to signal the onset of certain life stages. Many studies have examined how even small variations in the natural flow regime may have large impacts on fishes (Anderson et al. 2006, Dutterer and Allen 2008, Freeman and Marcinek 2006, Propst et al. 2008, Roy et al. 2005), macroinvertebrates (Dewson et al. 2007, Malmqvist and Englund 1999, McIntosh et al. 2002, Rader and Belish 1999, Suren et al. 2003a), byrophytes (Englund et al. 1997) and even periphyton (Suren et al. 2003b). Few studies exist however, that investigate aquatic macrophyte changes as a result of hydrologic modifications. A limited amount of research has looked at long-term consequences of hydrologic alteration for plant communities within the floodplain (Pettit et al. 2001), and emergent macrophyte growth and recession in rivers (Ham et al. 1981), though almost no reported effort has been devoted to effects of hydrologic alteration on submerged macrophytes. Given the limited range of movement for sessile aquatic plants, and the increasing frequency with which we are altering the natural flow regime of most rivers, it is important to understand how flow alterations may influence these important primary producers.

We chose to investigate the effects of hydrologic alteration on the aquatic macrophyte *Podostemum ceratophyllum* Michx. (Riverweed), as it is a key foundational species (Ellison et al. 2005) for shoal habitats, which support a large number of imperiled fishes and federally endangered fishes (Freeman and Freeman, 1994). *P.ceratophyllum* thrives in swift water on rocky substrates (Hammond, 1937), and provides a complex habitat structure for the benthic community (Argentina 2006, Grubaugh and Wallace 1995, Hutchens et al. 2004). It has been associated with increased abundances of macroinvertebrates (Hutchens et al. 2004, Grubaugh and Wallace 1995, Voshell and Parker 1985) as well as increased presence of fish species (Argentina 2006, Connelly et al. 1999, Hagler 2006, Marcinek 2003). *P.ceratophyllum* has been noted to have lower abundances in areas of scouring or daily pulses from upstream hydroelectric dams (Hill and Webster1984), and may dry, break and flow downstream after experiencing low flow events (Nelson and Scott 1962, personal observations 2007- 2008).

Often hydrologic alteration is quantified by modeling changes in hydrologic data at a daily timescale, assessing for deviations from historical norms (Richter et al. 1996). A commonly used program, Indicators of Hydrologic Alteration was developed through The Nature Conservancy to analyze hydrologic changes, but presents problems of redundancy (Olden and Poff 2003) with respect to parameters and a bias towards longer time frames. Many current hydrologic alteration studies are not focused on fine-scale hydrologic modeling. Our goal was to estimate the effects of low flows and exposure events at an hourly timescale on *P. ceratophyllum* biomass at specific sample localities within our study site. We used an Information Theoretic approach (Burnham and Anderson, 2004) to evaluate alternative models of factors affecting *P. ceratophyllum* biomass, because we believe it to be more biologically meaningful to determine the relative effect of parameters rather than to accept or reject them completely with traditional null hypothesis testing.

We expected lower *P. ceratophyllum* biomass today than the two previous studies (Grubaugh and Wallace 1995, and Nelson and Scott, 1962), which were conducted during non-drought periods (USGS 2008). We anticipated that variation in *P. ceratophyllum* biomass within this shoal would be related in part to low flow hydrology factors. We wondered, however, whether we would be able to quantify a linear effect of increasing frequency or duration of low flows on *P. ceratophyllum* biomass by examining patterns across a topographically varied shoal environment (where some areas were more subject to becoming shallow or dry than others).

METHODS

Study site

This study was conducted at the shoals of the Middle Oconee River at Ben Burton Park, Athens, Georgia. The Middle Oconee River is a sixth-order river in the upper Altamaha watershed. It has a number of tributaries and eventually joins with the North Oconee River in Athens to form the Oconee River, and ultimately the Altamaha River.

The headwaters of the Middle Oconee River are in the Piedmont physiographic province at an elevation of approximately 1,000 feet above the mean sea level (GA DNR, 1998). The headwater streams are entrenched, have small floodplains and steep longitudinal gradients ranging from 4.5-7.4 feet per mile (GA DNR, 1998). The steeper portions are often reflected by shoal habitats within the channel.

This study site on the Middle Oconee has a drainage area of about 641 km^2 (USGS, 2008). Over half of the land in this basin is forested (~55%), however approximately 20% is pasture and row crop, about 9.5% is low and high impact urban development, and 6.6% is clear cut (NARSAL, 2008). In the 1950's, approximately 40% of the basin was used as farmland and 10% of this was in cotton, and by the 1990's, less than 20% of the basin was in cropland (Grubaugh 1994).

Within the Oconee River Basin, there are 14 withdrawal points for drinking water supply, 5,467 instream impoundments that cover 147 square kilometers, and three major surface water reservoirs (GRN 2008). The Oconee River is part of the larger Altamaha River basin, and in 2002, the Altamaha River was listed as the 7th most endangered river in the country due to the loss of water flow from reservoirs and power plants (GRN 2008).

The study shoal is located within Ben Burton Park, Athens, GA and is characterized as a bedrock outcrop. The hydrology of the shoal study area is highly influenced by two upstream facilities. The first is Bear Creek Reservoir, which is privately owned by the Upper Oconee Basin Water Authority and supplies water to Athens-Clarke County Public Utilities and three other surrounding counties. Bear Creek

Reservoir, constructed in 2002, is a pump-storage facility that is located outside of the river channel (on the former location of the stream named Bear Creek) spanning 505 acres. The intake point used to fill the reservoir from the Middle Oconee River is located approximately 2 miles upstream of the study shoal. The reservoir pumps operate from 8AM to 4PM and may withdrawal between 7 and 15 million gallons per day (MGD) under drought conditions, and 20 and 60 MGD during non-drought conditions (Williams 2007).

The second facility above the shoal is the Tallassee Shoals Hydroelectric Dam, which is operated by FLHC, Inc., and is located about 800 meters downstream of the intake for Bear Creek. This dam maintains a federal permit and has been named a "green" dam based on its perceived low impact to the hydrology of the river. The dam operates by directing water through a chute which intersects a turbine and produces energy. Any water that enters the chute is released approximately 3000 meters downstream through the headrace. If there is more water in the river than the capacity of the chute, water flows over the dam. When the discharge is $<100 ft^3/sec$ or $>900 ft^3/sec$ the dam cannot operate, so the chute is closed allowing water to flow over the dam itself. Under these conditions, when the small reservoir behind the dam is full, the upstream discharge equals the downstream discharge over this structure. According to the dam operator, it has not been used since the summer of 2007 due to low flow conditions that made it inoperable; in this situation, the dam and did not affect the hydrograph and hydrology downstream (Davis 2007).

In the past, the combined effect of the dam and pumping water to fill the reservoir has significantly changed the natural hydrology of the shoals just downstream. In recent months, with no dam operation, the water withdrawals alone have caused changes in the hydrology. This alteration is evident by the differences between U.S. Geological Survey (USGS) gages upstream (Arcade, GA), and downstream (Athens, GA) of our study shoal (Figure 2.1). It is clear that these facilities between the gages have resulted in extreme alteration of the hydrograph on a daily basis over the one month period (October 1 – 31, 2007) illustrated in Figure 2.1.

An additional factor within this reach of the river is an Athens-Clarke County Public Utilities intake located at the intersection of the Middle Oconee River and Mitchell Bridge, just down-stream from Ben Burton Park, which withdrawals water for the city. This pump takes water directly out of the river to a larger treatment facility located on the north side of Athens. The facility had not been in operation since from mid-summer through autumn 2007, thus, is not likely a source of any of the variability illustrated in the hydrograph (Knight 2007).

The study shoal itself consists mainly of bedrock, large boulders, and small areas of sand and gravel. *P. ceratophyllum* is widespread throughout the shoals, covering large bedrock areas, boulders of various sizes, and in some cases gravel. Historically, *P. ceratophyllum* has formed lush mats across this shoal during the growing season and has persisted throughout the winter in a more dormant stage (Grubaugh and Wallace, 1994). Red algae (*Rhodophyta*) are also common.

Due to the recent extreme drought of 2007-2008, much of the area that previously supported *P. ceratophyllum* has been exposed and the plant has died (Image 2.1). Many of the remaining refuge areas however are subject to fluctuating hydrology on a daily basis due to the upstream water withdrawals, which is compounded by the already low flows from persistent drought conditions.

Data Collection

Samples

We sampled *P. ceratophyllum* along a 100-meter long transect that defined a cross-section of the channel from one bank to the other. We used a nylon cord on a spool as a transect line which was affixed to trees on either bank. The cord was labeled at approximately 1 meter intervals with a permanent marker and every 2 meters with flagging tape. We defined five distinct sections along this transect based on substrate and topographical differences (Table 2.1).

P. ceratophyllum was sampled monthly by collecting two samples per section for a total of 10 samples. Sample locations were randomly produced and never re-sampled. If a sample point was dry, we chose the next random location. At each sampling location, we used a 103.87 cm^2 t-sampler with a 250µm mesh sleeve to collect all materials from the substrate. The sampler was pressed firmly to the substrate to prevent loss of materials. We used a metal putty knife and our hands to scrape *P. ceratophyllum* and its associated macroinvertebrates and algae. These materials were then placed into a plastic zip-lock bag and stored on ice until we returned to the lab within 2 hours of collection.

We then used an Earl Dudley Associates Inc. (Birmingham, AL) TC600 Total Station to record the distance along the transect and relative elevation of the sample location. Velocity measurements were recorded at 60% depth for each sample using a Marsh-McBirney Flo-Mate^{TM} Model # 2000. A DataSonde 4a Water Quality Multiprobe (Hydrolab Corporation, Austin, TX) and a 2100P HACH Turbidmeter were used once in the same location at each sampling time to record water quality parameters including pH, turbidity, temperature, dissolved oxygen and specific conductivity.

After returning to the lab, the ten samples were stored in a refrigerator for no more than 48 hours (and usually less than 4 hours) before sorting. Macroinvertebrates, algae and remaining detritus were removed from the *P. ceratophyllum* under 0.8x and 5x magnification.

P. ceratophyllum separated from the samples was then placed onto pre-weighed aluminum trays and dried at 60^{o}C for at 5 to 7 days before weighing. The samples were then ashed in a muffle furnace at 500^{o}C for 5 hours and then cooled for 24 hours in a desiccator. The dry weight was subtracted from the final weight to determine the ash free dry mass (AFDM) of the samples.

Hydrology

In order to understand the hydrological changes experienced by each sample location, we developed a fine-scale hydrologic assessment. A USGS gage located downstream of our study shoal recorded discharge and stage at 15 minute intervals. An Athens-Clarke County (ACC) Public Utilities intake was located between our study site and this gage, so we added back discharges withdrawn from this facility to the discharge recorded at the USGS gage. This provided us with an estimate of the gage reading if this uptake did not exist. (The ACC data were only available in hourly format, so we used hourly USGS data for this study).

An Onset HOBO (model # U20-001-04) pressure transducer (HOBO 1) was installed in December 2008, at the deepest portion of our cross-section (which was adjacent to the bank on river-left) to allow for more detailed hydrologic analysis. To secure it, we drilled four holes in a large boulder using a DeWalt pneumatic drill, and attached four eye bolts using epoxy glue. Zip ties were then used to attach a PVC chamber to the boulder to house HOBO 1. A plastic-coated steel wire was affixed to HOBO 1cap and secured to shore and the boulder. The boulder was then placed in the deepest location accessible and wedged between other rocks. While rare extreme high flows could potentially move the boulder, the steel wire would prevent a total loss of the HOBO.

HOBO 1 recorded changes in pressure at 15 minute intervals at this location, and in April, 2008, we installed a second pressure transducer (HOBO 2) above the water and to a tree, to adjust the pressure readings of our submerged HOBO (HOBO 1) for changes in atmospheric pressure. Data from both pressure transducers were downloaded and formatted using the Onset HOBOware Pro for Windows software package. We used a linear regression correlation to relate the water depths at HOBO 1 with the USGS stage readings. This relationship resulted in an equation for estimating changes at HOBO 1 location before it was in place (September to December 2008). We used this correlation to estimate hourly water depths for the 30 days prior to collecting each sample over the course of our sampling year.

In order to estimate how changes at the HOBO 1 location related to changes in depths across the cross-section for every sample, we conducted a number of surface water elevation assessments at approximately 2 meter intervals identified by pre-measured flagging tape (Figure 2.2). We also recorded the elevation of the substrate underneath each flag, and thus were able to generate water depth at those points. A regression between the water depth at each flagged point along the cross-section over time and the HOBO 1 water depth at the same time intervals resulted in individual equations relating HOBO 1 depth to depth at each flag over time. In most cases, a third order polynomial fit the data best due to an apparent inflection point at the middle discharge levels. However, changes in depth over a range of low flows appeared approximately linear in relation to depth at the transducer, and so we fit and used linear regressions to predict temporal sequences of depths at low flows along this cross-section. We accept that this may have resulted in a larger error at the higher water elevations, however, we were interested in the lower water elevations and how those changes impacted biomass during drought. At this scale, we were able to estimate the hydrologic history at one hour intervals for each 2 meter interval along the transect.

We determined each flag to be the center point of a 2 meter section to which this history was applied. Water depths over time were then calculated for all samples falling within each 2 meter section. To do this, we determined the difference in elevation between the flag location and the sample location. If the elevation at the sample was lower, we added this difference to the simulated water depth history. If the elevation at the sample was higher, the difference was subtracted, as we assumed the water to be shallower.

We did not conduct regressions between HOBO 1 and the first 21 meters (flags 2 – 10) because we determined the surface water elevation to be relatively flat in that section, meaning that changes at HOBO 1 were similar if not the same across that section. We related all samples collected within the first 21 meters of the transect directly to the HOBO 1, by calculating the difference in elevation between HOBO 1 and the bed elevation at each sample. This difference was either added for deeper samples or subtracted for shallower samples to generate a depth history for each sample location.

To determine frequencies and durations of exposure or stress events experienced at each point along the transect prior to being sampled, we used a binary system to label depths equal to or less than zero (dry) as a “1” and those greater than zero as “0.” Additionally, in a separate analysis, we labeled depths less than five centimeters (stressed conditions) as “1” and those above five centimeters as “0.” This system allowed us to sum exposure or stress events in terms of hours of duration to determine the frequency with which these events occurred at various time intervals. We used five centimeters to represent a “stressed” condition because depths that low may result in a partial exposure due to the vertical structure of the plant.

Statistical analysis

An information-theoretic approach (Anderson et al. 2001) was used for statistical analysis to allow investigation into the effect of several hydrologic and habitat variables on *P. ceratophyllum* biomass. We hypothesized that a combination of hydrology variables as well as substrate type, velocity, day and location within the channel would influence the *P. ceratophyllum* biomass (the response variable). Biomass was log-transformed because it was not normally distributed (Box and Cox 1964).

We determined that "day" may have a significant effect on the biomass collected from a given sample because concurrent work on *P. ceratophyllum* re-colonization rates found that season was a significant driver of the rate of asexual colonization (Chapter 3, Pahl 2009). If drying events occurred within a specific season, biomass collected may have been influenced by the time of year. Day was recorded as Julian day, and due to the season effect, a quadratic relationship between Julian day and biomass was determined to be the most appropriate. Thus, we use day and day^2 to account for this.

Substrate is also an important factor, as *P. ceratophyllum* grows predominantly on bedrock and boulders, but occasionally gravel. We hypothesized that *P. ceratophyllum* biomass would reflect the substrate, where bedrock and boulders may allow more *P. ceratophyllum* biomass to accumulate than gravel and cobble. This variable was categorized as discrete with a "1" representing bedrock/boulder, and a "0" representing gravel/cobble.

Velocity was included in the analysis and was reported as the velocity on the day the sample was taken, and reflects the general velocity of that site over time. While changes in velocity may occur seasonally, thus we took our samples at base flow, and hypothesized that if they were reflective of the prevailing base flow velocities, then our measured velocities should relate positively to *P. ceratophyllum* biomass. Based on previous work (Hammond 1937), we hypothesize that faster velocities will generally positively influence *P. ceratophyllum* biomass.

The location factor is an indication of the location of the sample within the channel. It is a binary variable with a "1" representing samples taken within the 12 meters of either edge of the channel (representing 25% of the transect) where shading occurs for the longest period of time, and a "0" representing samples taken on the center 75% of the channel. We hypothesize that location in the center of the channel with full sun for the longest period of time will positively influence *P. ceratophyllum* biomass (Argentina 2005).

For hydrology factors, we determined, through basic growth simulation models, that the single longest exposure event within the last 30 days, and the total number of hours of exposure during the last 30 days may be the largest drivers of change in biomass. We also hypothesized that water depths less than 5 cm might "stress" *P. ceratophyllum*, and therefore we identified total hours of water depths less than 5 cm as well as the longest time under 5 cm. These two variables represent "stressed" hydrologic conditions.

To understand how all of these variables related to *P. ceratophyllum* biomass, we first analyzed the effects of the five non-hydrologic covariates (day, day^2, substrate, velocity and location) using multivariate linear regression in SAS v 9.1 (SAS Institute, Inc., Cary, NC, USA). There were no strong correlations among the covariates (except of course day and day^2, all r^2 <0.52). Our 32 covariate models included combinations of all five variables as well as the interaction between location and day/day^2, as we believed that the location effect was influenced by the time of year, as more riparian foliage was present for shading during spring and summer. We did not test other interactions because we did not believe they were scientifically relevant (Anderson and Burnham 2002). We used Akaiki's Information Criterion (AIC), adjusted for a small sample size (AICc) to evaluate the relative support for each of these models (Anderson and Burnham 2002) using Proc GLM. We then chose the most supported models (those with AICc values within two of the best supported model) to analyze with our four hydrology variables. We did not include models with more than one hydrology variable or interactions because they were highly correlated.

Our final model set included the best supported habitat covariate models and each of these models with one of the four hydrology variables included for a total of 30 models evaluating 92 samples. This design resulted in a balanced representation of all variables within the models (Anderson and Burnham 2004), thus we were able to test the relative support for each hydrology parameter and the habitat covariate models independently. To do this, we used the total weights for each model that contained each variable and added them for a total parameter weight (Anderson et al. 2001, Anderson and Burnham 2004).

RESULTS

Biomass comparisons

A comparison between our study, Grubaugh and Wallace 1995, and Nelson and Scott 1962, indicates a significant decline in *P. ceratophyllum* in recent years (Figure 2.3). Biomass values are significantly lower on average than those reported by Grubaugh and Wallace (n=24, Fcrit=4.30, P < 0.0001) and Nelson and Scott (n=24, Fcrit=4.28, P < 0.0001). Mean annual standing crops for our 2007-2008 study was 54.04 ± 7.14 gAFDM/m^2. Compared with mean monthly standing crop from Nelson and Scott's 1956-1957 study (350.2 ± 33.8 gAFDM/m^2) and Grubaugh and Wallace's 1991-1992 study (514.0 ± 53.2 gAFDM/m^2), our results were an order of magnitude lower (Table 2.2).

Covariate Analysis

Comparison of relative support among the models using habitat and time of year variables to predict *P. ceratophyllum* biomass resulted in six models with AICc values within 2 of the top model (Table 2.3). The most supported model included the substrate, location, day and day^2 covariates, and was 1.35 times more likely to be the true model than the second model. The top six models had about 68% of the total model weight, and location in the channel was included in all six models along with time of year (day and day^2).

Hydrologic Analysis

We ran the six best-supported covariate models with each of the four hydrology variables added, giving 24 models, and combined these with the six habitat-covariate only models to yield a final set of 30 models. Of these 36 models, there were 8 models within 2 delta AICc values of the top supported model (Table 2.4). The top model with an AIC Weight of 0.11, was 1.55 times more likely to be true than the second most supported model, and 1.72 times more likely to be true than then most supported null model. The top model consisted of substrate, location, velocity, day and day^2 and total number of hours under "stressed" conditions (< 5cm). We summed total AIC weights across all models containing each hydrologic variable. We found the most support for the hydrology variable describing of the total time under 5 centimeters (Total AIC weight: 0.37), which was 1.57 times more likely to be true than total AIC weight of null covariate models (Table 2.5). We also calculated the parameter estimates for the most supported model (Table 2.6).

Parameter estimates from the top model were used to estimate percent log biomass loss at a range of total hours spent with less than 5 cm of water (Table 2.7. Samples experiencing the minimum time under low water (2 hours) may lose approximately 0.06% biomass in 30 days, while those experiencing the longest duration (687 hours) may lose up to 21% biomass in 30 days. The average of percent loss expected under average low water conditions is approximately 8% in 30 days.

Effect on the cross-section

In order to determine the effect of low flows as described by the hydrology factor (total hours below 5 centimeters) in the best-supported model on *P. ceratophyllum* standing crop along the cross-section, we first estimated the discharge at which the cross-section would theoretically become stressed. Using the water depth regression equations for each two-meter interval, we determined the depth at HOBO 1 at which the interval would go dry (depth = 0 cm) and become stressed (depth = 5 cm). We used a regression equation between HOBO 1 and the USGS stage downstream to determine discharge in cubic feet per second (cfs) at the cross-section. Flows at 55 cfs resulted in 2% of the transect experiencing stressed conditions (depth = 5cm), while discharges of 10 cfs resulted in 85% of the cross-section stressed with 51% completely exposed (Figure 2.4).

To understand how much of this biomass reduction may be due to water withdrawals vs. drought induced low flows, we calculated the difference between drainage areas at the upstream gage in Arcade, GA and Athens, GA. This difference was used to adjust the Arcade gage discharges to what we might expect at Athens with no withdrawals (Figure 2.8). Adjusted flows for the Middle Oconee River did not fall below 20 cfs, which indicates that flows less than 20 cfs may be the result of withdrawals from the upstream pump storage reservoir. Flow at our study site was below 20 cfs for 460 hours over the last year.

DISCUSSION

The results of our study indicate some substantial changes in *P. ceratophyllum* biomass within the shoal of the Middle Oconee River at Ben Burton Park, Athens, GA. Inter-annual declines in biomass appear to be significant, and hydrologic stress may be a factor in this reduction.

One possible reason for the difference in *P. ceratophyllum* biomass reported in our study and Grubaugh and Wallace's 1995 study was the sampling protocol. We sampled randomly, and only avoided locations that were dry or sandy depositional areas. Grubaugh and Wallace (1995) report avoiding locations where shallow conditions occurred and exposure events were possible. Although this might have influenced the overall averages, only 2 out of 104 samples taken in the present study were above 296.8 g-AFDM/m^2 which was Grubaugh and Wallace's lowest recorded biomass (no samples were as large as Grubaugh and Wallace's average of 514g-AFDM/m^2; Figure 2.6). Whereas our sampling protocol may have been expected to result in lower average *P. ceratophyllum* biomass estimates compared to the earlier studies, the overall lack of samples approaching those previously reported averages strongly supports the notion that *P. ceratophyllum* was considerably reduced.

Additionally, Grubaugh and Wallace (1995) report a decline in cropland coverage, specifically cotton and corn, as a possible reason for water quality conditions that supported slightly higher *P. ceratophyllum* biomass results in their study compared with an earlier study by Nelson and Scott (1962). Today, cropland coverage in the same three counties, Barrow, Clarke, and Jackson, remain at similar acreages with 27% in 1991, and 28% in 2005 (NARSAL 2008). The only county in which cropland and pasture acreage increased since 1991 is in Jackson County, but only by approximately 6500 acres (NARSAL, 2008). The lack of change in cropland indicates that this may not be the driver of decreased biomass in this study compared with the last two studies, given that Grubaugh and Wallace (1995) predicted that increasing cropland would negatively affect water quality and consequently *P. ceratophyllum* biomass.

Changes in impervious surface however have been quite significant, as the three counties experienced an increase from 9% low and high impact urban land cover in 1991 to 17% in 2005 (NARSAL 2008). As our study site is located upstream of much of Clarke County, we also looked at this change with respect to Barrow and Jackson county alone (upstream counties). In these two counties, low and high intensity urban land cover went from 5% in 1991 to 10% in 2005: a change of only 5% (NARSAL 2008). While the increase in urban land cover is undoubtedly bound to change water chemistry, data are not available for this comparison. Roy et al. (2005) report that impervious surfaces can change hydrologic regimes, including increased flashiness and possible reductions in base-flow due to declines in infiltration. Reduced base-flow from impervious surfaces may further exacerbate the effect of daily hydrologic changes from water withdrawals or hydroelectric operation. Increasing urban land use is also linked to rising populations, which require more extractive water use.

Subsequent to the studies conducted in the 1950's and 1990's, a pump storage facility (Bear Creek Reservoir) was constructed in 2002. No water return structure exists between Bear Creek Reservoir and our study shoal, thus less water is reaching the shoal today than before 2002. Figure 2.5 illustrates the differences in hourly discharges across this site over each study year. Flows were higher during Grubaugh and Wallace's 1991-1992 study, so despite hydrologic alteration likely due to dam operations (Figure 2.1), low flow conditions did not occur to the extent that they do today. Comparisons between hydrographs in Athens, GA and upstream of these facilities in Arcade, GA, indicated that over the year of our study, 175 withdrawal events occurred, spanning 47.9% of the year, where average withdrawals were 35.6 cfs.

Another source of declining biomass between study years could be herbivory by geese and crayfish (Parker, 2005). As water levels declined during the drought of 2007-2008, low flows resulted in easier access to *P. ceratophyllum* through shallower depths and lower velocities. Parker (2005) notes that deeper faster water was problematic for geese as they tended to be washed downstream and as a result are unable to graze.

Although our results indicated a negative effect of the number of hours *P. ceratophyllum* experienced water depths less than 5 cm, the standard error spanned zero (-0.0013 ± 0.0014 log g-AFDM/m^2/hr), indicating the possibility of a positive effect of such flows. This may relate to heavy periphyton coverage during the summer months, which could die during short exposure events and move downstream during subsequent storm flows. This would remove periphyton from its location on top of *P. ceratophyllum* where it competes for sunlight.

The estimated loss of *P. ceratophyllum* biomass over 30 days varies quite widely based on the number of hours spend under low water conditions, however the average of all samples experiencing low water depths indicates over an 8% loss. Based on predicted base flows using an upstream gage, we think that up to 83% of the low flows may be due to drought; however the remaining 17% may be due to water extraction to fill Bear Creek Reservoir. These results indicated that water withdrawals for consumptive use may have repercussions for benthic macrophytes under drought conditions.

While information-theoretic approaches may not illicit causality for different variables in relation to the *P. ceratophyllum* biomass, we feel it provides insight into the nature of the relationships and reasonable support for the inclusion of certain variables when thinking about *P. ceratophyllum* work. Our study indicates that indeed, hydrology does influence *P. ceratophyllum* biomass to some degree, as a hydrology variable was included in the most supported model. While the estimated effect of this hydrology parameter has an error that spans zero, it is likely that future work to increase the precision of this estimate will result in a negative association between low flows and *P. ceratophyllum* biomass.

As we look towards the future, it is becoming more evident that the southeastern United States may experience increases in winter precipitation as well as increased evapotranspiration in many climate change scenarios (Mulholland et al. 1997). The combination of these two factors may result in declines in summer and fall runoff which influences stream flow (Mulholland et al. 1997). To compound this problem, population growth rates in this region remain some of the highest in the country, and will likely require more surface water extraction. Dewatering of rivers for consumption will likely increase the severity of future droughts and low flows (Seager et al. 2007).

Through this research, we have indicated that hydrologic changes, as a result of droughts and water extractions, may have negative implications for aquatic macrophytes that are key foundational species in shoal habitats. While the effects of hydrologic alteration are difficult to separate from all environmental factors which shape species persistence and productivity (Rosenberg et al. 1997), this type of analysis has allowed us to investigate the relative likelihood that hydrology, particularly very low flows, plays a role in shaping *P. ceratophyllum* biomass.

In order to better estimate the effects of variable hydrologic regimes, we recommend a more spatially expansive approach, investigating hydrology effects at the shoal-wide scale, and ultimately reach and basin scale. This type of work may provide more precise estimates of low flow effects on *P. ceratophyllum* biomass that are meaningful for management. We also recognize the possible contributions of field or mesocosm experiments looking at *P. ceratophyllum* productivity changes during various hydrologic regimes through the use of ^{14}C uptake chambers (Hill and Webster 1984) to measure use of dissolved inorganic carbon, which is a common method to quantify aquatic plant productivity. This type of analysis may provide more evidence of causality.

CHAPTER 3

RECOVERY AND RE-COLONIZATION POTENTIAL FOR *PODOSTEMUM CERATOPHYLLUM* (RIVERWEED) IN A SOUTHEASTERN PIEDMONT RIVER

ABSTRACT

Shoal habitats in southern Piedmont streams provide a unique environment for a multitude of aquatic organisms. Hydrologic alterations through reservoir and dam installation, as well as surface water withdrawal for municipal, industrial and agricultural uses, have impacted the natural flow regimes of riverine shoals. Pronounced drought, as has been documented in northern Georgia in 2007 and 2008, exacerbates these impacts. The aquatic macrophyte *Podostemum ceratophyllum* Michx. (*Podostemaceae*), is a major primary producer in these shoal habitats that generally support a diversity of macroinvertebrates and fishes. As a result of the current drought, large areas of *P. ceratophyllum* have become desiccated or stressed in the Middle Oconee River, which may have implications for species at higher trophic levels. My study in the Middle Oconee River shoals, Athens, GA investigated local rates and mechanisms of re-colonization after disturbances such as those experienced over the last two years. *P.ceratophyllum* was able to recover rapidly (within a month), primarily through vegetative growth, during the growing season (May-October), but experienced very little colonization during the winter and early spring. It appears as though recovery through seed dispersal is limited; however more in depth studies could clarify this. Ultimately, this research can be utilized to aid in the development of more comprehensive in-stream flow recommendations in order to sustain macrophyte abundances and their associated biota.

INTRODUCTION

Throughout the past century humans have greatly modified natural riverine flow regimes. Today, over 5,500 dams higher than 15 m tall exist in the United States alone and over 7,000 in North America (Pringle et al. 2000). These impoundments have considerably changed flow regimes and altered ecosystems along river continua (Freeman et al. 2007, Bunn and Arthington 2002, Naiman et al. 1995, Sparks 1995, Ward et al. 1999)

There has been a substantial response by the scientific community resulting in a large body of work illustrating upstream and downstream effects of stream diversions and impoundments on macroinvertebrates (Dewson et al. 2007, Malmqvist and Englund 1999, McIntosh et al. 2002, Rader and Belish 1999, Suren et al. 2003a), fishes (Anderson et al. 2006, Dutterer and Allen 2008, Freeman and Marcinek 2006, Propst et al. 2008, Roy et al. 2005) as well as bryophytes (Englund et al. 1997) and periphyton (Suren et al. 2003b). In some cases, the removal of impoundments has allowed for studies of fish and invertebrate re-colonization (Catalano and Bozek 2007, and Kanehl et al. 1997). While some of these systems have experienced restorative management, there has been little support for long- term monitoring of the recovery of the benthic community after such efforts (Bernhardt et al. 2007).

Though there have been a number of studies investigating long-term changes from hydrologic alteration in plant communities within the floodplain (Pettit et al. 2001), and emergent macrophyte growth and recession in rivers (Ham et al. 1981), this study offers one of the first investigations into the potential for recovery of a submerged macrophyte, *Podostemum ceratophyllum*.

The flowering aquatic plant *P. ceratophyllum* thrives in the swift, bedrock- and boulder-dominated streams and rivers of eastern North America (Hammond 1937). *P. ceratophyllum* is the most dominant macrophyte in riverine shoal habitat in Georgia and is ecologically significant for a number of reasons. *P. ceratophyllum* is highly productive (Hill and Webster 1984) and has been linked with the highest secondary production of filter feeders (Grubaugh and Wallace 1995, Grubaugh et al. 1997) ever recorded in streams (Huyrn and Wallace 2000). *P. ceratophyllum* on bedrock appears to be particularly important for secondary filter-feeders when compared with cobble habitats (Rosi-Marshall and Meyer, 2004).

Hutchens et al. (2004) documented the importance of *P. ceratophyllum* for macroinvertebrate communities, finding that removal of this species resulted in a much lower total macroinvertebrate abundance and biomass. They also indicated that the recovery of such communities were extremely slow. *P. ceratophyllum* presence has also been correlated with the presence of a number of fish species through the southeast (Argentina 2006, Connelly et al. 1999, Hagler 2006, Marcinek 2003). *P. ceratophyllum* may provide fish, especially small ones, with refuge from predation, and food in the form of macroinvertebrates (Argentina 2006).

Over the past few decades, *P. ceratophyllum* has been in decline in many of the north-eastern states presumably due to various impacts such as poor water quality or hydrologic alterations. In Georgia, *P. ceratophyllum* is not listed as endangered or threatened, as it is in the northeastern U.S., however recent climatic events have caused significant negative impacts.

The drought of 2007-2009 has sent river water levels to record lows causing a widespread desiccation of *P. ceratophyllum.* The areas of remaining *P. ceratophyllum* are under additional stressors in some regions where hydrologic alteration, in the form of extreme fluctuations in discharge, increases the severity of daily trauma to the plants. Increasing human populations in Georgia may demand more of our water resources, exacerbating this problem in the future.

This study is designed to investigate how *P. ceratophyllum* recovers from removal disturbances such as short term desiccation under a variable hydrology due to anthropogenic alteration of the natural flow or scarification from debris flow. It is imperative to understand recovery potential and growth of *P. ceratophyllum* given that it is an important base to the biological structure within southern Piedmont Rivers.

To assess the rate of re-colonization of *P. ceratophyllum* under the current conditions, I conducted a removal study. Most studies to date collect *P. ceratophyllum* samples at discrete locations and compare these over time. In these cases, the sampling occurs in random locations so there is no temporal aspect to the individual sample itself, beyond the season. To understand how a specific location may change in terms of *P. ceratophyllum* biomass over time, I utilized a repeated measures experimental design to examine re-colonization.

METHODS

Study Sites

This study was conducted at two different sites; the Middle Oconee River and Hunnicutt Creek, a tributary to the Middle Oconee. The two sites allow comparison of *P. ceratophyllum* re-colonization in contrasting hydrologic regimes.

Middle Oconee River (MOR):

The Middle Oconee River at Ben Burton Park, Athens, Georgia is a sixth order river within the upper Altamaha watershed. It has a number of tributaries and eventually joins with the North Oconee River in Athens to form the Oconee River, and ultimately the Altamaha River. The study site is located in the north-west corner of Athens-Clarke County, and is north of a USGS gauging station.

The study site is characterized by bedrock a bedrock outcropping and scattered boulders, gravel and sandy pools. The hydrology of this site is heavily altered by upstream water extraction (see Chapter 2 for more details) as well as prevailing drought which has impacted this region beginning in 2007. Due to the extreme drought conditions, much of the area that previously supported *P. ceratophyllum* has been exposed, resulting in mortality of the Riverweed. Many of the remaining refuge areas however, are influenced by the upstream water extraction which causes daily fluctuations in discharge on the order of 13 to 28 cfs (7-15 MGD) which is permitted under drought conditions.

While current conditions do not allow for widespread re-colonization within this shoal due to low base flow and continuing fluctuations, a manipulative study has allowed us to assess the rates of *P. ceratophyllum* recovery from two different mechanisms. We intend to use these data to inform management plans regarding current water withdrawals and future extractions. As the local rates may be influenced partially by the recurring withdrawals, a comparison was made with an adjacent tributary population that was not subjected to major daily fluctuations in hydrology.

Hunnicutt Creek (HCC):

Hunnicutt Creek is a tributary to the Middle Oconee River and enters at Ben Burton Park. Hunnicutt Creek is spring fed with a generally unaltered hydrology, except for the possibility of runoff from localized impervious surfaces. The lowest 100 meters of the stream before its confluence with the Middle Oconee is predominantly bedrock and supports one main patch of *P. ceratophyllum* as well as a number of very small patches approximately 30m upstream. Within the study area of Hunnicutt Creek, *P. ceratophyllum* is only found on bedrock.

Hunnicutt Creek was subjected to an oil spill in October of 2003 (Shearer, 2003). The Upper Oconee Watershed Network has been monitoring this creek since then. It appears as though the stream has recovered however, and *P. ceratophyllum* coverage is near 100% where wetted bedrock occurs in the lower portion (the upper portion contains bedrock as well, but heavy shading likely excludes *P. ceratophyllum* from these locations).

Experimental Design

P. ceratophyllum populations may be affected by small-scale disturbances, such as scouring during a storm event or when a change in hydrology temporarily desiccates a patch. It is important to understand how much re-colonization occurs from local processes such as from vegetative in-growth versus seeds or cloning propagules from distant sources. This information will be especially important if climate change and modified hydrology continue to impact the quantity of remaining viable habitat.

In order to assess re-colonization of disturbed areas of *P. ceratophyllum*, it is important to consider the two major pathways of dispersal: seed germination and vegetative cloning (Hammond 1937). *P. ceratophyllum* can undergo sexual reproduction; however it predominantly undergoes pre-anthesis cleistogamy, a form of self-pollination (Philbrick et al. 2006). Philbrick (1984) also reports that *P. ceratophyllum* can form seeds above or below the water level, and that the seeds then flow downstream until the outer mucilaginous coat allows them to attach to a surface (usually a bare hard substrate). Philbrick (1984) also found that these seeds were often dislodged by rising water levels. Low flow conditions could either enhance germination through increased area of bare lodging sites, or decrease it through drying stress on new seedlings. Philbrick (1984) found that only one of his three study populations produced viable seeds, indicating that this mechanism may not be the most important.

In the field, these differing types of common colonization, seed dispersal and vegetative growth, can be studied through two experimental designs. First, small scale disturbances could result in patches of destroyed *P. ceratophyllum* surrounded by a larger colony. If the patch within the larger colony has the same substrate, bedrock in this case, the mechanisms for re-colonization could include vegetative spread through cloning, seed accrual, or the acquisition of a dislodged piece of *P. ceratophyllum* from upstream that contains growth meristems, which can reestablish. In an alternative situation, where a boulder is isolated by a substrate type that is not suitable for the vegetative spread of *P. ceratophyllum*, such as sand or silt, the only theoretical source for re-colonization would be seed accrual or plants dislodged upstream.

To determine what types of substrate are not suitable for *P. ceratophyllum* growth, I conducted a preliminary study in September of 2007, in which I assessed forty 30 cm transects from the center of boulder and bedrock substrate perpendicular to the flow. At each transect I characterized the substrate and *P. ceratophyllum* coverage at 5 cm intervals. I found sand and silt to be unsuitable as *P. ceratophyllum* substrate, while bedrock, boulders, and some cobble were acceptable.

Compounding factors influencing re-colonization post-disturbance could include the following: 1. the altered hydrology, including presence or absence of strong daily fluctuations beyond the natural variation, 2. percent of the area wetted at the time re-colonization was examined, 3. season, which influenced temperature and sunlight, 4. quality of the surrounding source patch, for example, in the case where the disturbance was within a patch of *P. ceratophyllum.*

I investigated colonization of disturbance sites through two different experiments, taking into account the applicable compounding factors described above. A repeated measures approach was taken to assess *P. ceratophyllum* re-colonization both within an existing patch and when isolated from remaining patches.

The following research questions were addressed: 1. What are the different mechanisms by which *P. ceratophyllum* re-colonized areas? 2. What is the rate of *P. ceratophyllum* productivity in terms of re-colonization rates within the shoal? 3. How do different local site conditions influence *P. ceratophyllum* productivity as affected by water depth and velocity? To understand these questions, two different methodologies and analytical strategies were utilized.

Patch Study:

I conducted a split-plot repeated measures study of re-colonization within an existing patch of *P. ceratophyllum* (Patch Study). The experiment consisted of two blocks of four 20cm x 20cm plots in the Middle Oconee River (MOR) as well as in one of its tributaries, Hunnicutt Creek for a total of 16 plots. In the MOR, two large patches (blocks) of *P. ceratophyllum* were identified, both near the center of the channel. Patches selected were predominantly bedrock, and appeared to maintain some flow at all times (100% area wetted) despite low discharge conditions during the drought of 2007-2008. These patches also maintained similar quality *P. ceratophyllum*, in color, average length and density of cover. The purpose of the two location blocks within the MOR was to allow for analysis of any additional spatial factors in the river that may have influenced re-colonization. As Hunnicutt Creek maintains just one major patch of *P. ceratophyllum*, only one location (block) of eight 20cm x 20cm plots was assessed there.

Four or eight 20 x 20cm plots were located within each patch by identifying areas that were relatively flat and uniform in coverage. These areas were then assessed for depth and velocity and assigned a treatment label that reflected its combination of depth and velocity (shallow: slow or deep: fast).

A comparison of velocities among plots at the beginning of this study using a student's t-test in the Middle Oconee River (MOR) and Hunnicutt Creek (HCC), found ambient velocities of the shallow plots within each site to be significantly different ($P<0.013$, $P=0.0003$ respectively) from deep plots, and no significant difference between the two sites in shallow plot velocities ($P=0.99$), or deep plot velocities ($P=0.08$).

Ambient depths of the "shallow" and "deep" plots within each site were found to be significantly different ($P<0.013$ MOR, $P=0.022$ HCC), however "shallow" plots were not significantly different between MOR and HCC ($P=0.57$), nor were the "deep" plots ($P=0.07$).

Water depth and velocity measurements were recorded during the monthly base flow when no apparent hydrological changes were occurring (early morning before upstream pumping began). The two different velocity and depth ranges found in the preliminary work are labeled "Deep" treatment, and "Shallow" treatment. The Deep treatment consists of the faster, deeper water, while the Shallow treatment is the slower, shallower water. (A factorial analysis was not conducted with the remaining two possible combinations of velocity and depth (deep: slow and fast: shallow) because they either did not exist or did not contain any *P. ceratophyllum* patches).

Each plot was scraped of any existing *P. ceratophyllum* on October 22, 2007 using a metal putty knife. A sub-sample $5cm^2$ was collected during the scraping process, dried at 50^oC for at least 7 days, weighed, ashed at 500^oC for 5 hours in a muffle furnace, and the re-weighed to find the ash free dry mass (AFDM) for later comparison. The scraped plots were then marked with stakes in the two upstream corners. Holes were drilled into the bedrock using a DeWalt pneumatic drill and cement drill bits. The holes were ¼" to ½" deep. One corner was marked with a 2" metal tension rod painted orange, and the other was marked with a 1" wooden pin also painted orange. This set-up was to reduce the number of permanent objects but ensure at least one marker did not decay and was able to withstand the high flows in the river.

Each plot was observed monthly using a 20cm x 20cm x 10cm wooden box with a woven wire grid providing 400 1cm x 1cm squares. The bottom of the box was lined with upholstery foam to help create a seal on the bottom of the rock and prevent flow-through during observation at lower flows. At flows exceeding visual assessment with the box, a viewing bucket with the same grid drawn on plexi-glass bottom with a permanent marker was used. A high powered flashlight was used to illuminate the plots for easier assessment.

At each observation day, the number of 1cm x 1cm squares intersected by spreading *P. ceratophyllum* was recorded as well as the number of cells with new propagules that did not appear to be attached to spread from the surrounding patch. Water depth, velocity, and time were also recorded. The results of each observation were recorded as the number of 1 cm^2 squares intersected by *P. ceratophyllum* and the number of squares with new propagules per 20cm x 20 cm plot.

Three hypotheses were tested: 1. Recovery rates will be faster in the deep: fast plots in terms of vegetative spread because of the superior quality of the *P. ceratophyllum* in those patches (longer and greener), and the general understanding that this species grows best in fast flowing water. 2. Recovery rates from new propagules will be faster in the shallower plots as they might have the opportunity to temporarily dry down allowing for seed deposition and germination. 3. Recovery rates will be faster in Hunnicutt Creek than the Middle Oconee River despite depth: velocity treatment due to the possibility of fluctuating flow stress on plots in the Middle Oconee.

This study was conducted for 11 months. The complete methodology was repeated on May 30, 2008 to separately assess the growing season re-colonization rates and mechanisms (figure 3.4). I hypothesized that the growing season would have a higher occurrence of new propagules due to the life-history characteristics of *P. ceratophyllum*. Many of the annual plots reached 100% coverage by May, thus a growing season assessment allowed for continued re-colonization rate calculations.

Throughout the early time period of the study, it became evident that perhaps some of the "new propagule" recordings were the result of incomplete scraping that left part of the plant in the plot. To account for this, I added dry flat rocks with no initial *P. ceratophyllum,* that were approximately the same size as the plots to the patches, so they were also within a patch. I recorded percent coverage on these over time as well to better understand the rates of propagule recruitment.

<u>Boulder Study:</u>

To understand how *P. ceratophyllum* may re-colonize an area with no local source for vegetative spread, I evaluated boulders that were isolated by sandy substrate (Boulder Study) within the Middle Oconee River (similar conditions did not exist in Hunnicutt Creek). In October 2007, I identified three blocks across the shoal that contained a number of boulders greater than 30cm in diameter that were surrounded by sandy substrate (Figure 2.5). Within each block, the six closest boulders to the center point that were not connected to any other bedrock or boulder substrate were selected. All boulders contained remnant *P. ceratophyllum* holdfast markings, indicating that they had previously served as a suitable substrate for the plant (Image 3.1). Some boulders contained a small fringe of live *P.*

ceratophyllum where the water levels covered a small portion of the boulder. To ensure that re-colonization rates could be determined with no local spread, these fringe areas were scraped with a putty knife and wire brush to remove all remnant *P. ceratophyllum.* As a control, each block contained one boulder that was completely dry at the start with no fringe *P. ceratophyllum* population to scrape.

Each boulder was observed monthly to quantify the number of new propagules landing on the boulder, as well as the amount of spread expressed in cm^2. The rocks were observed using the underwater viewer described in the first experiment. I hypothesized that there would be no vegetative spread due to the isolation of the boulders from other substrates containing *P. ceratophyllum*, and that the rate of re-colonization would be slower than on the plots surrounded by *P. ceratophyllum* because of the lack of vegetative spread and distance from neighboring propagule or seed sources.

Originally I planned to measure the surface area of the boulder as well as water depths over time to model the area wetted. The wetted area would be the possible re-colonization area to be compared with the *P. ceratophyllum* growth in cm^2. Unforeseen changes in the substrate, due to seasonal storm flows that caused shifting sand and silt, made this comparison ultimately impossible. Thus, this study does not afford comparisons between boulders, only on a given boulder over time.

Data Analysis

Patch Study:

The Patch Study was developed as an a priori split-plot repeated measure design with a block effect. Each patch of *P. ceratophyllum* is a whole-unit, subjected to two levels of depth treatment. The sub-unit factors are the time levels applied to each whole unit. The experimental units within these treatments are the *P. ceratophyllum* plots. A repeated measures split-plot design allows for analysis of the sub-units (time) within the whole-units (treatments).

The response variable in this study is the percent of the plot occupied by *P. ceratophyllum* over time. This number was calculated by taking the number of 1 cm x 1 cm squares crossed by spread as well as those occupied by a new propagule and dividing that by the total number of 1 cm x 1 cm squares in the plot. This number was then converted into a percentage. Initially an independent assessment of the new propagules and vegetative spread was intended, however due to the control rocks indicating that there were no actual new propagules, these data were pooled to form the percent cover values.

A split-plot repeated measures design was analyzed in SAS v 9.1 (SAS Institute, Inc., Cary, NC, USA) to determine sources of variance between the rates of re-colonization among the blocks over time. All comparisons regarding time were made with a univariate procedure adjusted for Huynh-Feldt epsilon due to insufficient degrees of freedom. The only exception is the comparison between the Middle Oconee River and Hunnicutt Creek during the growing season, as degrees of freedom allowed for a multivariate comparison between time factors. A profile analysis was used to illustrate the sources of any significant interactions between time and treatment, time and block or time, treatment and block.

Boulder Study:

No statistical analysis was possible with the data, given that I was unable to calculate boulder wetted area over time. It is however, valuable as a descriptive study.

RESULTS

Patch Study (Biomass accumulation):

P. ceratophyllum biomass at the start of this study was not significantly different among depth treatments within each site (P = 0.24, MOR; P = 0.63, HCC), nor was there a difference between blocks in the Middle Oconee River (P = 0.29) or between the Middle Oconee River and Hunnicutt Creek (P = 0.79).

Annual accumulation of biomass (over 352 days) was different between depth treatments within Hunnicutt Creek (P=0.04) with more accumulation in deep plots, but not in the Middle Oconee River (P=0.75) (Figure 3.5). Overall average biomass accumulation was greater between the Middle Oconee River than Hunnicutt Creek (P=0.029) (Figure 3.5 A) but there was no significant difference between blocks in the Middle Oconee River (P=0.85). Growing season (May 30, 2008 – September 17, 2008) average biomass accumulation did not differ significantly among treatments within each site (MOR, P=0.13; HCC, P=0.08). Growing season average biomass was not significantly different between the Middle Oconee River and Hunnicutt Creek (P=0.10), nor was it different between blocks in the Middle

Oconee River (P=0.31). A general trend in biomass suggests that there is lower biomass accumulation in shallower plots versus deeper plots, despite the lack of significance among all comparisons (Figure 3.5 A & B).

Growth rates varied among months, and between the two study systems. Based on the biomass data, growth rates over the annual study were approximately 0.15 ± 0.03 g-AFDM/cm^2/day in the Middle Oconee River, and slightly slower at 0.04 ± 0.01 g-AFDM/cm^2/day in Hunnicutt Creek. During the growing season the rates both the Middle Oconee River (0.07 ± 0.04 g-AFDM/cm^2/day) and Hunnicutt Creek (0.27 ± 0.11 g-AFDM/cm^2/day) had slightly faster growth rates than the annual average, although the rate was much higher in Hunnicutt Creek.

Patch Study (Percent-cover):

The null hypotheses investigated in this study were that there is no difference in *P. ceratophyllum* percent cover over time, among treatments over time, among blocks over time, or among an interaction between treatment and block over time. First, a repeated measures analysis of the two blocks within the MOR over an annual time frame resulted in a significant time effect (F=6.25, df=12, P<0.0001), but no significant effects of treatment, block, block*treatment interactions, or time*treatment, time*block, time*treatment*block interactions when $\alpha = 0.05$ (Table 3.1). Figure 3.6 illustrates how block # 2 in the MOR lagged behind block # 1 with respect to average percent cover from May 2008 until September 2008, when it surpassed percent cover in block #1.

Interestingly, the depth and velocity treatments were not significant over time in general or within specific locations when analyzing average *P. ceratophyllum* percent cover between the MOR and HCC (Table 3.2). Time, however, was a significant variable with respect to average *P. ceratophyllum* percent cover in both the MOR (blocks combined) and HCC (F=26.88, df=12, P<0.0001) (Table 3.2). The time*block interaction was also significant (F=3.01, df=12, P=0.0355) when $\alpha = 0.05$ (Table 3.2). A profile analysis of this interaction indicated that the average percent cover of *P. ceratophyllum* was similar between the MOR and HCC from October 2007 through February 2008, but became significantly greater in the MOR from March to May (Figure 3.7). In June, average percent cover in HCC surpassed the MOR and remained higher until October, 2008 when the two sites became very similar (Figure 3.7).

The growing season plots were analyzed similarly to the yearly data, first comparing the two plots within the MOR, and then comparing the MOR with HCC. Within the MOR, there was a significant effect on the average percent cover of *P. ceratophyllum* from the treatment (F=80.06, df=1, P=0.0009), block (F=37.87, df=1, P=0.0035), and block*treatment interaction (F=29.56, df=1, P=0.0056) reported in Table 3.3. There was also a significant among-subject effect of time (F=5.05, df=5, P=0.0104) which indicates that average percent cover changed significantly over time (Table 3.3). Average percent cover was significantly different among the two blocks in the first month of the growing season (May-June) as well as later from August to September (Table 3.3). These differences are the result of a treatment effect in block # 2, which likely caused the shallow/slow plots to become drier during low flows, which might reduce average percent cover of *P. ceratophyllum* (Figure 3.8).

A comparison between the combined blocks in the MOR and the block in HCC during the growing season indicates that time was significant (F=15.96, df=5, P=0.0006) as well as the time*block interaction (F=8.52, df=5, P=0.0046) reported in Table 3.4. It appears as though while HCC had smaller average percent values than the MOR, they changed over time in similar ways; both declining in August and October during low flow conditions with no significant difference between plots that were in deeper/faster water than those in shallower/slower water.

While average *P. ceratophyllum* percent cover varied among months and between the MOR and HCC, the variance followed similar patterns. The only major difference between the growing season study and the year-long analysis is that treatment became significant within the MOR in one month where the shallow plots became much drier than the deeper plots. The growing season analysis was integral to quantifying *P. ceratophyllum* growth over time, as it allowed for continued surveillance after plots reached 100% cover.

The rate of *P. ceratophyllum* spread in percent cover was fastest from April to May during the annual study in both locations (MOR: 0.0186 ± 0.0037 m^2/day; HCC: 0.0140 ± 0.0009 m^2/day), but the growing season plots indicate that this rate may continue to increase through June and July (MOR: 0.0267 ± 0.0023 m^2/day; HCC: 0.0255 ± 0.0019 m^2/day)

Boulder Study:

Monthly observations found that no boulders acquired any *P. ceratophyllum* for the first four months (November – February). March marked the beginning of *P. ceratophyllum* colonization with 39% of the boulders containing from 2 to 300 cm^2 of *P. ceratophyllum*. The average coverage was 24.4cm^2. Coverage persisted throughout September (Figure 3.11) but did appear to peak in May and June. The predominant pattern of re-colonization was through spread on the upstream side of the boulder. In many cases, shifting sand and silt uncovered unknown patches of *P. ceratophyllum* in close proximity to the boulders. In other cases, sand and silt covered boulders completely.

DISCUSSION

Initial biomass pooled from both sites was not significantly different from biomass 352 days later, suggesting that there were no extenuating environmental circumstances throughout this year beyond recognized hydrological changes. Plots in the Middle Oconee River gained less biomass during the growing season than those in Hunnicutt Creek, perhaps due to the influence of the treatment effect on shallow plots between May –June and August-September which negatively impacted average percent cover.

The results of the patch study indicate that there was no significant difference in average *P. ceratophyllum* percent cover among plots in the MOR and between MOR and HCC with regard to the two treatment levels, or location. The percent cover was significantly different however during the growing season comparisons within the MOR. This may be due to occurrence of a drying event in block 1 (Figure 2.7) which desiccated and removed all *P. ceratophyllum* during that time interval. By mid summer, this difference had disappeared, indicating recovery.

Expectedly, time was a significant factor in *P. ceratophyllum* percent cover at some point in each of the four comparisons (MOR blocks annual, MOR and HCC annual, MOR blocks growing season, and MOR and HCC growing season). In the annual comparisons between MOR and HCC, time was a significant factor in average percent cover during March, April, May and June, indicating that *P. ceratophyllum* spread occurred at the fastest rates during this time. Before March, there was not a significant difference in cover between sampling times because of the slow growth that resulted in values close to zero. After June, time is not significant, indicating that the plots have reached 100% cover in most cases; however density and length may have continued to increase.

The growing season comparisons within the MOR blocks provide insight into the growth rates during the later summer and early fall months. The MOR growing season plots had significant increases in average *P. ceratophyllum* cover within each time interval, indicating a continued spreading pattern, likely due to the physiological response to acceptable temperature, available light and substrate in a neighboring location. The block effect, and interactions between time and block were also significant, but I think this is mainly driven by the drying event, which impacted block 2 (Figure 2.7). The drying event resulted in a significant treatment and time*treatment effect, as the two shallow: slow plots were the ones that dried. These results indicate that within one month, drying can decimate a patch of *P. ceratophyllum*, but if it occurs within the growing season, that area may recover within a very quickly if surrounding *P. ceratophyllum* remains intact as a source of vegetative re-colonization.

These results are important because they provide a time-line for recovery. If water levels were to return to historic base-flow conditions, a large area would be submerged providing expansive opportunities for re-colonization. If these areas remained wetted, it is possible that *P. ceratophyllum* could grow as much as 0.0267 ± 0.0023 g-AFDM/m^2/day during the growing season in the Middle Oconee River, and 0.0255 ± 0.0019 g-AFDM/m^2/day in Hunnicutt Creek. This would depend on the size and position of the neighboring patch, as this study looked at *P. ceratophyllum* spread inward from a completely surrounding patch.

The results of the boulder study were the most surprising. I hypothesized that re-colonization would be slower and driven by new propagules rather than vegetative spread given the isolation from surrounding patches. Monthly observations found however, that re-colonization appeared to come from remnant *P. ceratophyllum* patches under the sand and silt that were exposed through winter high flow events. *P. ceratophyllum* spread upward from these refuges onto the boulders in many cases. In other instances, it appeared as though re-colonizing *P. ceratophyllum* was predominantly on the upstream side, which may relate to the increased velocities at that location, or perhaps some propagule recruitment. Given the coarse scale of observation techniques, I do not believe that I was able to accurately determine propagule presence, and often, what I determined to be local spread, may have actually been propagule recruitment that spread downward. A more in-depth study using magnification would be appropriate in the future for understanding the impact of seed dispersal on re-colonization potential in this shoal.

Future work should focus on comparing recovery rates in a multitude of larger river systems as well as tributaries. This will be important for understanding *P. ceratophyllum* growth dynamics more broadly. While we know that macroinvertebrate abundance is correlated with *P. ceratophyllum* presence (Hutchens et al. 2004), as well as presence of fishes (Argentina 2006, Hagler 2006, Marcinek, 2003, Connelly et al. 1999), further study regarding how and at what rate those communities recover would be useful in developing restoration predictions and goals. While *P. ceratophyllum* does possess the capacity to recover quickly under certain conditions (i.e. sufficient water, substrate, and season), it will be important to continue to monitor this important foundation species as well as the rest of the benthic community in this region (Kominoski et al. 2007) in order to detect declines and implement management strategies in a timely manner.

CHAPTER 4

MONITORING PRIORITY FOR *PODOSTEMUM CERATOPHYLLUM,* (RIVERWEED), IN MAJOR BASINS ABOVE THE FALL LINE IN GEORGIA, USA

ABSTRACT

Anthropogenic sources of stream flow alteration have increased in magnitude over the last 50 years. These changes may be stressors to populations of aquatic plants, including *Podostemum ceratophyllum*, a common fixture in southeastern shoals. *P. ceratophyllum* is ecologically important as it provides habitat for the benthic community, including imperiled species. While this plant ranges from Georgia north through Canada, it has declined in the northeastern portion of its range. Current work has indicated that hydrologic changes as a result of upstream water withdrawals and drought may result in biomass loss through stress. As Georgia continues to grow in population and demand for water resources, and as climate change may result in less runoff to feed river systems, it may be necessary to monitor this species. Other states such as New York and Massachusetts have employed their Natural Heritage Programs to monitor *P. ceratophyllum*, which may also be an option in Georgia. An analysis of the likely range of *P. ceratophyllum* in Georgia with respect to indicators of hydrologic alteration within this range provides some focal watersheds to begin a monitoring process, including the Conasauga, Upper Oconee, Upper Chattahoochee and Etowah basins.

INTRODUCTION

Aquatic macrophytes are experiencing significant changes within their habitat as our larger river systems continue to be altered by dams (Dynesius and Nilsson,1994), and water extractions. Changes to the natural flow regime can influence plants by changing the timing of critical flows (Poff et al. 1997) that may be necessary for seed dispersal, or by creating more pronounced low flow events, which can cause direct stress on or loss of aquatic species.

Often aquatic macrophytes occur in mid-order rivers where an open canopy allows for necessary sunlight (Argentina, 2006). These regions also tend to be most impacted by hydrologic alterations, as headwater streams are dewatered for development and mid and downstream portions are often impounded (Freeman et al. 2007).

An important foundational macrophyte along the east coast of the United States is *Podostemum ceratophyllum.* It thrives in high velocity conditions on rocky substrates typical of shoal habitat (Hammond 1937). It is a root-less species that attaches to rocks with a disk-like appendage called a raphe (Hammond 1937).

P. ceratophyllum plays an important ecological role as it provides a complex habitat matrix for other benthic organisms (Argentina 2006, Grubaugh and Wallace 1995, Hutchens et al. 2004). Its abundance has been correlated with increasing abundances of macroinvertebrates (Hutchens et al. 2004, Grubaugh and Wallace 1995, Voshell and Parker 1985) and presence of fish species (Connelly et al. 1999, Argentina 2006, Hagler 2006, Marcinek 2003), including a number of imperiled fishes (Freeman and Freeman 1994, Hagler 2006).

While *P. ceratophyllum* plays a key role as a major primary producer in middle order streams, it has been in decline across its range, particularly in the northeastern U.S. (USDA 2008). According to the U.S. Department of Agriculture (USDA) (2008), it is listed as a species of concern in Connecticut, Maine, Massachusetts and Tennessee. *P. ceratophyllum* is threatened in New York, endangered in Ohio and considered "historic" in Rhode Island (USDA 2008) (Figure 4.1). A "Historic" classification in this state implies that no specimens have been observed since 1982 (USDA 2008).

Although *P. ceratophyllum* is not listed as of special concern in any southeastern U.S. states, researchers have noted declines or population changes. Hill and Webster (1985) note that *P. ceratophyllum* productivity found in their study in the New River, VA was higher than that of Rogers et al (1983), whose site was just 128 km downstream and experienced strong daily fluctuations in flow from an upstream hydroelectric dam. Nelson and Scott (1962) also note that *P. ceratophyllum* was vulnerable to low flow events in a middle order Georgia Piedmont River, where short drying events caused the plant to dry, break off and flow downstream as detritus.

A study in a middle order Georgia Piedmont River by J. Pahl, R. Katz and M. Freeman (2008) (Chapter 2) found that hydrologic events such as low flows at an hourly scale may have a negative effect on *P. ceratophyllum* biomass. Often short low flow events are the result of upstream water extraction or hydropower generation, and longer duration events may be caused by drought conditions.

The goal of this chapter is to assess the likely range of *P. ceratophyllum* above the Fall Line in Georgia, and the possible extent of hydrologic alteration which may be affecting populations. Areas with the highest percentage of habitats impacted are cross-referenced with projected population growth to better understand the possible threats to *P. ceratophyllum* in the future through increased water extraction (Seager et al. 2007) and impoundment construction (SB 346 2008).

METHODS

In order to determine the possible range of *Podostemum ceratophyllum* within the Piedmont, Valley and Ridge, Appalachian, and Cumberland Plateau regions of Georgia (above the Fall Line), we used a subset of the Georgia Museum of Natural History database of fish collections in Georgia containing records from 1995-2007. The presence of *P. ceratophyllum* was recorded at shoal sites, as it is an indicator of good fish habitat (Argentina 2006, Hagler 2006, and Marcinek 2003). The sampling locations where *P. ceratophyllum* was present are shoal habitats and were characterized in terms of stream order, link magnitude and downstream link for a descriptive analysis of *P. ceratophyllum* general range requirements.

Strahler stream order is a process for defining stream size based on a hierarchy of tributaries (Strahler 1952). Link magnitude is a surrogate for upstream watershed size, as it is a count of all first order streams and is correlated with drainage area. Downstream link refers to the number of first order streams draining into the closest downstream segment to the site. This may be important, as tributaries close to larger order segments may be more likely to be colonized from larger patches of *P. ceratophyllum* located in large shoals.

We chose to use Geographic Information Systems (GIS) to view this data on the USGS National Hydrography Data Set 1999, 1:100,000 scale stream cover, because this is available to the public (http://nhd.usgs.gov/data/html) and most commonly used for similar research. The stream coverage was underlain by the USGS 1946 Physical Divisions of the United States, automated from Fenneman's 1:7,000,000 scale, physiographic provinces map. County designations were delineated using the USGS 1994 1:100,000 scale County Boundary-DLG map and watersheds were identified using a modification of the USGS HUC 8 watershed boundaries map. USGS gage locations were mapped using the USGS stream flow gage coverage available at (http://water.usgs.gov/waterwatch/?m=real&r=ga).

Due to the lack of a non-random sample of *P. ceratophyllum* locations and of specific non-presence data, a model to predict *P. ceratophyllum* presence was not possible at this time; however my descriptive approach may provides information on where *P. ceratophyllum* is known to occur on a larger scale. Based on this non-random sampling of *P. ceratophyllum* sites, we accept that there are likely locations outside of this range that are also suitable for *P. ceratophyllum* habitat.

In order to assess the possibility of hydrologic alteration near these *P. ceratophyllum* observations, I identified U.S. Geological Survey (USGS) gages within watersheds that contained *P. ceratophyllum* (Figure 4.2) and assessed the 15 minute interval hydrograph for signs of hydrologic alteration over the previous 60 days for each gage. Daily patterns in fluctuating discharge were determined to be the likely result of upstream water withdrawals or hydropower dam releases (Figure

4.3). While many of the hydrographs for each gage had easily distinguished patterns of alteration, others were more difficult and possibly the result of natural daily variations, particularly where the flow was extremely low (<1 cfs). In these cases, if there was a pattern of reductions or rises in flow with each day, and if daily fluctuations were 10% or more of the daily base flow, the gages were identified as altered.

To better understand the extent of hydrologic alteration, we determined the percent of USGS gages within each major watershed that showed signs of alteration. We believe this is the most informative approach given the lack of knowledge regarding locations of the source of alteration with respect to each gage (exact municipal and industrial surface withdrawal locations are not public information due to Homeland Security regulations).

Ideally, the use of a hydrology model such as the Indicators of Hydrologic Alteration (IHA) may be useful to quantify specific changes in hydrology that may be biologically meaningful to *P. ceratophyllum* such as low flow durations (Richter et al. 2007), however adequate before/after data were not available within the time frame of this project. Models such as IHA also typically work with daily data, so development of a model that works with more fine-scale hydrology measurements at the 15 minute or hourly time interval would be necessary to detect some of the short-term changes in hydrology which may negatively affect *P. ceratophyllum* biomass.

RESULTS

The results of this analysis indicate that a conservative estimate of the range of *P. ceratophyllum* above the Fall Line in Georgia spans almost all HUC 8 watersheds; exceptions are the Tugaloo, Hiawassee and Middle Tennessee-Chickamauga, although no sampling occurred there, so it is possible the range extends into these basins also.

Most of the *P. ceratophyllum* observations occur in middle order streams (Figure 4.4), and there seems to be some patterns involved with link magnitude and downstream link. For all data, link magnitude and downstream link are highly, positively correlated (R^2 = 0.88; Figure 4.5), but are less so for the samples under a value of 100 in link magnitude (R^2 = 0.14; Figure 4.5). The correlation between downstream link and link magnitude is actually negative for the samples with link magnitudes equal to or less than 10 (R = -0.19) (Figure 4.5), indicating that sites where *P. ceratophyllum* occurs may have a slight tendency to have higher downstream links when link magnitudes are very small. This type of pattern results when patches are in smaller streams but closely connected to larger systems, which may provide a better source for colonization.

Within this range, there are 159 USGS gages, 83 of which that indicate some form of hydrologic disturbance. The most altered basins (>50%) are the Oostanaula, Conasauga, Middle Savannah, Upper Chattahoochee, Etowah and the Upper Oconee (Figure 4.6, Table 4.1). The Ocoee Basin contains *P. ceratophyllum*, however no USGS gages were present in this basin for analysis.

DISCUSSION

Based on previous work by J. Pahl, R. Katz and M. Freeman (2009) (Chapter 1), it appears that shoals within waters upstream and downstream of USGS gage locations indicating hydrologic alteration may be areas to focus future monitoring of *P. ceratophyllum*. As *P. ceratophyllum* observations in other states indicate upstream water withdrawals or impoundments may be responsible for changes in *P. ceratophyllum* population sizes over time (NYSNHP 2008), these locations and drainages may be important focal points for a monitoring approach.

As we come to understand the critical role *P. ceratophyllum* plays in providing good habitat for a number of fish (Argentina 2006, Hagler 2006, Marcinek 2003) and macroinvertebrate species (Hutchens et al. 2004, Grubaugh and Wallace 1995, Voshell and Parker 1985), including imperiled species (Freeman and Freeman 1994, Hagler 2006), the need for monitoring of this species in Georgia is becoming more apparent. The results of this exercise highlight areas where attentive monitoring of this species could occur, as they may represent the most challenging places for *P. ceratophyllum* to maintain populations.

Podostemum ceratophyllum is typically found in large drainage areas (> 400 km^2, Etowah River: Hagler, 2006 and > 2000km^2, Flint River: Marcinek 2003) which may be related to increased sunlight availability (Argentina 2006), however one notable exception may be the Conasauga River where percent cover declines in relation to drainage area (Argentina 2006). J.E. Argentina and B.J. Freeman note in unpublished data that *P. ceratophyllum* has declined approximately 50% at some sites in the Conasauga

River over the last 20 years (2005). While there may be a number of causes for this decline, one possibility could be the higher percentage of altered flows experienced in that basin as a result of water extractions or impoundments (Table 4.1) relative to the Etowah or Upper Flint. (The possibility of this effect would depend however on the relative location of these site experiencing declines to sources of flow alteration).

Monitoring of aquatic species in Georgia such as *P. ceratophyllum* may be increasingly important as human population projections indicate a 46.8% increase between 2000 and 2030 (USCB 2008). More people will undoubtedly increase stress on our aquatic resources. Population projections by county in Georgia show that 88% of the counties expected to grow by more than 50% between 2000 and 2015 were above the Fall Line, with the highest growth rates occurring in counties in the following basins: Upper Chattahoochee, Etowah, Upper Oconee and the Upper Flint (GAOPB 2005). Table 4.2 highlights the top 12 counties and their projected growths in percent.

Particularly disturbing is the projection that by 2015, Gwinnett county (located in the headwaters of the Upper Oconee), will house one out of every eleven people in Georgia (GAOPB 2005), and already has a high proportion of hydrologic alteration. By 2015 the 28 county Atlanta-metro area is expected to house about 57% of the state's population, and require potable water for this growth. Most of the projected population growth is for the region above the Fall Line, where there is a large area of headwater streams and middle order rivers, and the majority of *P. ceratophyllum* populations likely exist.

In conjunction with increasing populations, climate change projections for the north Georgia region include increased precipitation along with increased evapotranspiration rates, likely resulting in decreased runoff to fuel river systems (Mulholland et al. 1997). Low flows on top of increased water extraction may result in perilous conditions for *P. ceratophyllum* in the future.

To meet some of the future demand as well as to mitigate some of the problems due to the recent drought in the southeast, Georgia's Legislature has passed the Georgia Water Conservation and Drought Relief Act (SB342 2008) which encourages and provides funding for reservoir construction. Impoundment structures alter flows, and during droughts, may be sources of debate regarding outflows, as was experienced during the drought of 2007-2009 when Lake Lanier outflows became a legal warfare between the states of Georgia and Florida. It may be critical to assemble baseline data on *P. ceratophyllum* now to better understand its population dynamics and stressors; this may help us mitigate the effects of future impoundments and manage impoundment outflows to benefit people and the benthic community.

Monitoring approaches for *P. ceratophyllum* in other states where it is listed as of special concern or threatened (NY and MA) are based in the Natural Heritage Program. The New York Natural Heritage Program, a contract unit housed in the New York State Department of Environmental Conservation's Division of Fish, Wildlife and Marine Resources, was established in 1985 and is a partnership with The Nature Conservancy (NYSNHP 2008). The mission of this organization is to "facilitate conservation of New York's biodiversity by providing comprehensive information and scientific expertise on rare species and natural ecosystems to resource managers and other conservation partners (NYSNHP 2008)." *Podostemum ceratophyllum* is currently monitored by this program in cooperation with Cornell University, at an un-specified time interval. Records show monitoring to occur fairly randomly but closer to a decadal time scale. A number of field observation records indicated a decline in *P. ceratophyllum* within locations among years, and potentially attribute this to upstream impoundments or water diversions (NYSNHP 2008).

The Massachusetts Natural Heritage and Endangered Species Program was founded in 1978 and serves as the State's branch of the National Natural Heritage program in cooperation with The Nature Conservancy. This organization's primary goal is to protect the State's range of native biological diversity (MANHESP 2008) It is responsible for conservation and protection of the State's non-game non-commercial species and has over 176 invertebrate and vertebrates and 259 plant species listed as of special concern, threatened or endangered (MANHESP 2008). Unfortunately state funding for this project was discontinued in 2004, and it now relies solely on grant money for specific projects, private donations, and over 20,000 residents who contribute via their state income tax forms (MANHESP 2008). The program currently monitors *P. ceratophyllum* as it is listed of special concern, occurring in only eight locations across the state. Monitoring occurs at five year intervals for species of this listing to document any changes in population vigor and to identify any possible sources of decline.

The NY and MA Natural Heritage Programs are comparable to the Georgia Department of Natural Resources (GADNR) Wildlife Resources Division Natural Heritage Program, now referred to as the Nongame Conservation Section. The GADNR program was established in 1986, and focuses on rare, threatened or endangered species and communities (GADNR 2008). Like the NY and MA Programs, it is geared towards providing an objective source of information regarding plant and animal communities for conservation purposes and land use decision making. Both NY and MA include an expansive data base regarding rare, threatened and endangered organisms; however *P. ceratophyllum* has not yet made the Georgia list. The resource base afforded to such programs, and the general use of data for management decisions, may make the Natural Heritage Program a key universal monitoring entity in Georgia.

In addition to monitoring, further research by the scientific community may enhance our understanding of the biological response of *P. ceratophyllum* to hydrologic stress and other anthropogenic sources of decline. Ideally this information along with patterns in *P. ceratophyllum* population abundance and quality will help inform management of Georgia's water resources.

CHAPTER 5

CONCLUSIONS

Hydrologic alterations in the form of extreme drought, water impoundments and extraction have profoundly shaped riverine systems in the southeastern United States. Low annual rainfall, in conjunction with special permits for continued water use, has come close to dewatering some major rivers. While many aquatic organisms may be impacted by these conditions, some of the most affected are sessile aquatic macrophytes.

In Georgia, and many southeastern states, the predominant aquatic macrophyte is the riverweed, *Podostemum ceratophyllum*, an important foundational species. This plant has been in decline in northeastern states, and the results of this research show that there is the potential for local declines due to hydrologic stress. Reductions in flow and continued daily disturbances from upstream dams or extractions result in extremely low water depths (< 5 cm), which were found to have a negative effect on *P. ceratophyllum* biomass. It is likely that a low flow threshold exists below which *P. ceratophyllum* biomass is significantly affected on a larger scale.

While this study also indicated that *P. ceratophyllum* may be able to re-colonize previously disturbed areas through asexual spread, seed dispersal ability may be limited and should be investigated further. Local recovery will depend on remnant populations that manage to exist in wetted refuge areas.

This work found substantially lower *P. ceratophyllum* biomass in the Middle Oconee River compared to studies conducted 16 and 50 years ago; an issue which may extend beyond the Upper Oconee watershed. Hydrologic alteration seems to be prevalent across Georgia above the Fall Line, where the range of *P. ceratophyllum* is extensive. Projected population growth in the region threatens to compound the problem and further reduce biomass of this important species.

State-wide programs, such as the Georgia Natural Heritage Program, may be employed to conduct base-line monitoring of this species to better understand how we may mitigate the effects of future water consumption and impoundments. Scientific research should continue and focus on determining shoal-wide effects of varying hydrology as well as estimating the quality and quantity of *P. ceratophyllum* across its range.

REFERENCES

Anderson, D. R., and K. P. Burnham. 2002. Avoiding pitfalls when using information-theoretic methods. J. of Wildl. Manage. 66(3): 912-918.

Anderson, D. R., W. A. Link, D. H. Johnson, K. P. Burnham. 2001. Suggestions for presenting the results of data analyses. J. of Wildl. Manage. 65(3): 373-378.

Anderson, E. P., M. C. Freeman, and C. M. Pringle. 2006. Ecological consequences of hydropower development in Central America: impacts of small dams and water diversions on neotropical stream fish assemblages. River Res. Appl. 22(4)397-411.

Argentina, J. E. 2006. *Podostemum ceratophyllum* and patterns of fish occurrence and richness in a southern Appalachian river. M.S. Thesis, University of Georgia, Athens, GA.

Box, G.E., and D.R. Cox. 1964. An analysis of transformations (with discussion). J. Roy. Statist. Soc. Ser. B. 26:211-252

Burnham, K. P., and Anderson, D. R. 2004. Multimodel Inference: Understanding AIC and BIC in model selection. Sociological Methods and Research. 1-56.

Bernhardt, E. S., E. B. Suddeth, M. A. Palmer, J. D. Allan, J. L. Meyer, G. Alexander, J. Follastad-Shah, B. Hassett, R. Jenkinson, R. Lave, Jeanne Rumps, and L. Pagano. 2007. Restoring rivers one reach at a time: results from a survey of U.S. river restoration practitioners. Restoration Ecology. 15(3)482-493.

Bunn, S. E., and A. H. Arthington. 2002. Basic principles and ecological consequences of altered flow regimes for aquatic biodiversity. Environmental Management 30:492-507

Catalano, M. J. and M. A. Bozek. 2007. Effects of dam removal on fish assemblage structure and spatial distributions in the Baraboo River, Wisconsin. North American Journal of Fisheries Management. 27:519-530.

Connelly, W.J., D.J. Orth, R.K. Smith. 1999. Habitat of the riverweed darter, *Etheostoma podostemone* Jordan, and the decline of riverweed, *Podostemum ceratophyllum*, in the tributaries of the Roanoke River, Virginia. Journal of Freshwater Ecology 14(1): 93-102.

Davis, Robert A. Project Manager. FLHC, Inc. Tallassee Shoals Hydropower Dam, Athens, GA. Group Communication 10-12/2007

Dewson, Z.S., A.B.W. James, and R.G. Death. 2007. A review of the consequences of decreased flow for instream habitat and macroinvertebrates. J. N. Am. Benthol. Soc. 26(3):401-415

Dutterer, A.C. and M.S. Allen. 2008. Spotted sunfish habitat selection at three Florida rivers and implications for minimum flows. Transactions of the American Fisheries Society 137:454-466

Dynesius, M., and C. Nilsson. 1994. Fragmentation and flow regulation of river systems in the northern third of the world. Science. 266(5186):753-762.

Ellison, A.M, M.S. Bank, B.D. Clinton, E.A. Colburn, K. Elliot, C.R. Ford, D.R. Foster, B.D. Kloeppel, J.D. Knoepp, G.M. Lovett, J. Mohan, D.A. Orwig, N.L. Rodenhouse, W.V. Sobczak, K.A. Stinton, J.K. Sone, C.M. Swan, J. Thompson, B. von Holle, J.R. Webster. 2005. Loss of foundation species: consequences for the structured dynamics of forested ecosystems. Front. Ecol. Environ. 9:479-486

Englund, G., B-G. Jonsson, and B. Malmqvist. 1997. Effects of flow regulation on bryophytes in north Swedish rivers. Biological Conservation. 79(1):79-86

Freeman, B.J., and J.E. Argentina. 2005. unpublished data in Argentina, 2006.

Freeman, B.J., and M.C. Freeman. 1994. Habitat use by an endangered riverine fish and implications for species protection. Ecology of Freshwater Fish. 3(2): 49-58.

Freeman, M.C., and P.A. Marcinek. 2006. Fish assemblage responses to water withdrawals and water supply reservoirs in piedmont streams. Environ. Manage. 38(3):435-450

Freeman, M. C., C. M. Pringle, C. R. Jackson. 2007. Hydrologic connectivity and the contribution of stream headwaters to ecological integrity at regional scales. J. Am. Water Resour. Assoc. 43(1)5-14.

GADNR. Georgia Department of Natural Resources. 1998. Oconee River Basin Management Plan; Georgia Department of Natural Resources, Environmental Protection Division.

GADNR, Georgia Department of Natural Resources. 2008. Natural Heritage Program. http://georgiawildlife.dnr.state.ga.us/content/displaycontent.asp?txtDocument=87

GAOPB, Georgia Office of Planning and Budget. 2005. Georgia 2015 Population Projections.

Gehrke, P.C. and J.H. Harris. 2001. Regional-scale effects of flow regulation on lowland riverine fish communities in New South Wales, Australia. Regul. Rivers: Res. Mgmt. 17: 369-391

GRN, Georgia River Network, 2008. Oconee River Basin Fact-Sheet.

Grubaugh, J.W., 1994. Influences of elevation, stream size, and land use on structure, function, and production of benthic macroinvertebrate communities in two southern river ecosystems. Ph.D. Dissertation, University of Georgia, Athens, GA.

Grubaugh, J.W. and J.B. Wallace. 1995. Functional structure and production of benthic community in a Piedmont river: 1956-1957 and 1991-1992. Limnology and Oceanography 40:490-501.

Grubaugh J.W., J.B.Wallace, and E.S.Houston. 1997. Production of benthic macroinvertebrate communities along a southern Appalachian river continuum. Freshwater Biology 37:581-596.

Hagler, M. M. 2006. Effects of natural flow variability over seven years on the occurrence of shoal-dependent fishes in the Etowah River. M.S. Thesis, University of Georgia, Athens, GA.

Ham, S. F., J. F. Wright, and A. D. Berrie. 1981. Growth and recession of aquatic macrophytes on an unshaded section of the River Lambourn, England, from 1971 to 1976. Freshwater Biology 11:381-290.

Hammond, BL. 1937. Development of *Podostemum ceratophyllum*. Bulletin of the Torrey Botanical Club. 64:17-36

Hill, B.H., and J.R.Webster. 1984. Productivity of *Podostemum ceratophyllum* in the New River, Virginia. American Journal of Botany. 71(1):130-136

Hutchens, J.J., J.B. Wallace, and E. D. Romaniszyn. 2004. Role of *Podostemum ceratophyllum* Michx. in structuring benthic macroinvertebrate assemblages in a southern Appalachian river. J. N. Am. Benthol. Soc. 23(4):713-727

Huryn, A.D., and J.B.Wallace. 2000. Life history and production of stream insects. Annual Review of Entomology 45:83-110.

Kanehl, P. D., J. Lyons, and J. E. Nelson. 1997. Changes in the habitat and fish community of the Milwaukee River, Wisconsin, following removal of the Woolen Mills Dam. N. Am. J. Fish. Manage. 17(2)387-400.

Knight, Jeff, PE. Athens-Clarke County. Environmental Engineer. Personal Communication 10-12/2007.

Kominsoki, J. S., B. J. Mattsson, B. Rashleigh, and S. L. Eggert. 2007. Using Long-term chemical and biological indicators to assess stream health in the Upper Oconee River watershed. Proceedings of the 2007 Georgia Water Resources Conference, March 27-29, 2007. University of Georgia.

Malmqvist, B., and G. Englund. 1996. Effects of hydropower-induced flow perturbations on mayfly (Ephemeroptera) richness and abundance in north Swedish river rapids. Hydrobiologia 341:145-158.

Marcinek, P.A. 2003. Variation of fish assemblages and species abundances in the upper Flint River shoals, Georgia. M.S. Thesis. University of Georgia, Athens, GA.

MANHESP, Massachusetts Natural Heritage & Endangered Species Program. 2008. *Podostemum ceratophyllum* monitoring data. Division of Fisheries and Wildlife. Contact: Sarah Haggerty, Information Manager.

McCully, P. 2001. Silenced Rivers. The Ecology and Politics of Large Dams. Zed Books, London, United Kingdom. 359pp.

McIntosh, M. D., M. E. Benbow, and A. J. Burky. 2002. Effects of stream diversion on riffle macroinvertebrate communities in a Maui, Hawaii, stream. Journal of Environmental Engineering 129:755-764.

Mulholland, P.J., G.R. Best, C.C. Coutant, G.M. Hornberger, J.L. Meyer, P.J. Robinson, J.R. Stenberg, R.E. Turner, F. Vera-Herrera, R.G. Wetzel. 1997. Effects of climate change on freshwater ecosystems of the south-eastern United States and the gulf coast of Mexico. Hydrological Processes. 11(8):949-970

Naiman, R. J., J. J. Magnuson, D., McKnight, M., and J. A. Stanford. 1995. The freshwater imperative: A research agenda. Island Press, Washignton, D. C. 165 pp.

NARSAL, Natural Resources Spatial Analysis Lab. Accessed 2008. “Georgia Land Use Trends.” University of Georgia College of Agriculture and Environmental Sciences. http://narsal.uga.edu/glut/county.php

Nelson, D.J., and D.C. Scott. 1962. Role of detritus in the productivity of a rock-outcrop community in a piedmont stream. Limnology and Oceanography. 7(3):396-413.

NYSNHP, New York State Natural Heritage Program. 2008. *Podostemum ceratophyllum* monitoring data. N.Y. Department of Environmental Conservation. Contact: Steve Young

Olden, J.D. and N.L. Poff. 2003. Redundancy and the choice of hydrologic indices for characterizing streamflow regimes. River Res. Applic. 19:101-121

Pahl, J.P. 2009. Effects of flow alteration on the aquatic macrophyte *Podostemum ceratophyllum* (Riverweed); local recovery potential and regional monitoring strategy. M.S. Thesis, University of Georgia, Athens, GA.

Parker, J.D. 2005. Plant-herbivore interactions: consequences for the structure of freshwater communities and exotic plant invasions. Ph.D. Dissertation, Georgia Institute of Technology, Atlanta, GA.

Pettit. N. E., R. H. Froend, P. M. Davies. 2001. Identifying the natural flow regime and the relationship with riparian vegetation for two contrasting western Australian rivers. Regulated Rivers: Research & Management. 17(3)201-215.

Philbrick C. T., Vomela, M., Novelo, A. R. 2006. Preanthesis cleistogamy in the genus *Podostemum* (Podostemuaceae). Rhodora. 180(935)195

Philbrick, C. T. Aspects of Floral Biology, Breeding System, and Seed and Seedling Biology in Podostemum ceratophyllum (Podostemaceae). Systematic Botany, 9(2)166-174.

Poff, N.L., Allan J.D., Bain, M.B., Karr, J.R., Prestegaard, K.L., Richter, B.D., Sparks, R.E., Stromberg J.C. 1997. The natural flow regime – a paradigm for river conservation and restoration. BioScience 47:769-784.

Pringle, C. M., M. C. Freeman, and B. J. Freeman. 2000 Regional effects of hydrologic alterations on riverine macrobiota in the New World: tropical-temperate comparisons. Bioscience. 50(9)807-823.

Propst, D. L., K. B. Gido, and J. A. Stefferud. 2008. "Natural Flow Regimes, nonnative fishes, and native fish persistence in arid-land river systems." Ecol. Appl. 18(5):1236-1252

Rader, R. B., and T. A. Belish. 1999. Influence of mild to severe flow alterations on invertebrates in three mountain streams. Regulated Rivers: Research and Management 15:353-363.

Revenga, C., S. Murray, J. Abramovitz, and A. Hammond. 1998. Watersheds of the world; ecological value and vulnerability. Washington (DC): World Resources Institute and Worldwatch Institute.

Richter, B.D., J. V. Baumgartner, R. Wigington, D. P. Braun. 1997. How much water does a river need? Freshwater Biology 37,231-249.

Richter, B.D., J.V. Baumgartner, J. Powell, and D.P. Braun. 1996. A method for assessing hydrologic alteration within ecosystems. Conservation Biology. 10(4):1163-1174.

Richter, B.D. and R. Mathews. 2007. Application of the indicators of hydrologic alteration software in environmental flow setting. Journal of the American Water Resources Association. 43(6):1400-1413

Rosi-Marshall, E. J., J. L. Meyer. 2004. Quality of suspended fine particulate matter in the Little Tennessee River. Hydrobiologia. 519:29-37.

Rosenberg, D.M., F. Berkes, R.A. Bodaly, R.E. Hecky, C.A. Kelly, and J.WM Rudd. 1997. Large-scale impacts of hydroelectric development. Environ. Rev. 5(1):27-54

Rosenberg, D.M., P. McCully, and C.M.Pringle. 2000. Global scale environmental effects of hydrological alterations: introduction. BioScience 50(9):746-751

Roy, A. H., M. C. Freeman, B. J. Freeman, S. J. Wenger, W. E. Ensign, J. L. Meyer, 2005. "Investigating hydrologic alteration as a mechanism of fish assemblage shifts in urbanizing streams." J. of the North Am. Benthological Society 24(3):656-678

SB 342, 2008. Senate Bill 342, Georgia Water Conservation and Drought Relief Act. http://www.legis.state.ga.us/legis/2007_08/sum/sb342.htm

Seager, R., M. Ting, I. Held, Y. Kushnir, J. Lu, G. Vecchi, H. Huang, N.Harnik, A. Leetmaa, N-C. Lau, C. Li, J. Velez, N. Naik. 2007. Model projections of an imminent transition to a more arid climate in southwestern North America. Science. 316(5828):1181-1184

Shearer, Lee. Warrant sought in oil spill into Athens, GA., Creek. 2003, Athens Banner-Herald, Ga. Distributed by Knight Ridder/Tribune Business News.

Silk, N., and K. Ciruna eds. 2005. A practitioner's guide to freshwater biodiversity conservation. Washington, DC: Island Press.

Sparks, R. E. 1995. Need for ecosystem management of large rivers and floodplains. Bioscience. 45:168-182.

Strahler, A.N. 1952. Hypsometric (area altitude) analysis of erosional topology. Geological Society of America Bulletin. 63:1117-1142.

Suren, A. M., B. J. F. Biggs, M. J. Duncan, and L. Bergey. 2003a. Benthic community dynamics during summer low-flows in two rivers of contrasting enrichment 2. Invertebrates. New Zealand Journal of Marine and Freshwater Research 37:71-83

Suren, A. M., B. J. F. Biggs, C. Kilroy, and L. Bergey. 2003b. Benthic community dynamics during summer low-flows in two rivers of contrasting enrichment 1. Periphtyon. New Zealand Journal of Marine and Freshwater Research 37:53-70.

Voshell, J.R.Jr., C.R. Parker. 1985. Quantity and quality of seston in an impounded and free-flowing river in Virginia, U.S.A. Hydrobiologia. 122(3):271-280

Ward, J. V., K. Tockner, and F. Schiemer. 1999. Biodiversity of floodplain ecosystems: Ecotones and connectivity. Regulated Rivers: Research and Management 15:125-139

Williams, Kevin B. Senior Operations Specialist/Project Manager. Bear Creek Water Treatment Facility, Athens, GA. Personal Communication 10-12/2007

USCB, U.S. Census Bureau. 2008 U.S. Census Bureau population projections by state. http://www.census.gov/population/www/projections/projectionsagesex.html. Accessed 11/02/2008.

USDA, U.S. Department of Agriculture. 2008. Plant Database

USGS, U.S. Geological Survey. Online Hydrograph Data. http://waterdata.usgs.gov/nwis/rt
Accessed 8/2007 – 11/2008

Table 2.1: Characteristic sections of the cross-sectional transect. Each section is described in terms of substrate and surface water slope.

Section	Meters	Substrate	Surface Water Elevation
1	2 – 22	Sand/silt with random boulders	Fairly uniform (flat)
2	22 – 38	Varied (boulders, gravel, sand)	Sloping towards section 1
3	38 – 61	Gravel and Cobble, some boulders	Fairly uniform (flat) and relatively shallow
4	61 – 85	Mostly Bedrock	Fairly uniform (flat) and relatively shallow
5	85 – 94	Mostly Bedrock	Sloping towards the bank

Table 2.2: Comparison of annual mean P. ceratophyllum biomass between three decades. Our data is compared with that of Nelson and Scott, 1962 and Grubaugh and Wallace, 1995. The range of biomass values recorded during our study was 0 – 371.3 g-AFDM/m^2, however we reported the next lowest biomass value for comparison (only one sample had a biomass value of 0 g-AFDM/m^2).

Year of Study	**Mean *P. ceratophyllum* ± SE**	**Range**
Nelson & Scott 1956-1957	350.2 ± 33.8	136.8 - 635.0
Grubaugh & Wallace 1991-1992	514.0 ± 53.2	296.8 - 1044.8
Pahl 2009	54.0 ± 7.1	0.11 – 371.3

Table 2.3: Best-supported models of *P. ceratophyllum* standing stock biomass using habitat and time of year variables. Results are number of model parameters (K) and AIC values for the five (of 32 total covariate models) within two of the lowest AIC value. Model parameters include substrate (Bedrock/boulder or gobble/gravel), location (center 75% of channel or edges), velocity (cm/s; measured when sample was taken), time of year (represented by day and day^2 terms), and an interaction between location and time of year.

Covariates in Model	K	AICc	delta AICc	AIC Weights
Substrate, Location, Day, Day^2	6	41.97	0	0.19
Substrate, Location, Velocity, Day, Day^2	7	42.57	0.59	0.14
Location, Day, Day^2, Day*Location, Day^2*Location	8	43.36	1.39	0.09
Location, Day, Day^2	5	43.37	1.40	0.09
Substrate, Location, Velocity, Location*Day, Location*Day^2, Day, Day^2	9	43.39	1.42	0.09
Location, Velocity, Day, Day^2	96	43.90	1.94	0.07

Table 2.4: Best-supported models of *P. ceratophyllum* standing stock biomass using habitat, time of year and hydrology variables. Results are number of model parameters (K) and AIC values for the three (of 25 total models) within two of the lowest AIC value. Model parameters include substrate (Bedrock/boulder or gobble/gravel), location (center 75% of channel or edges), velocity (cm/s; measured when sample was taken), time of year (represented by day and day^2 terms), the total number of hours water depth was less than 5 cm during 30 days prior to sampling (T5), and the longest single duration in hours of water depth less than 5 cm during 30 days prior to sampling (L5).

Variables in Model	**K**	**AICc**	**Delta AICc**	**AIC Weights**
Substrate, Location, Day, Day^2, T5	7	40.88	0	0.11
Substrate, Location, Velocity, Day, Day^2, T5	8	41.76	0.87	0.07
Substrate, Location, Day, Day^2	6	41.97	1.09	0.07
Location, Day, Day^2, T5	6	42.07	1.19	0.06
Substrate, Location, Day, Day^2, L5	7	42.14	1.26	0.06
Substrate, Location, Velocity, Day, Day^2	7	42.57	1.68	0.05
Substrate, Location, Day, Day^2, Day*Location, Day^2*Location, T5	9	42.71	1.82	0.05
Substrate, Location, Velocity, Day, Day^2, L5	8	42.83	1.94	0.04

Table 2.5: A comparison of the total weight of relative support for each variable. The AIC weights of each model containing each hydrology model were summed, and all models containing only covariates were summed to represent null (no hydrology) models. The most supported variable is the total number of hours with less than 5 cm of water depth of the last 30 days. This parameter is 1.57 times more likely to describe *P. ceratophyllum* biomass than the next highest variable (null variable with no hydrology).

Variable	Relative AIC Weight (sums)
Total Hours <5cm	0.37
Null (no hydrology)	0.23
Longest Hour <5cm	0.21
Longest Hour <0cm	0.09
Total Hours <0cm	0.09

Table 2.6: Top AIC model variable estimates. The estimated effect on the response variable (*P. ceratophyllum* log g-AFDM/m^2) for each factor within the top model (n=92) and standard error are displayed below. The intercept is the model intercept. T5 refers to the total number of hours 30 days prior to collection that the sample experienced water depths less than 5 cm.

	Intercept	**Substrate**	**Location**	**Day**	**Day2**	**T5**
Estimates	1.4447	0.6012	-1.1364	0.0232	-0.00006	-0.0013
Standard error	0.6005	0.3301	0.2629	0.0062	0.00002	0.0007

Table 2.7: Hydrology effect on *P. ceratophyllum* biomass. Based on the variable estimates from the top model, the following biomass loss (in percent) are estimated for a range of total hours spent with less than 5 cm of water during the last 30 days. The shortest total duration was the smallest recorded number of hours greater than zero. The average values refer to hours spent in less than 5 cm of water among samples that experienced at least some shallow water (n=40). The longest duration was the greatest number of hours recorded within 30 days of sample collection, spent with less than 5 cm of water.

	Hours < 5 cm	**Log Biomass loss (%)**
Shortest	2	0.06
Average (all >0 hours)	256.40	7.83
Longest	687	21.12

Table 3.1: Middle Oconee River block annual comparisons. A split-plot repeated measures analysis was conducted. Time is the only significant factor. A univariate approach adjusted for the Huynh-Feldt epsilon was used to calculate p-values for parameter involving Time due to insufficient degrees of freedom for a multivariate test.

Variable	Degrees of Freedom	F value	P value
Time	12	6.25	<0.0001*
Time*Treatment	12	0.70	0.6973
Time*Block	12	1.42	0.2203
Time*Treat*Block	12	0.48	0.8705
Treatment	1	1.65	0.5562
Block	1	0.03	0.2688
Block*Treatment	1	1.40	0.3022

Table 3.2: Middle Oconee River and Hunnicutt Creek comparisons. A split-plot repeated measures analysis with only two blocks (MOR all plots equal one block, HCC has one block). Time is significant as well as the Time*Block interaction. Due to this interaction, a profile analysis was conducted to determine at which time interval the significant interaction occurred. The significant time intervals and parameters are displayed in this table. A univariate approach adjusted for the Huynh-Feldt epsilon was used to calculate p-values for parameters involving Time due to insufficient degrees of freedom for a multivariate test.

Parameter	Degrees of Freedom	F value	P value
Time	12	26.88	<0.0001*
Time*Treatment	12	0.94	0.4459
Time*Block	12	3.01	0.0355*
Time*Treat*Block	12	0.72	0.5662
Treatment	1	0.03	0.8632
Block	1	1.08	0.3228
Block*Treatment	1	0.00	0.9659
Time Intervals/Parameter			
5:6 Time	1	16.22	0.0024*
5:6 Block	1	9.44	0.0118*
6:7 Time	1	5.65	0.0387*
7:8 Time	1	9.25	0.0124*
8:9 Block	1	7.17	0.0232*
12:13 Block	1	5.72	0.0379*

Table 3.3: Middle Oconee River growing season block comparisons. A split-plot repeated measures analysis was used. Time, treatment, block and block*treatment interaction factors were significant at $\alpha = 0.05$. Due to this interaction, a profile analysis was conducted to determine at which time interval the significant interaction occurred. The significant time intervals and parameters are displayed in this table. A univariate approach adjusted for the Huynh-Feldt epsilon was used to calculate p-values for parameters involving Time due to insufficient degrees of freedom for a multivariate test.

Parameter	**Degrees of Freedom**	**F value**	**P value**
Time	5	5.05	0.0104*
Time*Treatment	5	3.14	0.0501
Time*Block	5	3.00	0.0573
Time*Treat*Block	5	2.60	0.0834
Treatment	1	80.06	0.0009*
Block	1	37.87	0.0035*
Block*Treatment	1	29.56	0.0056*
Time Intervals/Parameter			
1:2 Treatment	1	19.68	0.0114*
1:2 Block*Treatment	1	15.40	0.0172*
4:5 Time	1	109.45	0.0005*
4:5 Treatment	1	85.05	0.0008*
4:5 Block	1	67.23	0.0012*
4:5 Block*Treatment	1	52.46	0.0019*

Table 3.4: Middle Oconee River and Hunnicutt Creek growing season comparisons. A split-plot repeated measures analysis was applied to the growing season re-colonization rates with only two blocks (MOR all plots equal one block, HCC has one block). Block is significant at time interval 1:2, and time is significant between time intervals 2 and 3. A Wilks' Lambda multivariate test was used for Time and its interactions, and a univariate approach was used to assess Treatment, Block, and their interaction.

Parameter	**Degrees of Freedom**	**F value**	**P value**
Time	5	15.96	0.0006*
Time*Treatment	5	0.40	0.8364
Time*Block	5	8.52	0.0046*
Time*Treat*Block	5	0.48	0.7820
Treatment	1	0.14	0.7150
Block	1	2.19	0.1648
Block*Treatment	1	0.44	0.5176
Time Intervals/Parameter			
1:2 Block	1	11.22	0.0058*
2:3 Time	1	24.13	0.0004*

Table 4.1: Hydrologic alteration by major Georgia river basin. Percent of U.S. Geological Survey gages showing signs of hydrologic alteration within each major river basin above the fall line where *Podostemum ceratophyllum* has been observed. The Middle Tennessee and Upper Coosa basins indicate 100% alteration, however they have very few (1 and 3 respectively) gages within GA, so it is likely that analysis of gages in Alabama and Tennessee would change this percentage. The most impaired basins according to this analysis include the Oostanaula, Conasauga, Middle Savannah, Upper Chattahoochee, Etowah and the Upper Oconee. The Little, Broad and Upper Savannah Rivers indicate no hydrologic alteration, possibly due to the small number of gages, and only partial overlap with the state of Georgia.

River Basin	% USGS gages Altered	Number of gages
Middle Tennessee	100	1
Upper Coosa	100	3
Oostanaula	71	7
Conasauga	71	7
Middle Savannah	67	3
Upper Chattahoochee	63	31
Etowah	60	21
Upper Oconee	56	9
Coosawattee	50	6
Middle Chattahoochee	50	20
Tugaloo	50	2
Upper Ocmulgee	45	22
Upper Flint	43	11
Upper Tallapoosa	33	3
Little	0	2
Broad	0	2
Upper Savannah	0	1

Table 4.2: Projected population growth in north Georgia. Population growth projected to occur from 2000 to 2015 in percent change for the top 12 fastest growing counties in Georgia. The watershed in which they occur is also noted. Data is from the Georgia 2015 Population Projections Report from the Georgia Office of Planning and Budget: Policy, Planning and Technical Support. 2005. A single asterisk (*) represents one of the top 12 counties in terms of population, in which half of the state of Georgia will live by 2015. A double asterisk (**) represents where 1/11th of Georgia's population will live by 2015, more than the population of Georgia's 79 smallest counties.

County	Growth (%)	Watershed	
Forsyth	137	Upper Chattahoochee	*
Henry	135	Upper Flint/Upper Ocmulgee	*
Newton	121	Upper Ocmulgee	*
Paulding	117	Etowah	
Cherokee	91	Etowah	*
Lee	91	Ichawaynachaway, Lower Flint, Kinchafoonee-Muckalee (below fall-line)	
Pickens	90	Etowah / Coosawattee	
Butts	88	Upper Oconee	
Dawson	87	Etowah/Upper Chattahoochee	
Barrow	84	Upper Oconee	
Walton	75	Upper Oconee	
Gwinnett	75	Upper Oconee	**

Figure 2.1: Hydrographs from the USGS gages in Athens, GA and Arcade, GA. These hydrographs illustrate the changes in natural flow regime as a result of upstream hydroelectric dam operations and municipal water withdrawals. The Arcade, GA gage is upstream of our study site, and the Athens, GA gage is downstream. The source of the alterations during the 1990's is likely the Tallassee Shoals Hydropower Dam, located approximately two miles upstream from Ben Burton Park. The source of hydrologic alteration during our study in 2007-2008, is Bear Creek Reservoir, a pump-storage facility constructed in 2002. The hydroelectric dam was not in operation throughout the course of our study due to historic drought conditions that did not enable the dam to produce electricity.

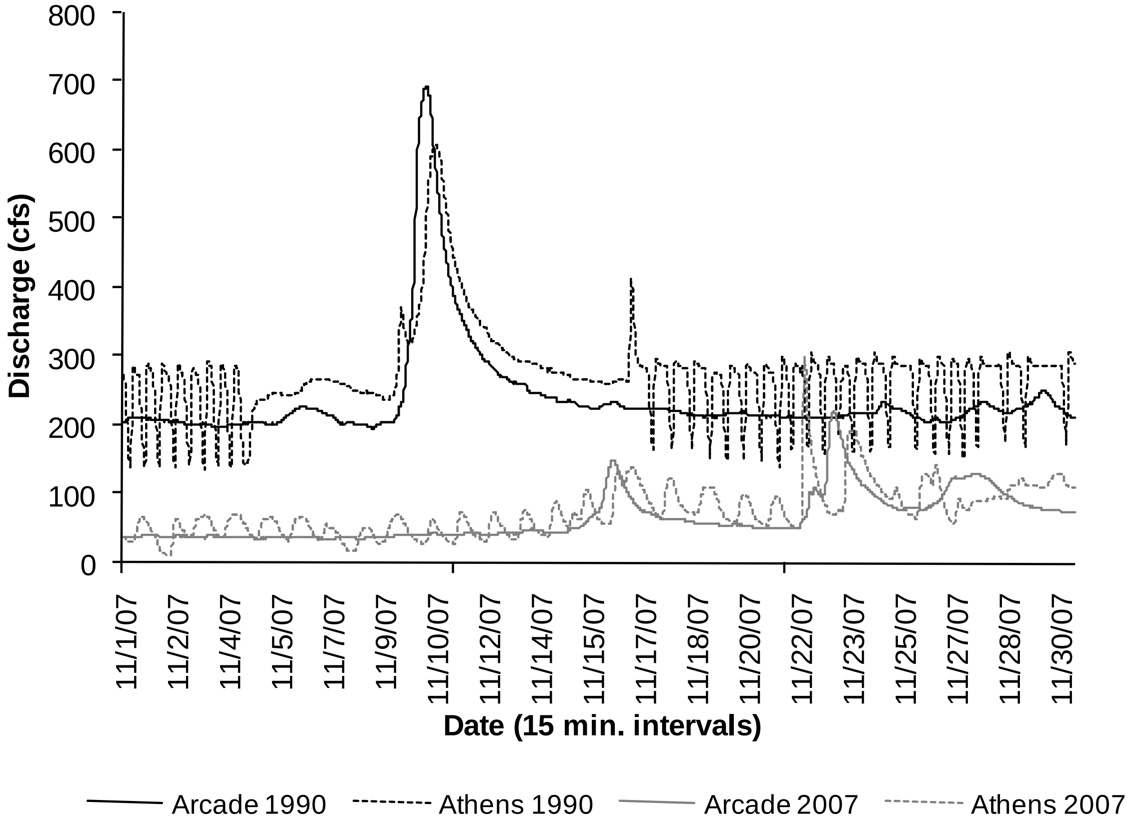
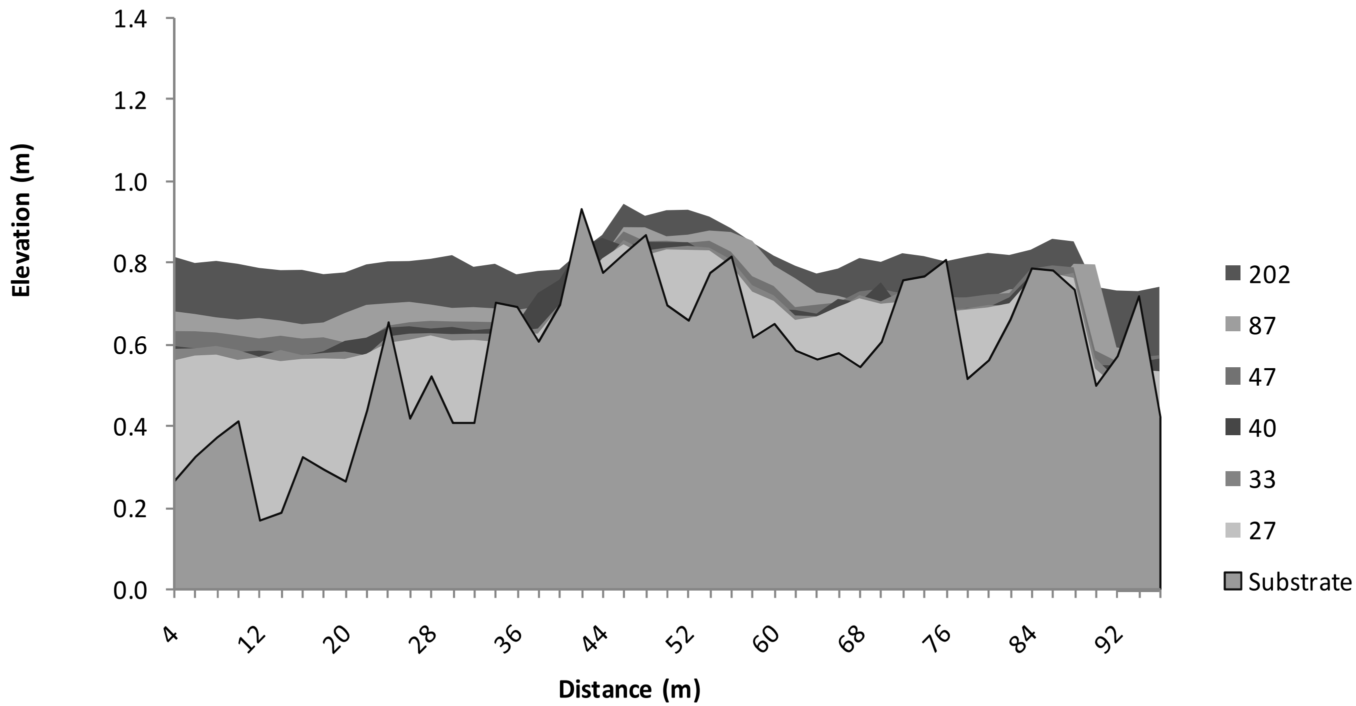

Discharge (cfs)
800
700
600
500
400
300
200
100
0
11/1/07
11/2/07
11/4/07
11/5/07
11/7/07
11/9/07
11/10/07
11/12/07
11/14/07
11/15/07
11/17/07
11/18/07
11/20/07
11/22/07
11/23/07
11/25/07
11/27/07
11/28/07
11/30/07
Date (15 min. intervals)
Arcade 1990
Athens 1990
Arcade 2007
Athens 2007

Figure 2.2: Water surface elevation changes across our study shoal. Changes along a cross-sectional transect in the Middle Oconee River, Ben Burton Park, Athens, GA. This figure illustrates the variability in flows across the channel. The legend refers to a subset of varying discharge levels in cfs (cubic feet per second). The substrate and water surface elevations are displayed using data collected at the 2 meter interval.



1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Elevation (m)
4
12
20
28
36
44
52
60
68
76
84
92
Distance (m)
202
87
47
40
33
27
Substrate

Figure 2.3: Monthly average P. ceratophyllum biomass comparisons between three studies. Our study 2007-2008 is compared with Grubaugh and Wallace (1995), who examined *P. ceratophyllum* biomass between 1991 and 1992, and Nelson and Scott (1962), whose study spanned 1956-1957. Error bars were not available from the two previous studies because they were not reported in their papers, however our error bars indicate that our monthly average biomass valued did not come close to the other studies. The lowest biomass reported by both authors was 136.8 g-AFDM/m^2 (Nelson and Scott, 1962), which is still higher than our highest monthly average.

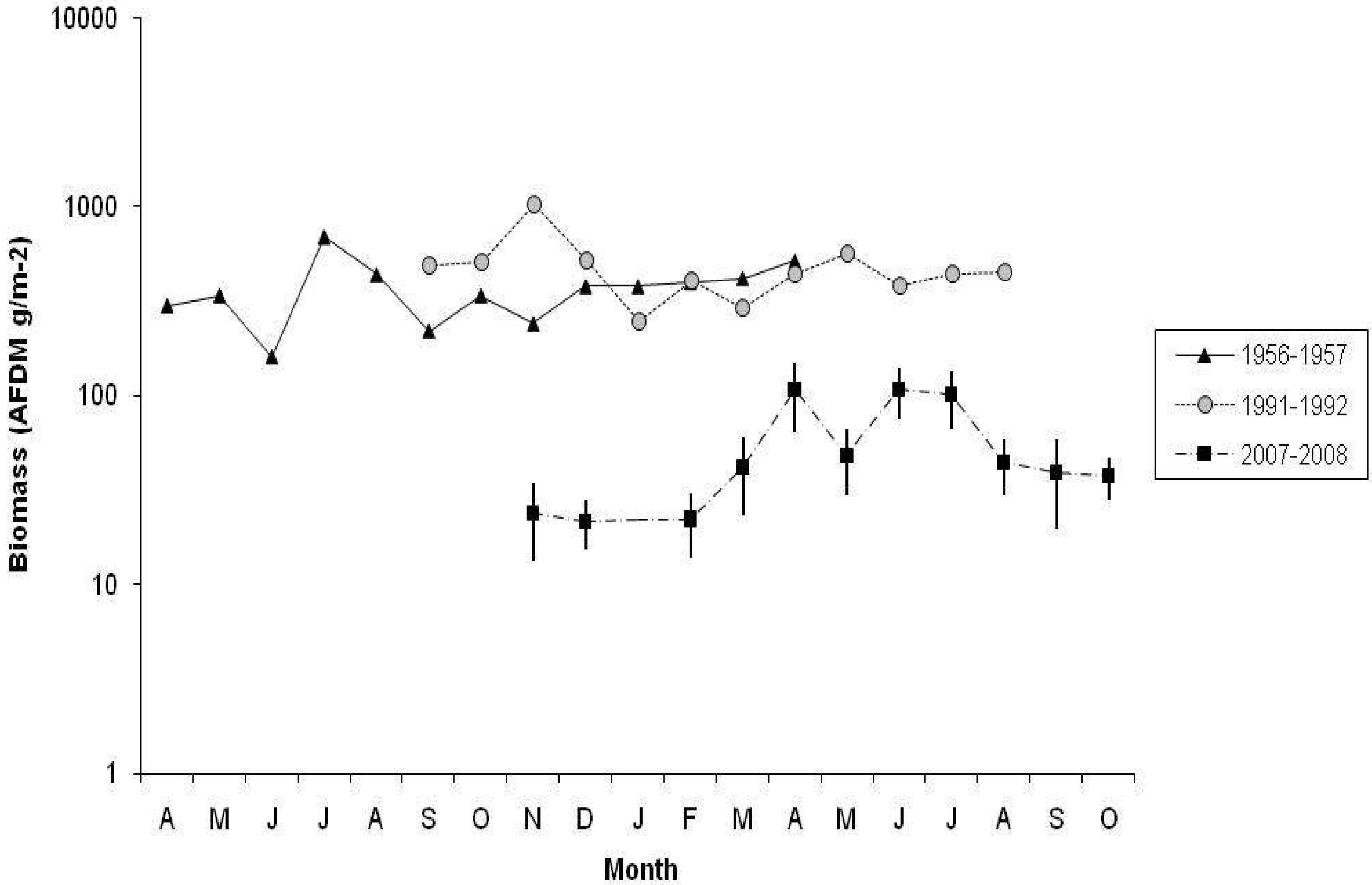
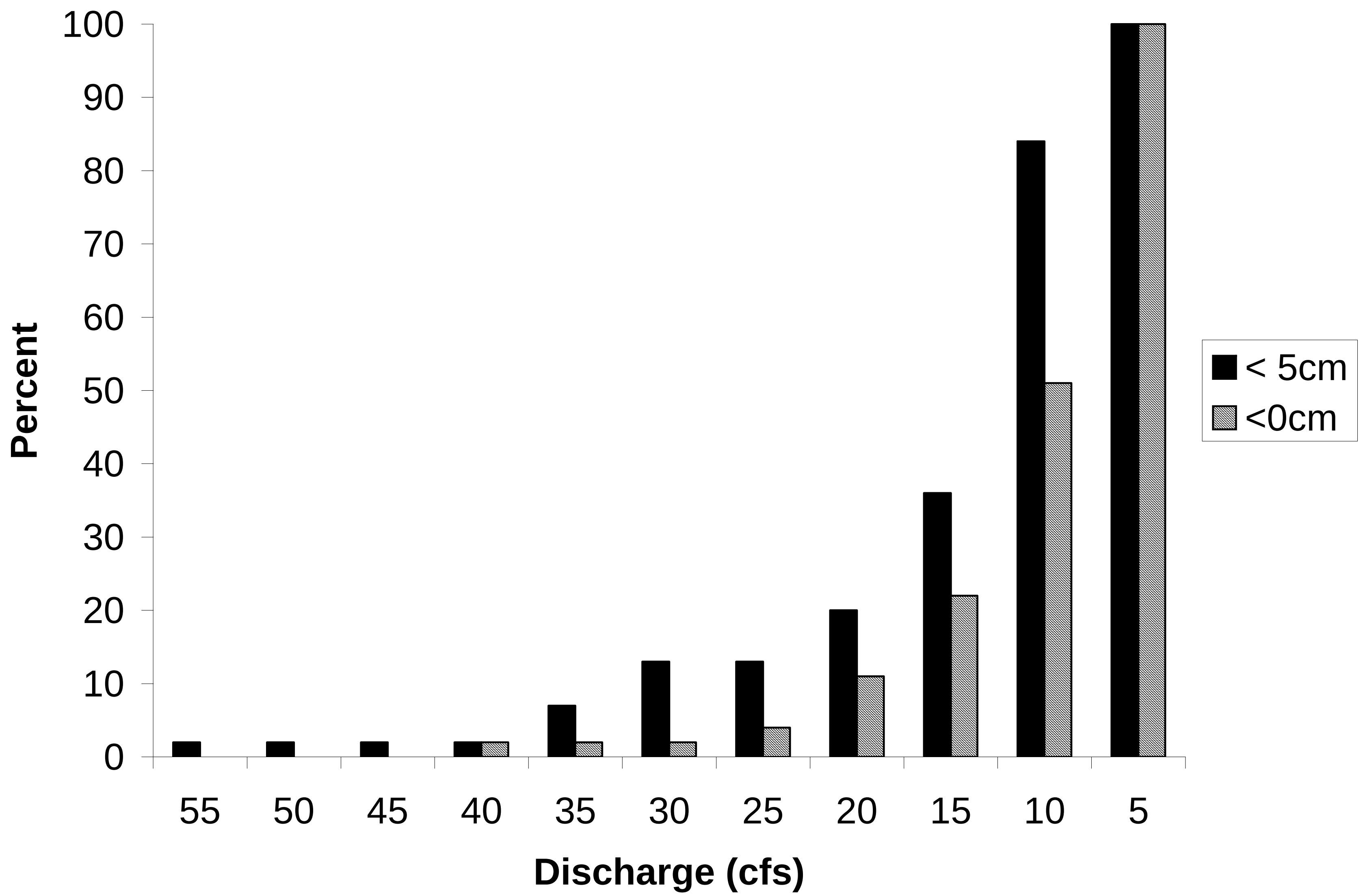

10000
1000
100
10
1
Biomass (AFDM g/m-2)
A M J J A S O N D J F M A M J J A S O
Month
1956-1957
1991-1992
2007-2008

Figure 2.4: Frequency of low flows across transect. Frequency analysis of flows across the cross-sectional transect at which areas will become stressed (< 5cm) or exposed (<0cm). The discharge at which a percentage of our transect would be stressed or exposed was calculated by using the regression equation between water depth at each interval and our pressure transducer to determine the depth reading on the pressure transducer when the flag location would be dry (0 cm) or stressed (5cm). These values were then converted to discharges using the relationship between our pressure transducer and the USGS gage downstream. Stressed conditions (<5 cm) begin to occur across our transect at a discharge of 55 cubic feet per second (cfs), and exposures begin at discharges of 40 cfs.



100
90
80
70
60
50
40
30
20
10
0
Percent
55
50
45
40
35
30
25
20
15
10
5
Discharge (cfs)
< 5cm
<0cm

Figure 2.5: Frequency analysis of annual flows in the Middle Oconee River, Athens, GA. Hourly intervals for a year during Grubaugh and Wallace's study (8/27/1991 -8/28/1992) and one year during our study (8/27/2007-8/27/2008) are represented. The red dotted vertical line represents 55 cubic feet per second (cfs), the discharge at which our cross-section began to experience stressed conditions, and the blue dotted vertical line represents the 7Q10 for this site (45 cfs). There were approximately 2700 hours spent under 55 cfs during our study, but none during Grubaugh and Wallace's study. We were not able to make comparisons between our study and that conducted by Nelson and Scott (1962) due to the lack of hourly data available from that time period.

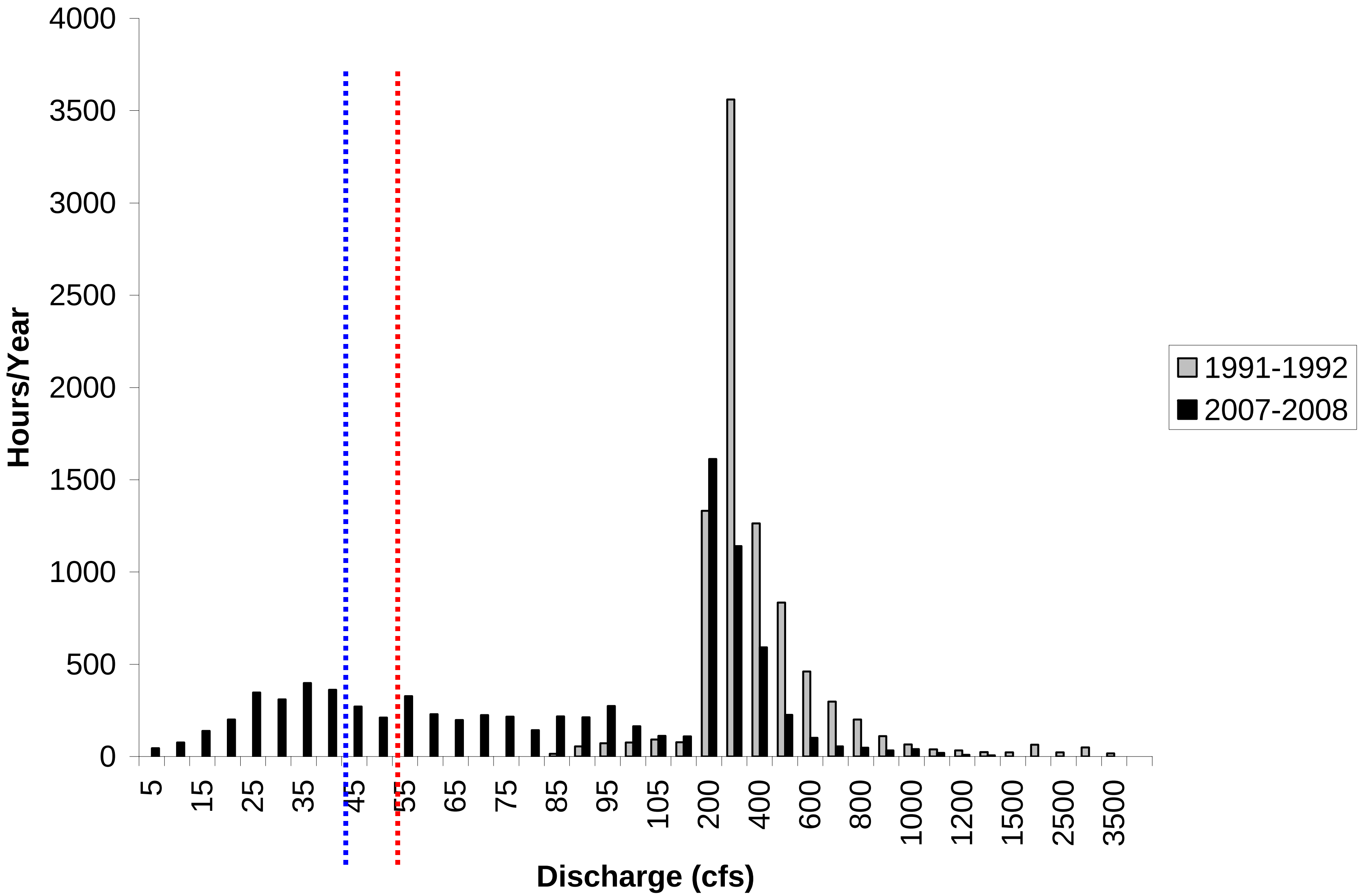

Hours/Year
4000
3500
3000
2500
2000
1500
1000
500
0
5
15
25
35
45
55
65
75
85
95
105
200
400
600
800
1000
1200
1500
2500
3500
Discharge (cfs)
1991-1992
2007-2008

Figure 2.6: Frequency analysis of *P. ceratophyllum* biomass. Only 14 out of 104 samples or 13.3% of the total samples exceeded 136 g-AFDM/m^2, which was the lowest recorded biomass in the Nelson and Scott (1962) study. Only 2 out of 104 samples or 1.9% were as large as or larger than Grubaugh and Wallace's (1995) lowest biomass value (296.8 g-AFDM/m^2).

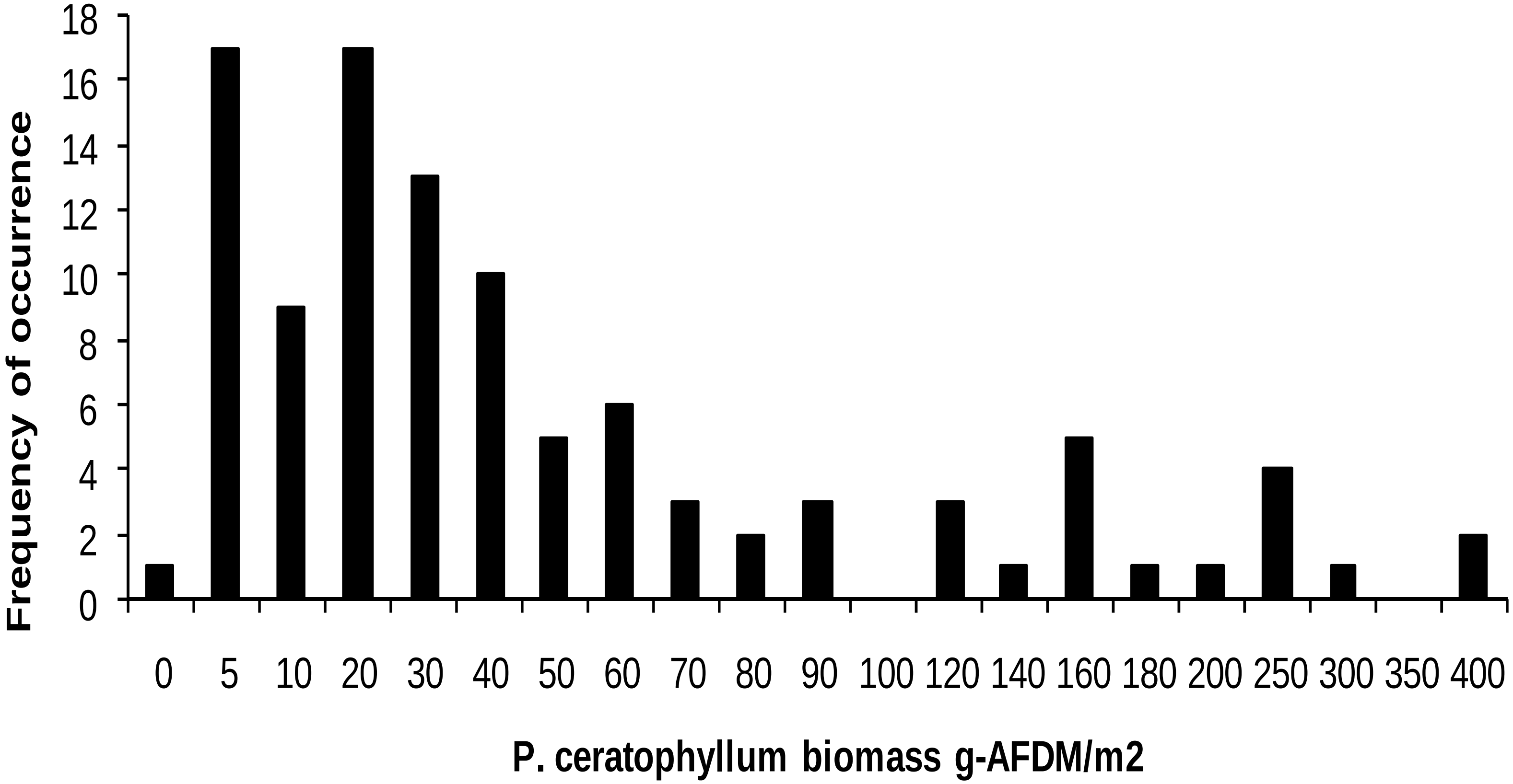
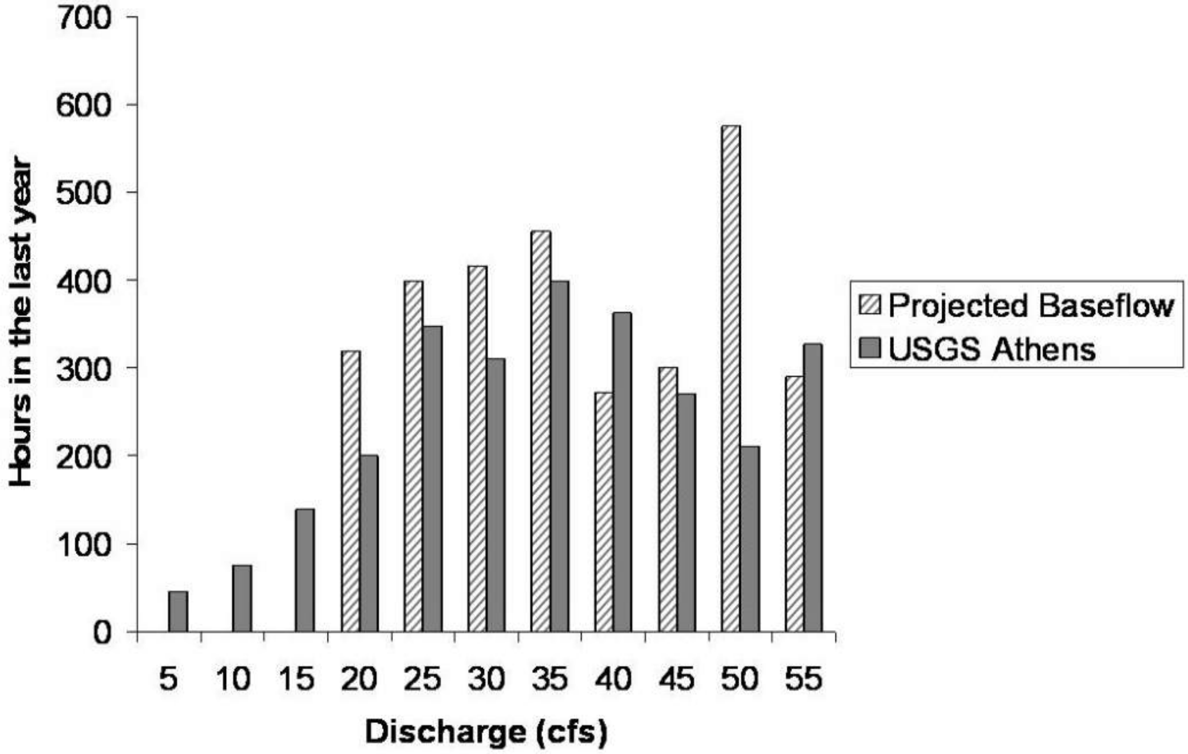
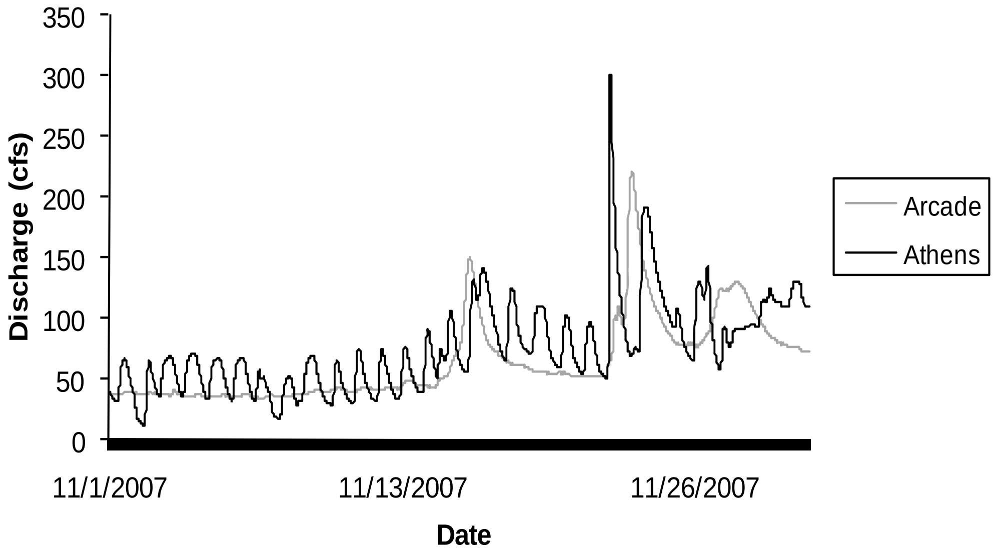

Frequency of occurrence
0
2
4
6
8
10
12
14
16
18
0 5 10 20 30 40 50 60 70 80 90 100 120 140 160 180 200 250 300 350 400
P. ceratophyllum biomass g-AFDM/m2

Figure 2.8: Yearly flows in the Middle Oconee River; drought vs. water extraction. Watershed adjusted estimated flows at Middle Oconee River (based on the upstream USGS gage in Arcade, GA) illustrating likely flows without Bear Creek Reservoir, in contrast to recorded flows at the USGS gage in Athens, GA. The difference between these may be the result of pump storage activities at Bear Creek Reservoir.



700
600
500
400
300
200
100
0
Hours in the last year
5
10
15
20
25
30
35
40
45
50
55
Discharge (cfs)
Projected Baseflow
USGS Athens

Figure 3.1: Hydrographs from the USGS gages in Athens, GA and Arcade, GA. These hydrographs illustrate the changes in natural flow regime as a result of upstream hydroelectric dam operations and municipal water withdrawals. The Arcade, GA gage is upstream of our study site, and the Athens, GA gage is downstream. The source of the alterations during the 1990's is likely the Tallassee Shoals Hydropower Dam, located approximately two miles upstream from Ben Burton Park. The source of hydrologic alteration during our study in 2007-2008, is Bear Creek Reservoir, a pump-storage facility constructed in 2002. The hydroelectric dam was not in operation throughout the course of our study due to historic drought conditions that did not enable the dam to produce electricity.



Discharge (cfs)
350
300
250
200
150
100
50
0
11/1/2007
11/13/2007
11/26/2007
Date
Arcade
Athens

Figure 3.2: Experimental Design of Middle Oconee River Plot Study. Solid block represent those under a shallow treatment, and striped blocks represent the deep treatment. White blocks are those analyzed throughout the entire year, and gray blocks represent the growing season.

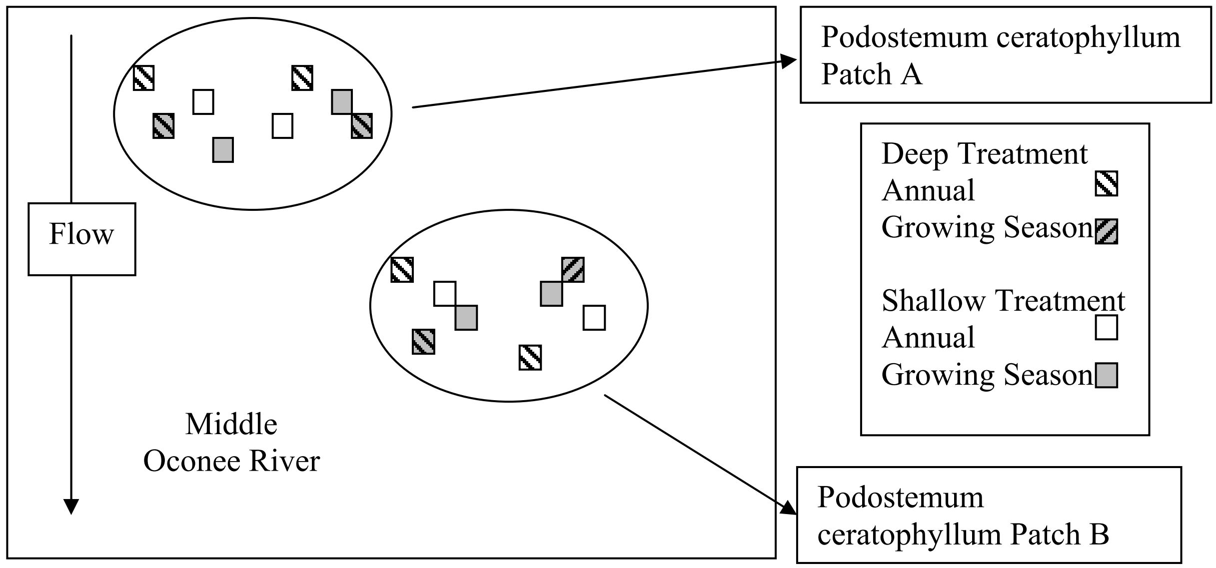

Flow
Middle
Oconee River
Podostemum ceratophyllum Patch A
Deep Treatment
Annual
Growing Season
Shallow Treatment
Annual
Growing Season
Podostemum ceratophyllum Patch B

Figure 3.3: Experimental Design of Hunnicutt Creek Plot Study. Solid block represent those under a shallow treatment, and striped blocks represent the deep treatment. White blocks are those analyzed throughout the entire year, and gray blocks represent the growing season.

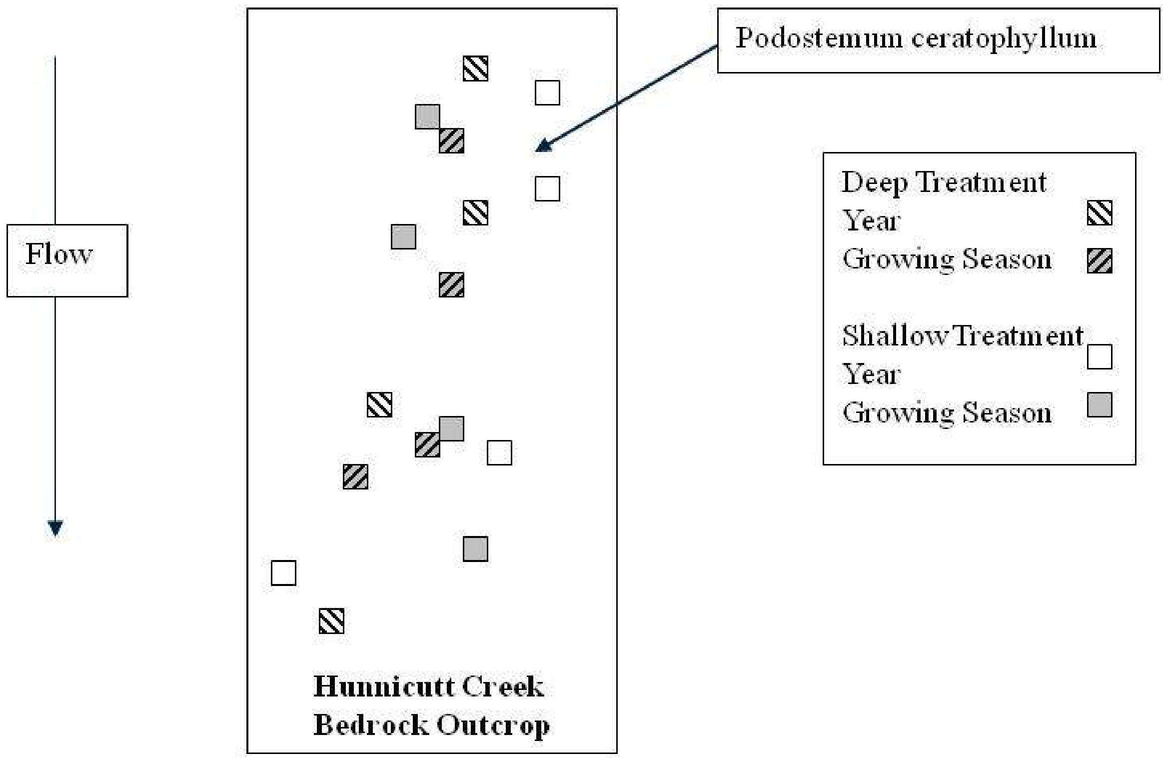

Flow
Podostemum ceratophyllum
Deep Treatment
Year
Growing Season
Shallow Treatment
Year
Growing Season
Hunnicutt Creek
Bedrock Outcrop

Figure 3.4: Experimental Design of Middle Oconee River Boulder Study. The white circles represent boulders within one of three blocks, and the gray circles represent the control boulder within each block. The control boulders were fully exposed at the beginning of the study, thus had no possibility for missed *Podostemum ceratophyllum* in the scraping process.

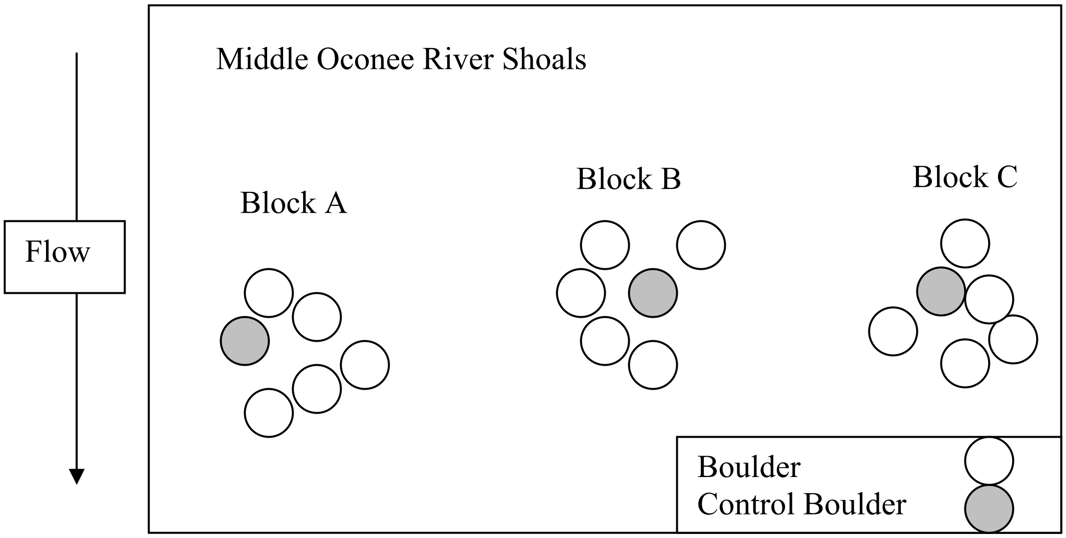
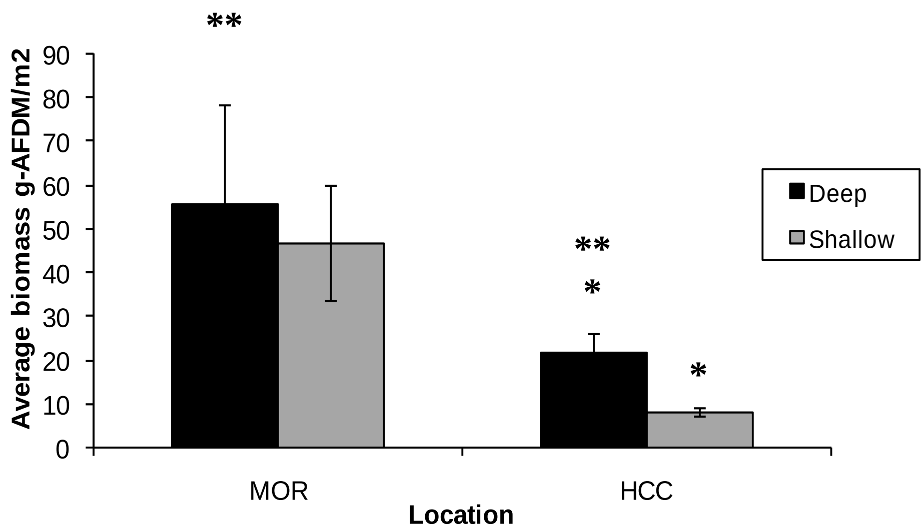

Flow
Middle Oconee River Shoals
Block A
Block B
Block C
Boulder
Control Boulder

Figure 3.5: Biomass comparisons between sites and seasons. **A.** Year-long average *P. ceratophyllum* biomass comparisons between MOR and HCC by treatment and location. **B.** Growing season average *P. ceratophyllum* biomass comparisons between MOR and HCC by treatment and location.

A.


**
Average biomass g-AFDM/m2
90
80
70
60
50
40
30
20
10
0
**
*
*
Deep
Shallow
MOR
HCC
Location

B.

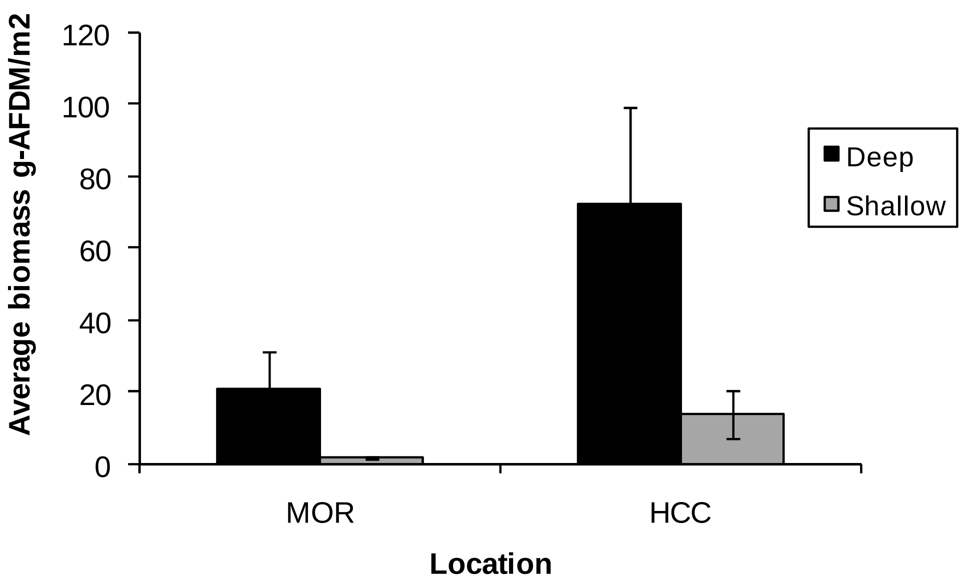
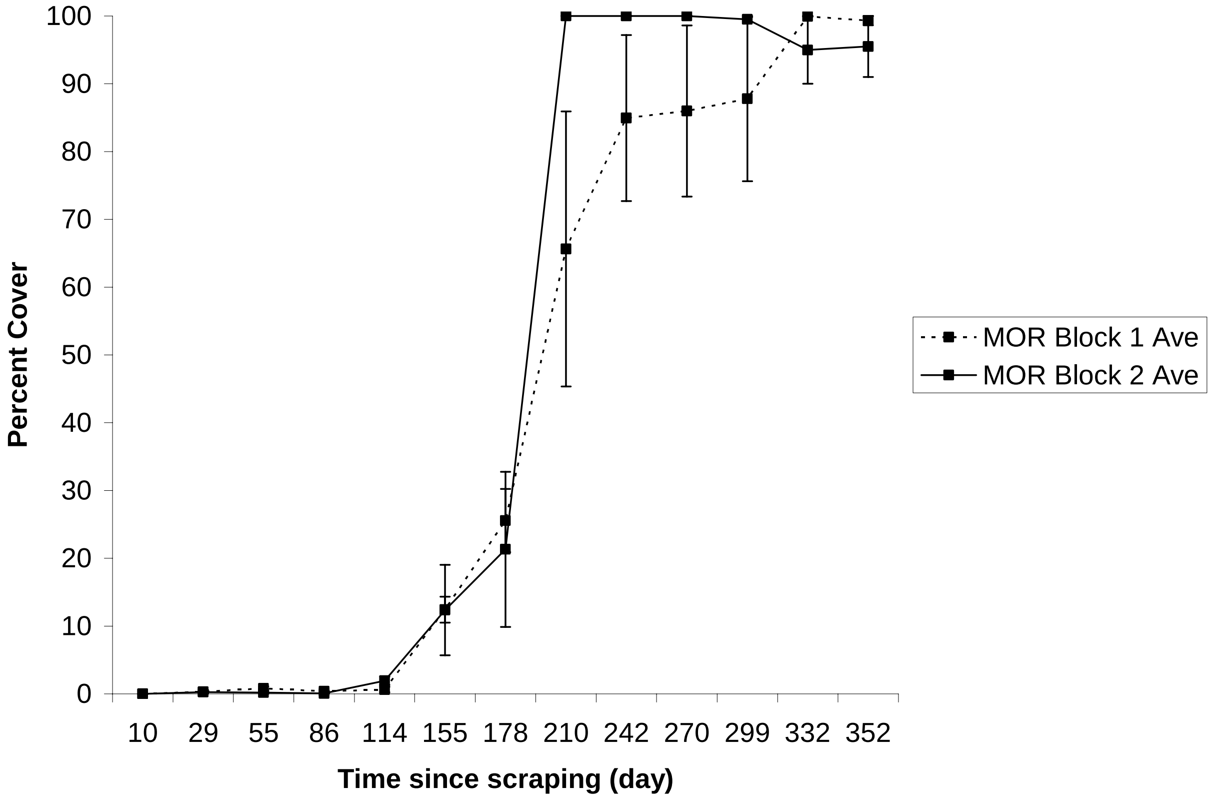
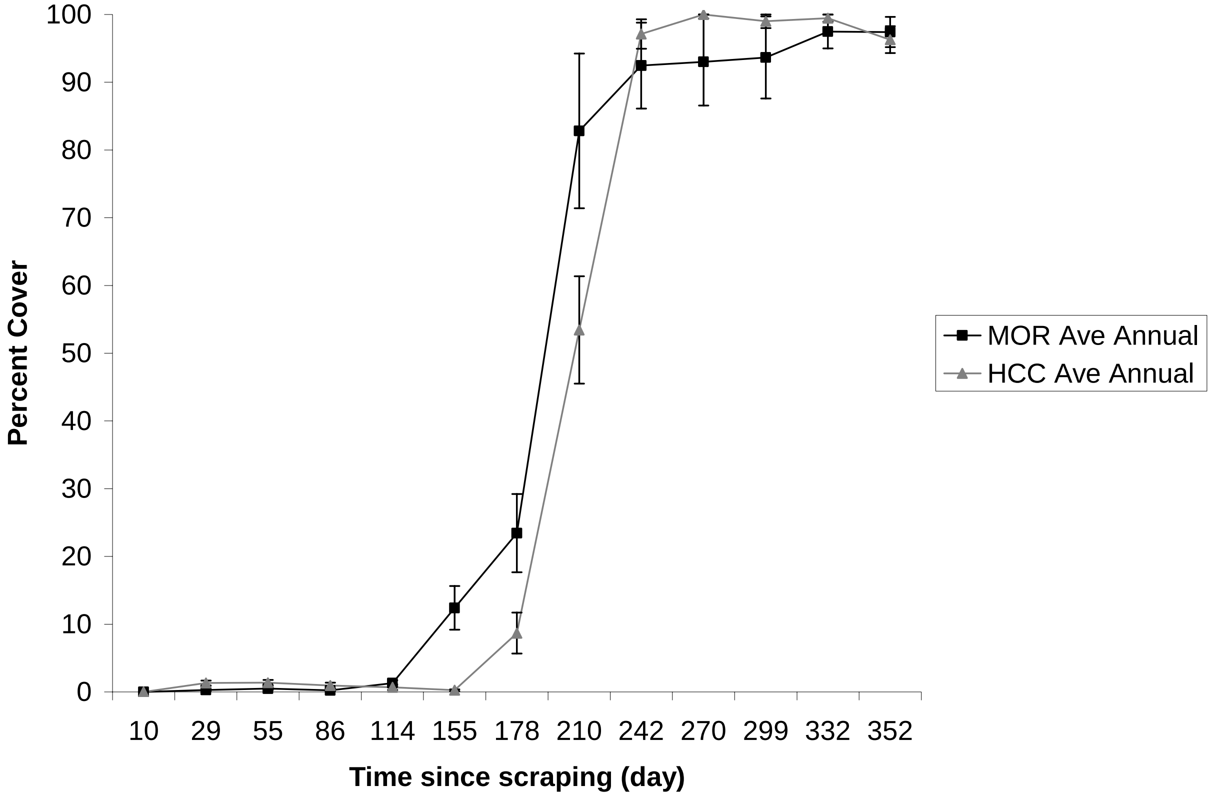

Average biomass g-AFDM/m2
120
100
80
60
40
20
0
Deep
Shallow
MOR
HCC
Location

Figure 3.6: Middle Oconee River blocks: annual average percent cover. Block 1 appeared to lag behind Block 2 in re-colonization rates, with Block 2 reaching 100% cover by day 210. Block 1 reached 100% cover 122 days later.



Percent Cover
100
90
80
70
60
50
40
30
20
10
0
10
29
55
86
114
155
178
210
242
270
299
332
352
Time since scraping (day)
MOR Block 1 Ave
MOR Block 2 Ave

Figure 3.7: Annual average percent cover comparison between sites. While re-colonization rates in plots in Hunnicutt Creek appeared to be initially slower (as signified by the lagging percent cover line), it eventually surpassed the Middle Oconee plots. Both sites neared 100% cover after around 320 days.



100
90
80
70
60
50
40
30
20
10
0
Percent Cover
10
29
55
86
114
155
178
210
242
270
299
332
352
Time since scraping (day)
MOR Ave Annual
HCC Ave Annual

Figure 3.8: Middle Oconee River blocks: growing season average percent cover. On day 79, two of the plots in Block 1 dried and no *P. ceratophyllum* survived. Flows remained relatively low in the following days, likely explaining the fluctuating and ultimately declining percent cover.

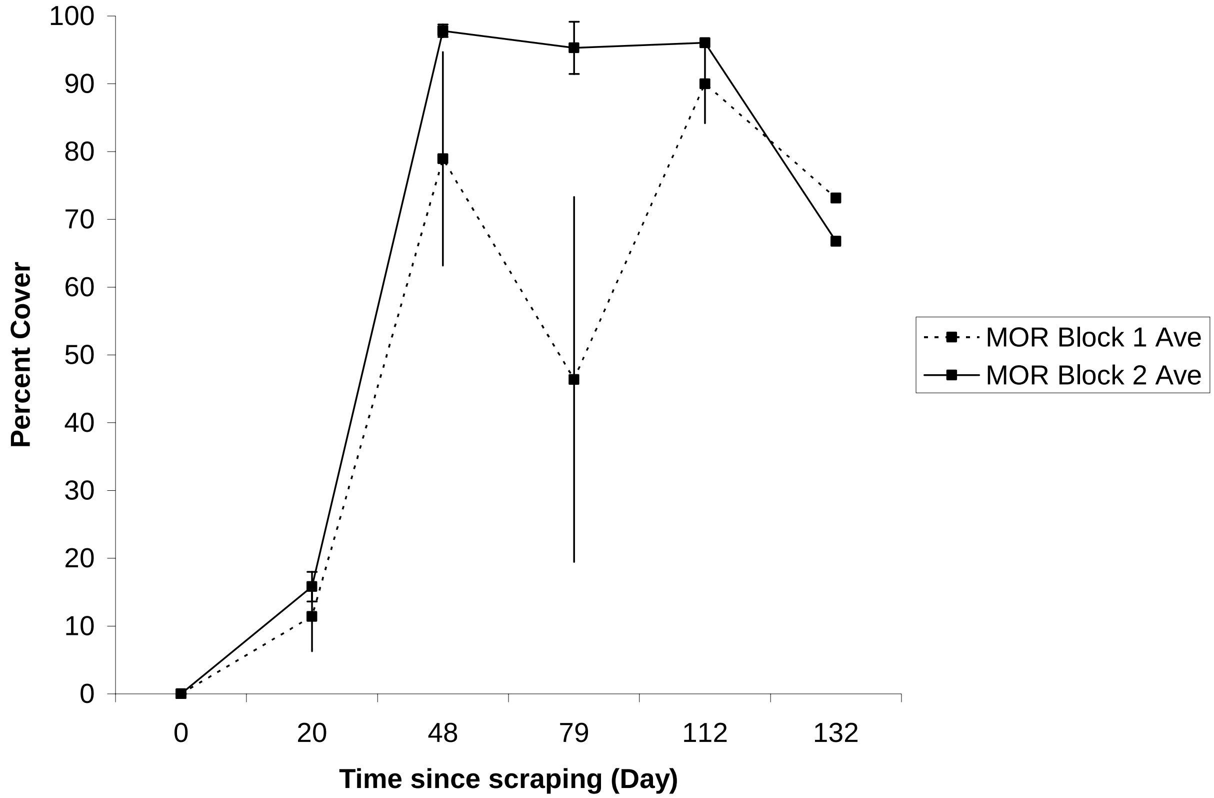

100
90
80
70
60
50
40
30
20
10
0
Percent Cover
0
20
48
79
112
132
Time since scraping (Day)
MOR Block 1 Ave
MOR Block 2 Ave

Figure 3.9: Growing season average percent cover comparison between sites. On day 79, a drying event left many plots with little or no water, resulting in some mortality. This may be responsible for the lower average percent cover on that day. Flows remained relatively low in the following days, likely explaining the lack recovery to 100% cover.

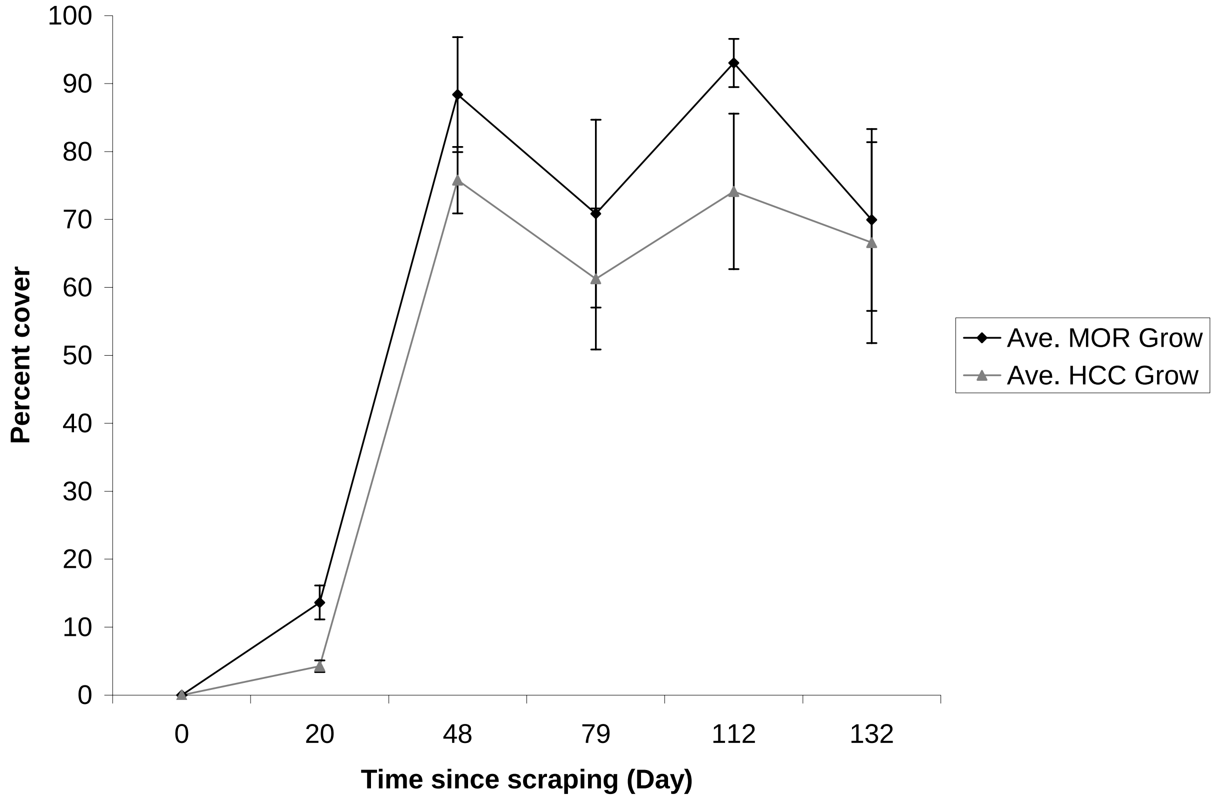
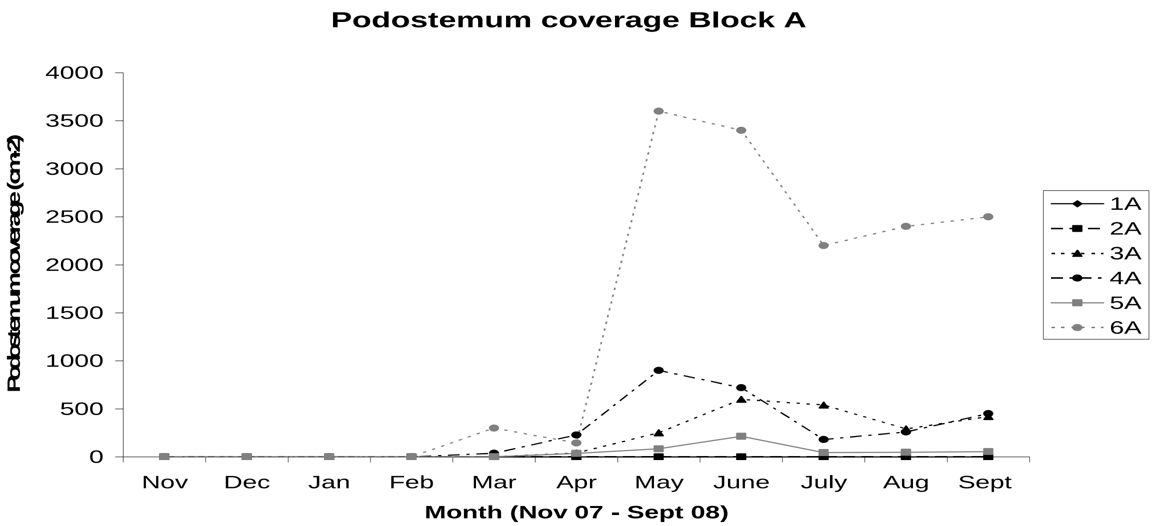
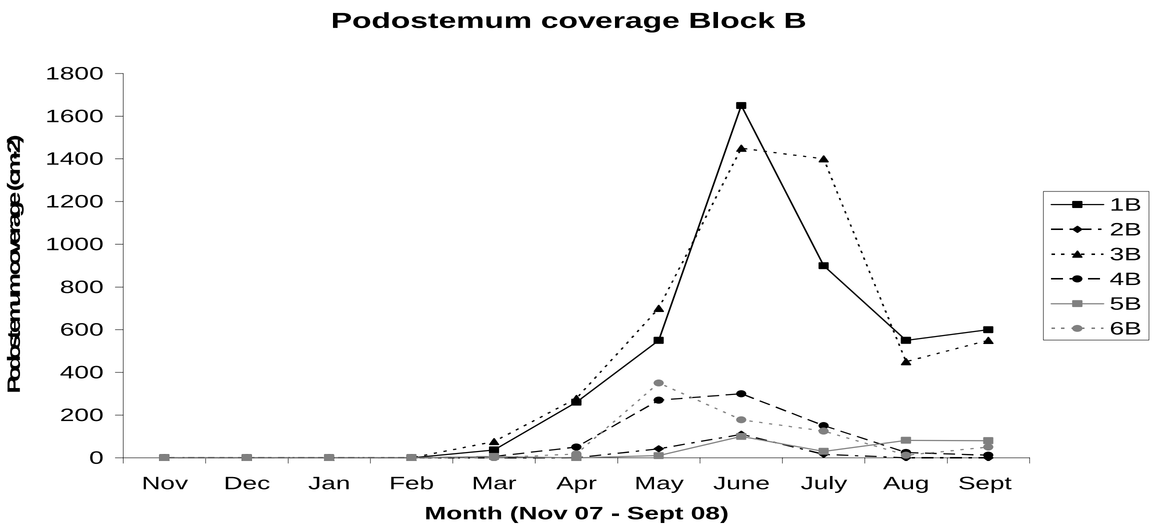

Percent cover
100
90
80
70
60
50
40
30
20
10
0
0
20
48
79
112
132
Time since scraping (Day)
Ave. MOR Grow
Ave. HCC Grow

Figure 3.10: Boulder *P. ceratophyllum* coverage comparisons. *P. ceratophyllum* coverage (cm^2) by boulder in 3 Blocks in the Middle Oconee River.


Podostemum coverage Block A
Podostemum coverage (cm2)
4000
3500
3000
2500
2000
1500
1000
500
0
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
Month (Nov 07 - Sept 08)
1A
2A
3A
4A
5A
6A


Podostemum coverage Block B
Podostemum coverage (cm2)
1800
1600
1400
1200
1000
800
600
400
200
0
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
Month (Nov 07 - Sept 08)
1B
2B
3B
4B
5B
6B

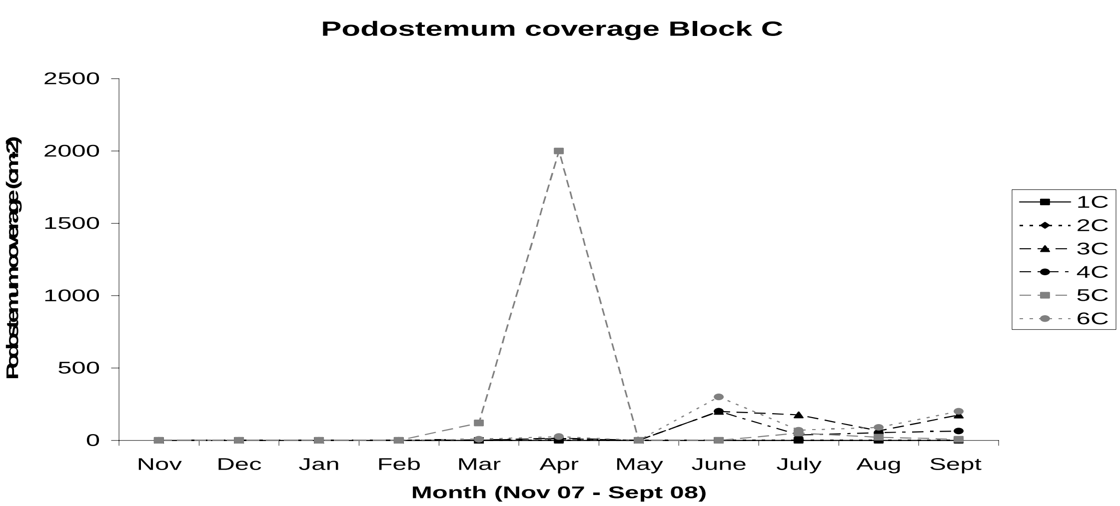

Podostemum coverage Block C
Podostemum coverage (cm2)
2500
2000
1500
1000
500
0
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
Month (Nov 07 - Sept 08)
1C
2C
3C
4C
5C
6C

Figure 4.1: *P. ceratophyllum* distribution. Distribution of *Podostemum ceratophyllum* (USDA Plant Database) ranging from Georgia north along the east coast through northern Canada. States where *P. ceratophyllum* is state listed as a species of special concern, threatened, endangered or historic are highlighted accordingly.

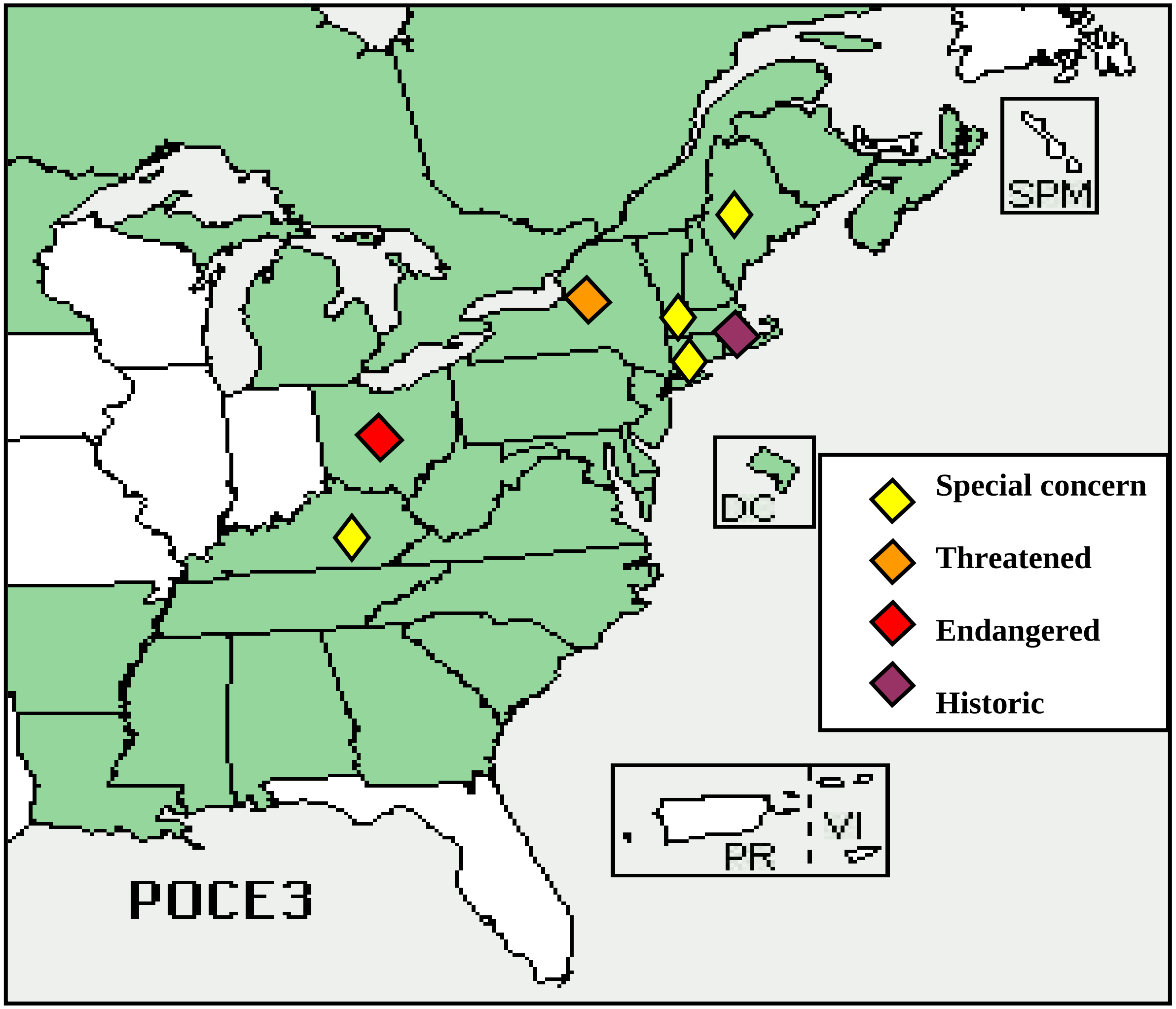

SPM
DC
Special concern
Threatened
Endangered
Historic
PR
VI
POCE3

Figure 4.2: *P. ceratophyllum* survey distribution in Georgia. 1:100,000 meter scale stream coverage map of Georgia highlighting physiographic province, *Podostemum ceratophyllum* observation locations (plus signs), and U.S. Geological Survey gages (circles). *P. ceratophyllum* observations were collected through fish surveys by B.J. Freeman and M.C. Freeman over the past 20 years, and are not random observations. This map represents an initial *P. ceratophyllum* range identification.

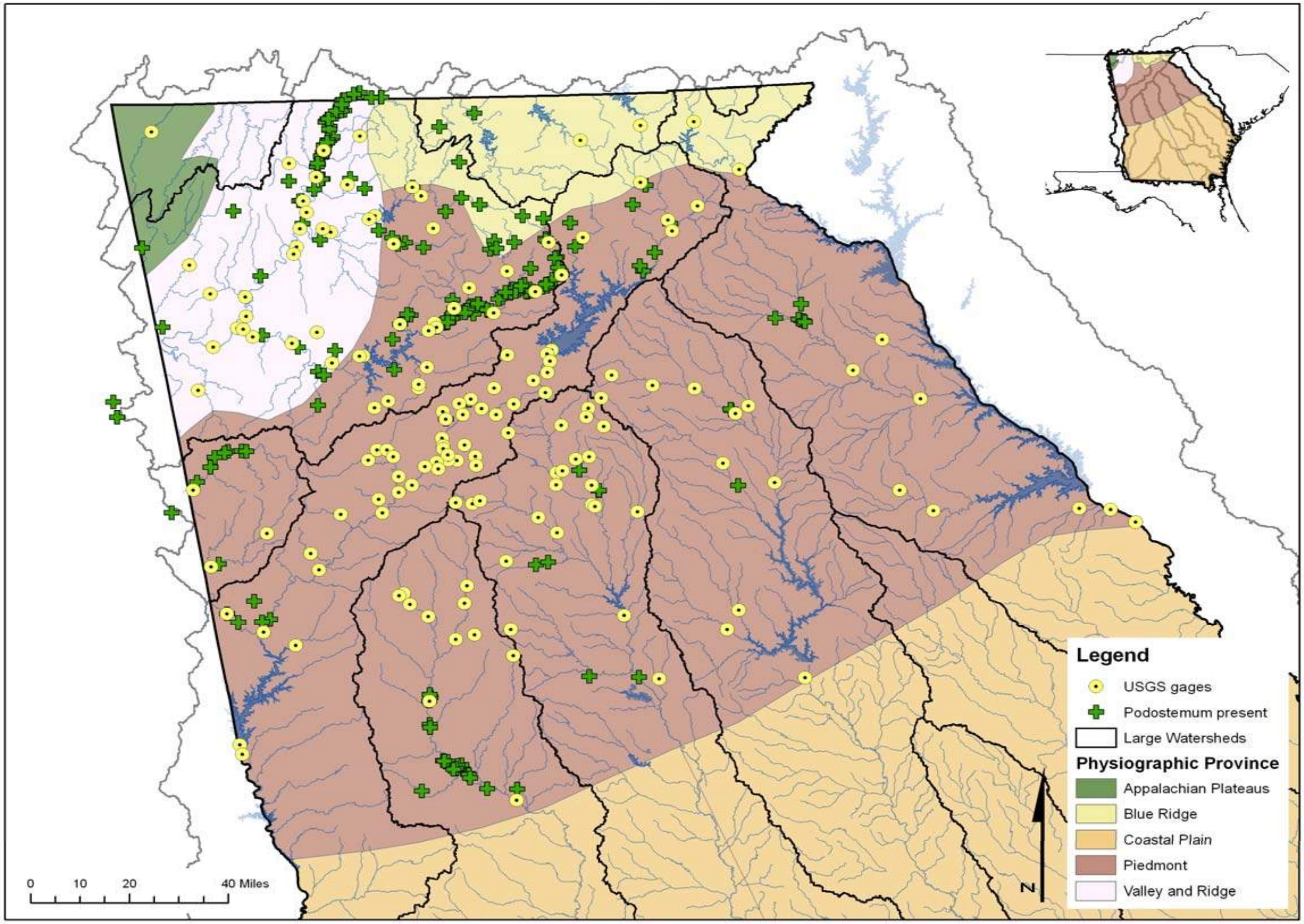

Legend
USGS gages
Podostemum present
Large Watersheds
Physiographic Province
Appalachian Plateaus
Blue Ridge
Coastal Plain
Piedmont
Valley and Ridge
0 10 20 40 Miles
N

Figure 4.3: Examples of altered and unaltered hydrology. Hydrographs of three U.S. Geological Survey gages at the 15 minute time scale to illustrate gages that had hydrologic alteration present and those that were classified as not altered. USGS gage number 02392950 is from Noonday Creek at Hawkins Store Rd, near Woodstock, GA, and represents a normal hydrograph. USGS gage number 02389150 is from the Etowah River at GA 9, near Dawsonville, GA, and indicates upstream water extraction. USGS gage number 0239400 is from the Etowah River at Allatoona Dam, above Cartersville, GA and reflects the presence of the upstream dam operation.

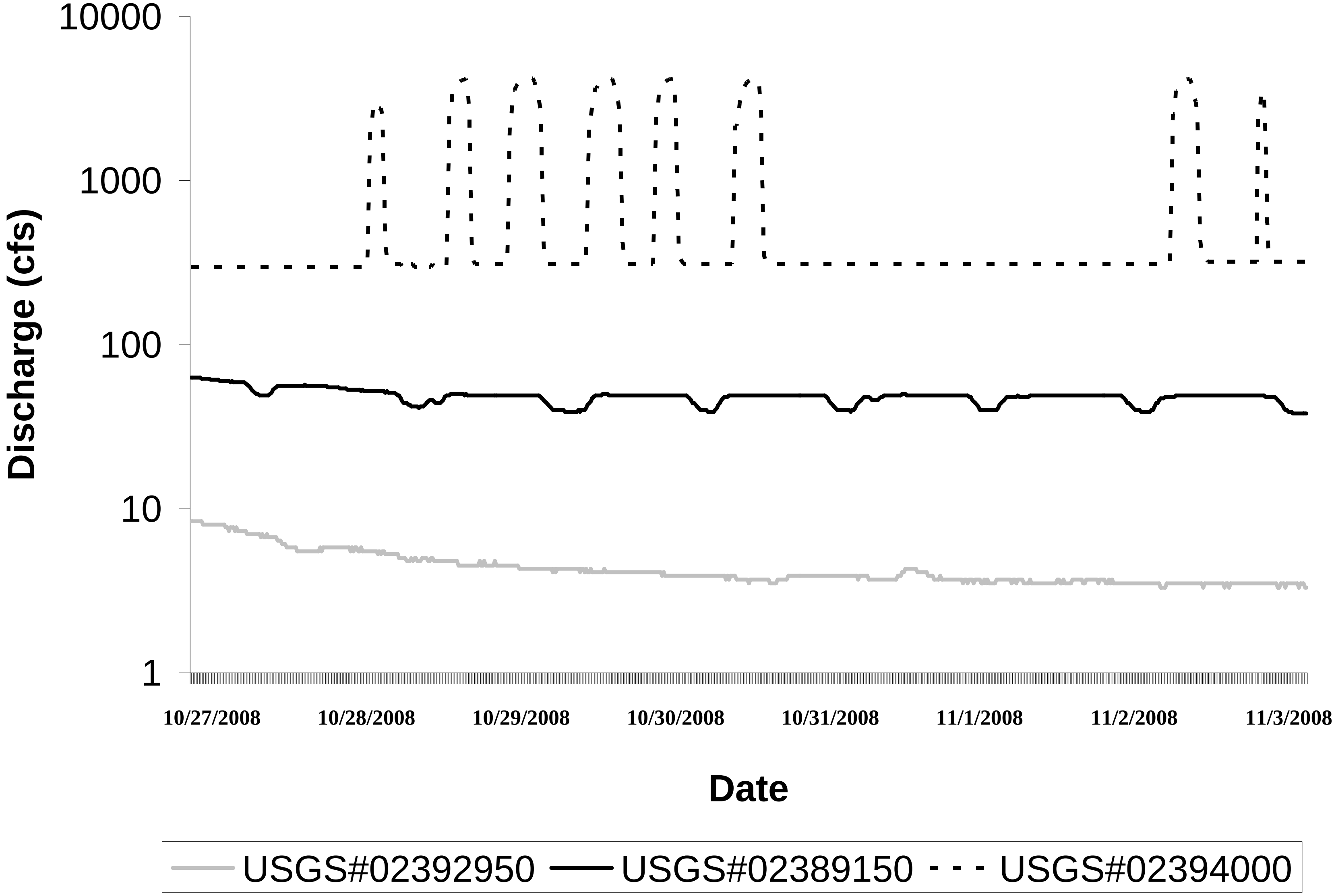

10000
1000
100
10
1
Discharge (cfs)
10/27/2008
10/28/2008
10/29/2008
10/30/2008
10/31/2008
11/1/2008
11/2/2008
11/3/2008
Date
USGS#02392950
USGS#02389150
USGS#02394000

Figure 4.4: Histogram of *Podostemum ceratophyllum* observations classified by stream order.

Podostemum presence by stream order

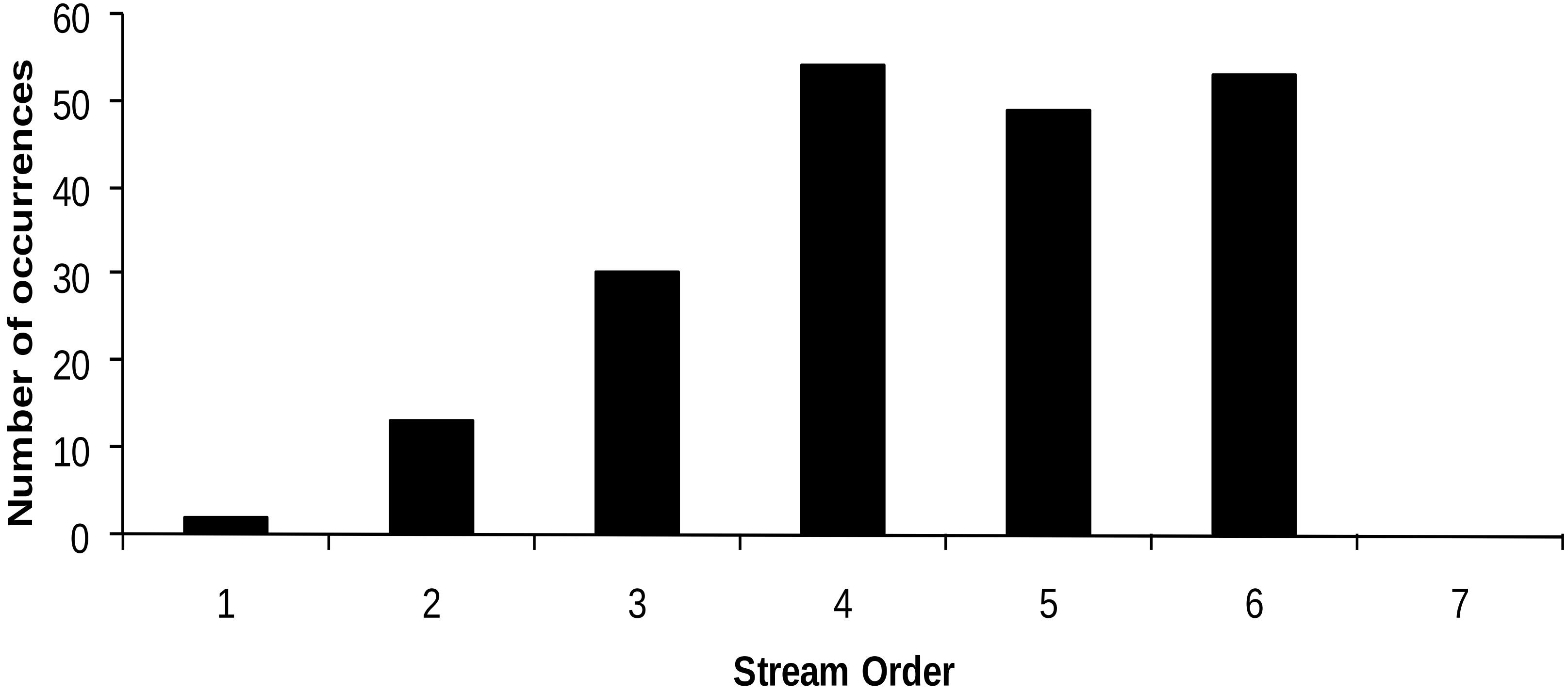
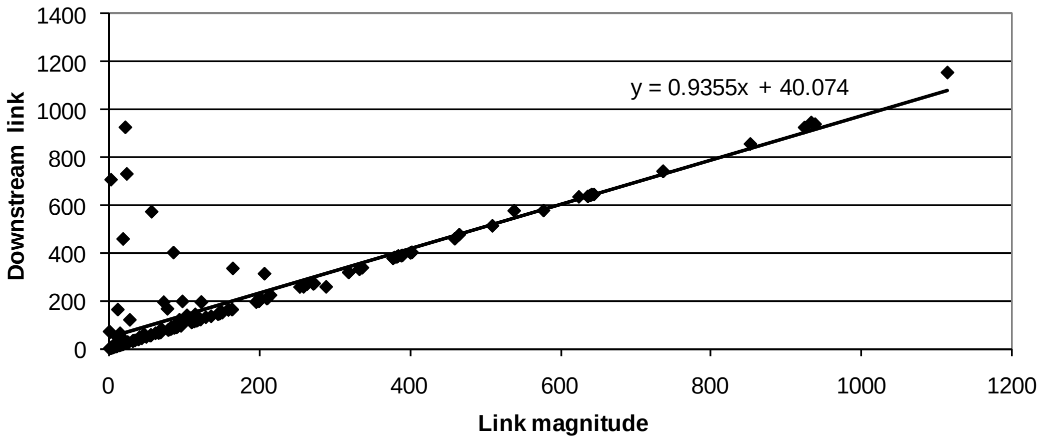
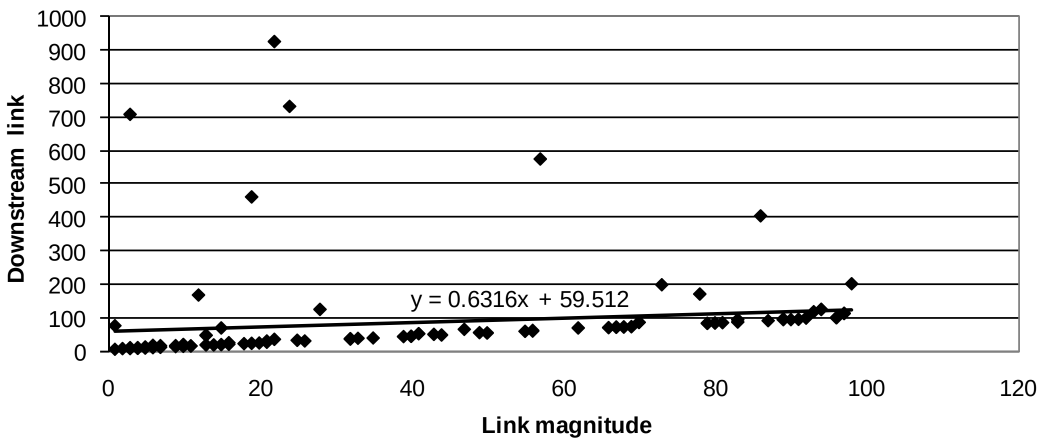


Figure 4.5: Link magnitude and downstream link associations. Regressions between link magnitude and downstream link for all observation sites, those with link magnitudes under 100, and those equal to or less than 10. These figures indicate that link magnitude and downstream link are well correlated for link magnitudes greater than 200, but are less correlated below this value. At extremely low link magnitudes, there is not a very strong correlation, and downstream links can range from close to the link magnitude to much larger.


1400
1200
1000
800
600
400
200
0
Downstream link
y = 0.9355x + 40.074
0
200
400
600
800
1000
1200
Link magnitude


1000
900
800
700
600
500
400
300
200
100
0
Downstream link
y = 0.6316x + 59.512
0
20
40
60
80
100
120
Link magnitude

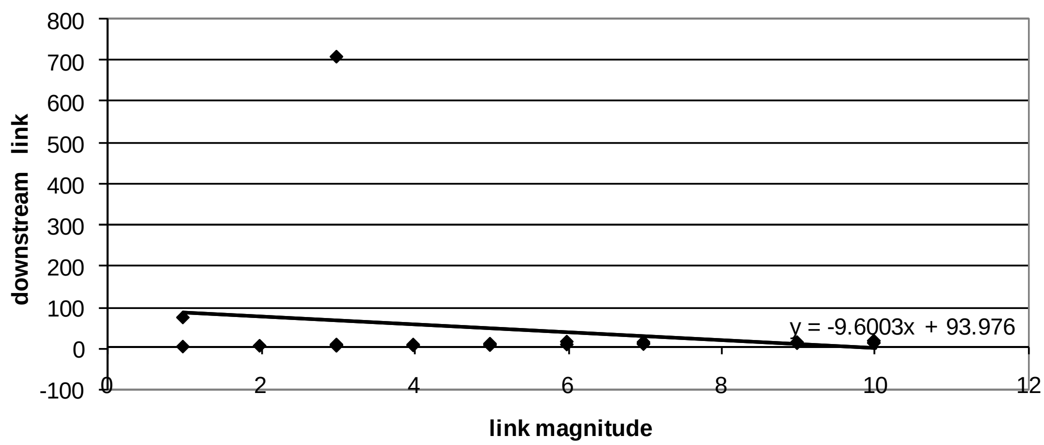

800
700
600
500
400
300
200
100
0
-100
downstream link
y = -9.6003x + 93.976
0
2
4
6
8
10
12
link magnitude

Figure 4.6: Hydrologic alteration by major basin. 1:100,000 scale stream cover map of Georgia above the fall line with major drainages outlined. Each basin is color coded with respect to its percentage of USGS gages that indicated altered hydrology from water extractions or impoundments.

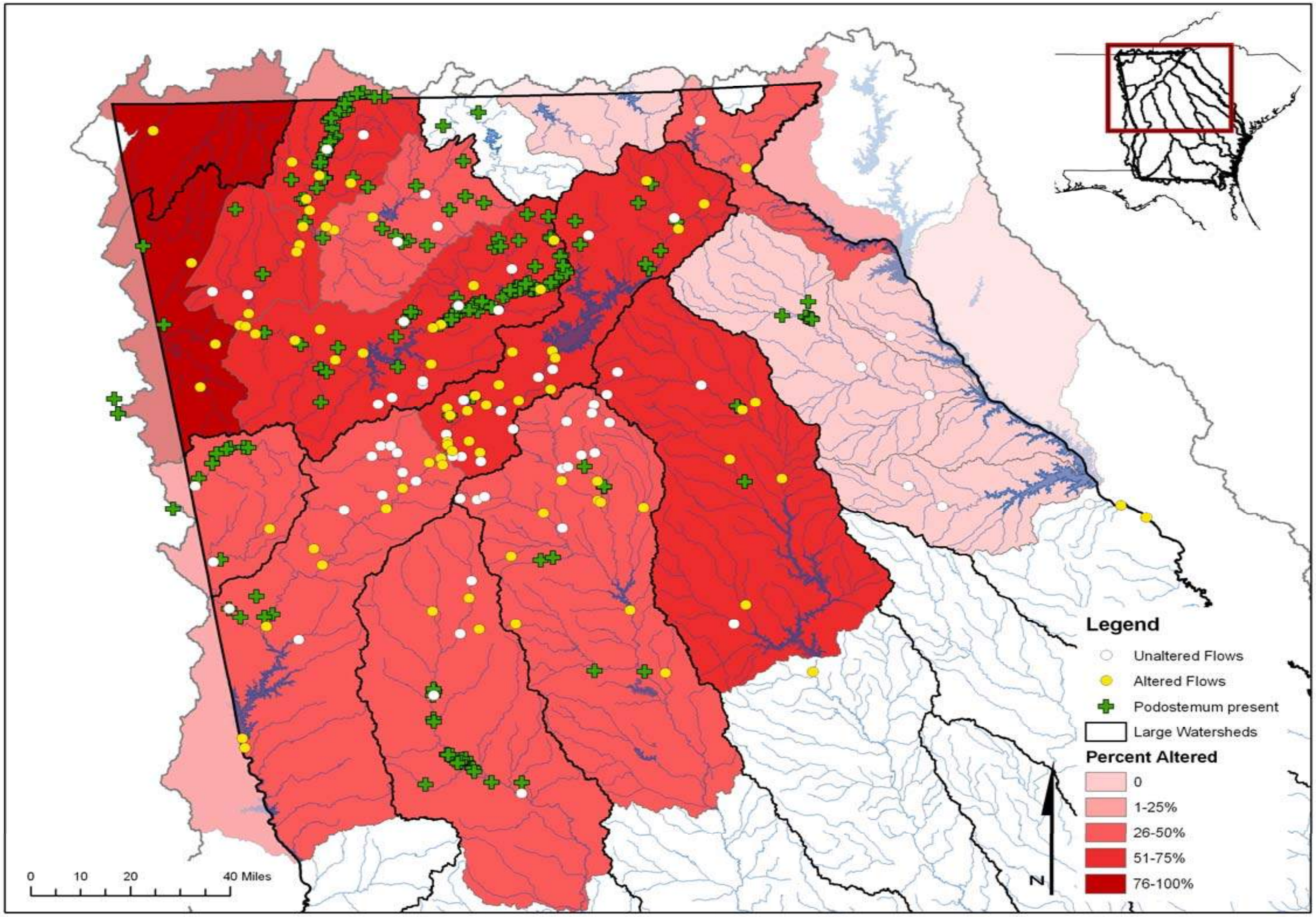

Legend
Unaltered Flows
Altered Flows
Podostemum present
Large Watersheds
Percent Altered
0
1-25%
26-50%
51-75%
76-100%
0 10 20 40 Miles
N

Image 3.1: Study shoal in the Middle Oconee River, at Ben Burton Park, Athens, GA. This image highlights the variability in substrate elevation and the large area of exposed sediments under drought conditions.

Image 3.2: Photograph of *P. ceratophyllum* holdfast (raphe) markings on a boulder. This type of marking was used as evidence of past colonization for boulders that were used in the isolated substrate study.

APPENDIX A

RAW DATA: RIVERWEED BIOMASS AND OTHER VARIABLES

P. ceratophyllum (Riverweed) biomass is expressed in g-AFDM/m^2, velocity is in m/s, substrate code 1 = bedrock/boulder, 0 = gravel/cobble, Location code 1 = edge, 0 = center.

Date	Riverweed	Substrate	Location	Velocity
12/13/2007	24.9254	1	1	0.11
12/13/2007	61.1149	1	1	0.04
12/13/2007	4.8137	0	0	0.08
12/13/2007	38.9237	1	0	0.34
12/13/2007	32.1267	0	0	0.04
12/13/2007	32.8006	1	0	0.59
12/13/2007	19.9576	0	0	0.75
12/13/2007	1.0494	0	0	-0.04
12/13/2007	1.2131	0	1	-0.06
12/13/2007	0.2696	1	1	0.15
2/11/2008	12.1979	1	0	0.51
2/11/2008	6.8066	0	0	0.52
2/11/2008	58.0630	1	0	0.51
2/11/2008	35.2941	1	0	0.59
2/11/2008	7.0184	1	1	0.85
2/11/2008	55.2999	1	0	0.79
2/11/2008	1.2516	1	1	0.42
2/11/2008	2.0892	1	1	0.41
3/25/2008	69.3174	1	0	0.66
3/25/2008	0.1059	1	0	0.75
3/25/2008	0.5776	1	0	0.25
3/25/2008	120.4776	1	0	0.23
3/25/2008	116.2126	1	0	0.29
3/25/2008	21.5751	0	0	0.61
3/25/2008	0.0000	1	1	0.29
3/25/2008	6.1423	1	1	0.37
4/21/2008	69.3848	1	0	0.71
4/21/2008	11.2545	1	0	0.82
4/21/2008	371.2815	1	0	0.52
4/21/2008	155.1459	1	0	0.48
4/21/2008	27.0145	1	1	-0.01
4/21/2008	161.5193	0	0	0.40
4/21/2008	41.8023	1	1	0.73
4/21/2008	23.0192	1	1	0.49
5/27/2008	16.7132	1	1	1.17
5/27/2008	5.6513	1	1	0.43

5/27/2008	81.7849	1	1	0.38
5/27/2008	18.5232	1	0	-0.02
5/27/2008	48.0697	0	0	0.37
5/27/2008	11.6203	0	0	0.24
5/27/2008	197.4199	1	0	0.67
5/27/2008	31.2987	0	0	0.52
5/27/2008	4.7752	1	1	0.27
5/27/2008	70.5209	1	1	0.53
6/19/2008	1.8100	1	1	0.65
6/19/2008	9.7911	0	1	0.14
6/19/2008	25.9266	1	0	0.20
6/19/2008	215.7987	1	0	0.49
6/19/2008	276.3936	1	0	0.42
6/19/2008	146.7700	1	0	0.25
6/19/2008	141.9371	1	0	0.03
6/19/2008	208.5492	1	0	0.47
6/19/2008	20.5545	1	1	0.52
6/19/2008	29.2000	1	1	0.47
7/14/2008	9.0209	1	1	0.18
7/14/2008	13.2184	1	1	0.06
7/14/2008	75.8737	1	0	0.12
7/14/2008	156.0316	1	0	0.02
7/14/2008	36.1606	1	0	0.08
7/14/2008	355.7525	0	0	0.19
7/14/2008	207.6442	1	0	0.13
7/14/2008	44.9408	1	0	0.09
7/14/2008	27.5441	1	1	0.05
7/14/2008	84.0378	1	1	0.07
8/18/2008	54.0676	1	0	0.01
8/18/2008	87.5999	0	0	0.10
8/18/2008	154.3372	1	0	0.34
8/18/2008	1.8388	0	0	0.24
8/18/2008	28.8726	1	0	-0.04
8/18/2008	19.3126	1	0	0.11
8/18/2008	4.0050	1	1	0.09
8/18/2008	15.1632	1	1	0.07
9/19/2008	36.0836	1	1	0.28
9/19/2008	14.6433	1	1	0.00
9/19/2008	11.2545	1	0	0.16
9/19/2008	28.8052	1	0	0.02
9/19/2008	212.6794	1	0	0.34
9/19/2008	4.2264	0	0	0.25
9/19/2008	27.8714	1	0	0.10
9/19/2008	19.1586	1	0	0.00
9/19/2008	18.8890	1	1	0.19
9/19/2008	17.8877	1	1	0.16
10/15/2008	7.5960	1	1	0.04
10/15/2008	39.8960	0	1	0.09
10/15/2008	15.6349	1	0	0.16
10/15/2008	54.2409	1	0	0.22
10/15/2008	23.5198	0	0	0.41

10/15/2008	110.2532	1	0	0.36
10/15/2008	7.8945	1	0	0.18
10/15/2008	42.6880	1	0	0.11
10/15/2008	39.9923	1	1	0.37
10/15/2008	35.3808	1	1	0.23

A Survey of the New River Aquatic Plant Community in Response to Recent Triploid Grass Carp Introductions into Claytor Lake, Virginia

Author(s): Matthew A. Weberg, Brian R. Murphy, Andrew L. Rypel and John R. Copeland

Source: Southeastern Naturalist, 14(2):308-318.
Published By: Eagle Hill Institute
URL: http://www.bioone.org/doi/full/10.1656/058.014.0211

A Survey of the New River Aquatic Plant Community in Response to Recent Triploid Grass Carp Introductions into Claytor Lake, Virginia

Matthew A. Weberg[1,*], Brian R. Murphy[1], Andrew L. Rypel[1, 2], and John R. Copeland[3]

Abstract - Aquatic plant communities play critical roles in the form and function of stream ecosystems. In this study, we surveyed the aquatic-plant community along a 39-km reach of the New River, VA, in response to triploid *Ctenopharyngodon idella* (Grass Carp) stockings to control *Hydrilla verticillata* (Hydrilla) in Claytor Lake. We utilized drift-net sampling methods and visual observations to document the current plant community in this reach. Nine of 12 aquatic plant species identified in our survey have been documented as preferred forage for Grass Carp. These findings may indicate that migrating Grass Carp could alter the plant community in this reach. We recommend continued monitoring of this system to characterize any future effects of Grass Carp herbivory.

Introduction

Aquatic plants are vital to the overall structure and function of lotic ecosystems (Minshall 1978). In mid-sized rivers, aquatic plants often comprise a significant fraction of primary production (Hill and Webster 1983, Minshall 1978, Rodgers et al. 1983, Vannote et al. 1980), and are thus especially important in these environments. For example, diverse aquatic-plant communities provide complex and heterogeneous habitat for a large variety of aquatic species, as well as refuge from predators (Allen and Castillo 2007, Grenouillet et al. 2002). Furthermore, aquatic plants in lotic habitats are known to play important roles in nutrient dynamics and sediment transport (Clarke and Wharton 2001, Madsen et al. 2001). Therefore, changes to the diversity and abundance of aquatic plants have the capacity to severely alter river ecosystems (Holmes et al. 1998), including the recreational and industrial benefits these environments provide to humans (Strange et al. 1999).

Invasive species are one of the foremost threats to the integrity of aquatic ecosystems at multiple scales. Pimentel et al. (2005) estimated the monetary cost of invasive species management for 6 developed nations at >$US335 billion per year and growing. Additionally, the economic effects of invasive species can be highly localized and severe. For example, property values in Wisconsin lakes invaded by *Myriophyllum spicatum* L. (Eurasian Water Milfoil) on average experienced a 13% decline following invasion (Horsch and Lewis 2009). Similarly, *Hydrilla*

[1]Department of Fisheries and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061. [2]Current address - Wisconsin Department of Natural Resources, Bureau of Science Services, Madison, WI 53707. [3]Virginia Department of Game and Inland Fisheries, Blacksburg, VA 24060. [*]Corresponding author - matt.weberg@gmail.com.

Manuscript Editor: Julia Cherry

verticillata (L.f.) Royle (Hydrilla) infestations can block irrigation canals, hasten sedimentation in reservoirs, interfere with water supplies, impede boat navigation, and reduce fisheries productivity (Langeland 1996).

Hydrilla was first documented in 2003 in Claytor Lake, Pulaski County, VA, by Virginia Department of Game and Inland Fisheries (VDGIF) biologists (J.R. Copeland, VDGIF, Blacksburg, VA, pers. comm.). Claytor Lake is an impoundment of the upper New River located in the Valley and Ridge physiographic province. In 2011, triploid (reproductively sterile) *Ctenopharyngodon idella* (Valenciennes in Cuvier and Valenciennes) (Grass Carp) were stocked into the reservoir to manage the expanding Hydrilla infestation using an incremental stocking approach. This strategy aimed to gradually reduce Hydrilla abundance over several years through periodic low-level Grass Carp stockings (Bain 1993, Chilton and Magnelia 2008). However, relatively long migrations (up to 500 km) by Grass Carp have been observed in large-river environments in both their native range and the US (Gorbach and Krykhtin 1988). Such occurrences could bring stocked Grass Carp into contact with macrophyte communities in river reaches adjacent to reservoirs. The New River upstream of Claytor Lake is an important aquatic resource for the region and supports a highly valued sport fishery (Copeland 2014). Therefore, this river reach could be negatively affected if upstream migrations by Grass Carp lead to reductions in native vegetation abundance. In 2012, we documented low levels of Grass Carp migration into this reach of the New River through a concurrent telemetry study (Weberg 2013). Thus, it is important to understand the current aquatic-plant community present within this river reach as a baseline for assessing potential future ecological alterations due to Grass Carp herbivory.

Despite the documentation of Hydrilla within the watershed and the recent introduction of Grass Carp into Claytor Lake, no studies have examined the New River aquatic-plant community since the late 1970s (Hill and Webster 1983, Rodgers et al. 1983). We conducted a drift survey of the aquatic-plant communities at 8 sites along a 39-km reach of the New River directly upstream of Claytor Lake. The objectives of the survey were to: (1) determine if Hydrilla had become established within this reach and (2) document the relative abundances of submersed and emergent macrophytes present within this reach to compare with identified plant preferences of Grass Carp and assess the potential for future herbivory effects should significant Grass Carp migrations occur.

Methods

Study site

The New River originates in the Appalachian highlands of North Carolina and flows northwest through Virginia and West Virginia before joining the Ohio River (Hill and Webster 1982). Within southwest Virginia, the New River is characterized by a steep gradient, narrow floodplain, and primarily bedrock channel. Our study focused on the 39-km river reach between Buck Dam and the head of Claytor Lake (generally marked by a set of riffles located near Allisonia, VA; Fig 1.).

Assessment of aquatic plant community upstream of Claytor Lake

During July 2012, we surveyed the aquatic-plant community by canoe starting at Buck Dam and concluding at the Allisonia rapids at the head of Claytor Lake. We visually surveyed for aquatic plant species along this reach; in deeper pool sections, we randomly threw a double-sided rake attached to a rope and slowly retrieved it to check for plant presence. We recorded all aquatic-plant species as we encountered them, maintained a running list, and placed voucher specimens of each species on ice for verification by taxonomic experts at the Massey Herbarium at Virginia Tech, Blacksburg, VA. To gauge the occurrence and abundance of aquatic-plant species along this reach, we also collected a single 5-minute drift-net sample using a 7.6-m beach seine approximately every 5 river-km using the methodology outlined by Owens et al. (2001). We collected drift samples by wading into the river at each sampling site and stretching the seine net perpendicular to the flow of the river. We removed from the net all aquatic plant fragments collected during each drift sample and stored them on ice. At the conclusion of the survey, we separated the samples by species, and blotted dry and weighed (g fresh weight [FW]) them.

Results

We identified 13 macrophyte species, of which 9 have been identified as readily or moderately consumed by Grass Carp (Table 1; Opuszynski and Shireman 1995).

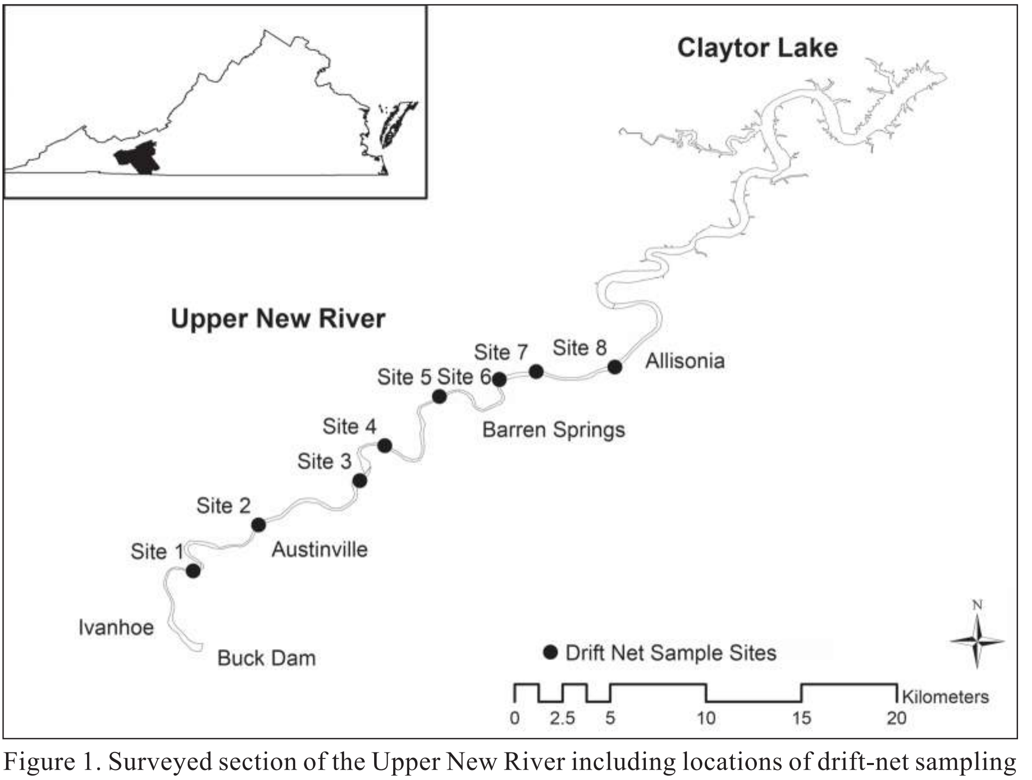


Figure 1. Surveyed section of the Upper New River including locations of drift-net sampling sites between Buck Dam near Ivanhoe, VA, and the start of Claytor Lake near Allisonia, VA.

Four of the 7 species sampled in the drift-net survey occurred in relatively low abundance (less than 21% of the plant-fragment sample per site [g FW]); however, we detected *Elodea canadensis* (Water Weed) and *Potamogeton crispus* (Curly Leaf Pondweed) at all sites (Table 2). While absent from the site-6 drift sample, we also observed *Podostemum ceratophyllum* (Riverweed) throughout the entirety of the survey, especially within shallow run and riffle habitats. The highest amount of plant fragments collected in our drift-net samples was at site 5 (365 g; Fig. 2). We did not detect Hydrilla on the surveyed river reach.

Overall, aquatic plant fragments collected in our drift-net samples were dominated by either Riverweed or Water Weed (Table 2, Fig. 2). In total, Water Weed comprised more than 62% of the total plant-fragment sample (g FW) during all drift-net surveys while Riverweed accounted for of approximately 23%. Interestingly, Riverweed dominated fragment samples at the 4 most-upstream sites, but Water

Table 1. List of aquatic plant species documented during a float survey of the New River between Buck Dam and Allisonia, VA, in July 2012. Determinations of prior species documentations were based on survey results from Hill and Webster (1984). *Indicates plants identified as readily or moderately consumed by Grass Carp (Opuszynski and Shireman 1995).

Common name	Scientific name	Classification	Prior documentation
Water Weed*	*Elodea canadensis* (Michx.) Britton	Submersed	Yes
Curly Leaf Pondweed*	*Potamogeton crispus* L.	Submersed	Yes
Longleaf Pondweed*	*Potamogeton nodosus* Poir.	Floating-leaved	No
Leafy Pondweed*	*Potamogeton foliosus* Raf.	Submersed	No
Wild Celery*	*Vallisneria americana* Michx.	Submersed	Yes
Riverweed	*Podostemum ceratophyllum* Michx.	Submersed	Yes
Musk-grass*	*Chara* L.	Algae	No
American Water-willow	*Justicia americana* (L.) Vahl	Emergent	Yes
Giant Duckweed*	*Spirodela polyrhiza* (L.) Schleid.	Floating-leaved	No
Arrowhead*	*Sagittaria* sp.	Emergent	No
Common Cattail*	*Typha latifolia* L.	Emergent	Yes
American Bulrush	*Schoenoplectus pungens* (Vahl) Palla	Emergent	No
Grassleaf Mudplantain	*Heteranthera dubia*(Jacq.) MacMill	Submersed	No

Table 2. Percent by weight of total sampled plant fragments for each species from drift-net samples taken approximately every 5 river-km during an aquatic plant survey of the New River between Buck Dam and Allisonia, VA, in July 2012.

	Site							
Common name	1	2	3	4	5	6	7	8
Water Weed	29.0	46.9	9.6	9.5	87.5	58.3	69.2	20.2
Curly Leaf Pondweed	0.4	5.4	1.1	0.3	10.8	29.7	12.9	42.0
Longleaf Pondweed	4.6	6.1	1.5	-	0.7	-	-	-
Leafy Pondweed	-	-	0.1	0.3	0.4	1.2	12.9	20.5
Wild Celery	0.4	12.2	0.2	0.6	0.3	10.7	-	-
Riverweed	65.7	29.3	87.5	89.3	0.3	-	4.8	17.3
Musk-grass	-	-	-	-	-	-	0.1	-

Weed dominated the samples obtained at 3 of the 4 lower-most sites. We also detected Curly Leaf Pondweed in low abundance in drift-samples at the 4 upstream sites, but its abundance increased substantially at the 4 downstream sites. The final downstream site was in fact dominated by Curly Leaf Pondweed and also had more equal fractions of Riverweed and Water Weed in sampled drift fragments. Longleaf Pondweed and *Vallisneria americana* (Wild Celery) were relatively uncommon species and appeared to be confined to upstream river reaches.

Discussion

Aquatic plant community of the New River upstream of Claytor Lake

Understanding aquatic-plant communities in mid-sized rivers can provide important insight into ecosystem structure and stability (Gregg and Rose 1982, Minshall 1978). However, comparatively few studies have addressed riverine aquatic-plant communities in the US, especially in the Southeast (Franklin et al. 2008). Our study identified a more-diverse aquatic-plant community in this stretch of the New River than was found during prior investigations (Hill and Webster 1984). In both terrestrial and aquatic-plant communities, greater occurrence and abundance of native species is believed to provide resiliency against the establishment of introduced species (Capers et al. 2007, Dukes 2001, Larson et al. 2013), which could explain the apparent absence of Hydrilla within this reach. However, a lack of Hydrilla may also be a function of early detection within Claytor Lake and the possibility that this section of the New River may have been sampled prior to a

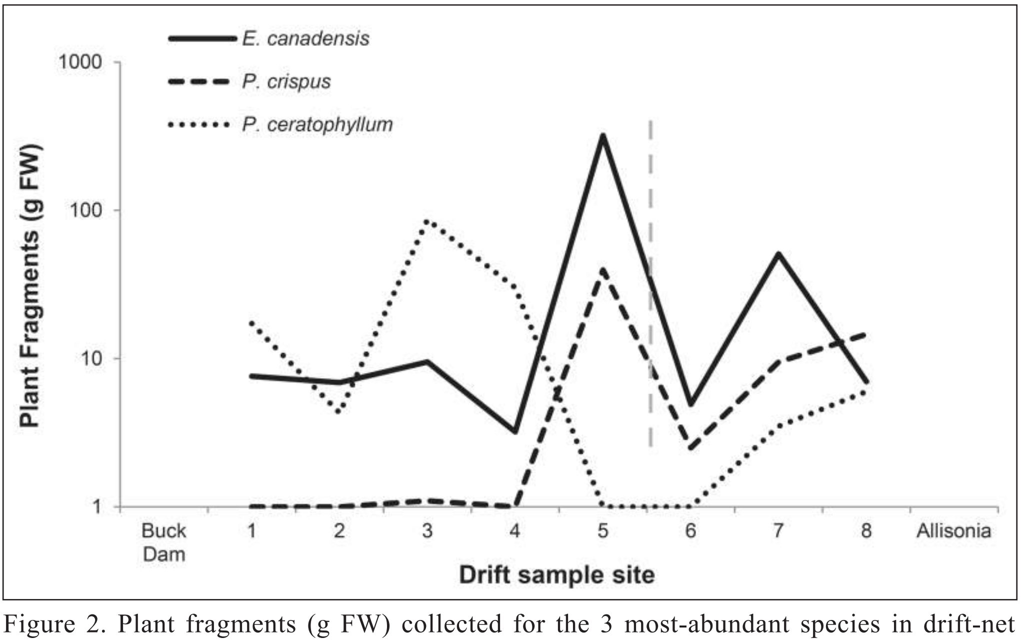


Figure 2. Plant fragments (g FW) collected for the 3 most-abundant species in drift-net samples taken in July 2012 at 8 sites in the New River between Buck Dam and Allisonia. The vertical dashed line (grey) indicates the furthest location upstream of Claytor Lake at which we documented Grass Carp during a concurrent telemetry study (Weberg 2013).

future "invasion wave" (Neubert and Caswell 2000, Skarpaas and Shea 2007). For example, there are increasing reports of established Hydrilla beds within the New River downstream of Claytor Dam (J.R. Copeland, pers. comm.), a reach that was not sampled in this study. Suitable habitat for aquatic plants in riverine environments is often limited by flow conditions (Butcher 1933, Sand-Jensen and Madsen 1992, Sprenkle et al. 2004) as well as through variations in dispersal (Bunn and Arthington 2002, Riis and Sand-Jensen 2005, Santamaria 2002), often leading to patchy distributions on the landscape. Similarly, the amount of plant fragments collected in our drift-net samples varied greatly among sites, which could be attributed to the high gradient and primarily bedrock channel of the upper New River.

The most lush stands of more-abundant species such as Wild Celery, *Potamogeton foliosus* (Leafy Pondweed), and Water Weed appeared to be highly localized at depositional zones within the river. Therefore, these depositional areas may be of significant ecological importance for aquatic biota within this reach. Prior to our study, Hill and Webster (1984) identified Riverweed as the most abundant plant species within this reach of the New River while Water Weed accounted for just 0.03% of macrophyte coverage. Conversely, the results from our drift-net survey indicate Water Weed may be the most abundant macrophyte, possibly suggesting a temporal shift in community structure. Riverweed was also abundant in our drift-net survey, although due to its epilithic nature, our sampling method may have underestimated its true abundance in this reach of the New River. Additionally, Hill and Webster (1984) used aerial photography combined with ground-truthing to determine overall coverage and abundance of plant species, which could further explain the observed differences in results. We collected no emergent plant species during our drift-net survey; however, we observed patchily distributed stands of *Justicia americana* (American Water-willow) throughout the survey. Hill (1981) identified American Water-willow as the most productive macrophyte within the upper New River, although he speculated that its localized distribution limited the species' overall contribution to the stream's energy budget. Although our study provides a much-needed description of the current aquatic-plant community of the New River upstream of Claytor Lake, future monitoring may also be important to identify potential alterations of plant abundance or community structure due to Grass Carp herbivory.

Evidence and implications of Grass Carp herbivory on Riverweed

Riverweed can be the dominant source of autotrophic production in Appalachian Rivers (Hill and Webster 1983) and may promote increased macroinvertebrate production (Hutchens et al. 2004) and stream-fish abundances (Argentina et al. 2010). If Grass Carp herbivory on Riverweed were to increase substantially, it could have major ecological repercussions. Currently, no studies have identified Riverweed as preferred forage for Grass Carp; however, we incidentally observed Riverweed within the alimentary tract of numerous Grass Carp collected near the Allisonia rapids during a concurrent study of Grass Carp growth in fall 2012 (Weberg 2013). The presence of Hydrilla in nearby shoal areas of Claytor Lake at the time of our

Grass Carp sampling efforts offers additional circumstantial evidence of Grass Carp herbivory on Riverweed. Riverweed has been noted as a preferred macrophyte for other herbivorous taxa such as *Branta canadensis* L. (Canadian Geese) and *Procambarus spiculifer* (LeConte) (White-tubercled Crayfish) (Parker et al. 2007); however, the voracious feeding pattern of Grass Carp on preferred plant species (up to 100% of body weight per day; Osborne and Riddle 1999) is of particular concern. For example, prior to 2012 Riverweed was abundant on the substrate at the Allisonia rapids, whereas in fall 2012 the substrate in this area was apparently devoid of Riverweed presumably due to Grass Carp herbivory (J.R. Copeland, pers. comm.). Prior studies have noted overall declines of Riverweed density within Appalachian streams (Argentina et al. 2010, Munch 1993). If this trend has already begun in the New River, it could be compounded by Grass Carp herbivory in this reach.

Implications of potential Grass Carp migrations

The majority of macrophyte species observed in our examination have been documented as preferred forage for Grass Carp that could migrate into that area. These findings, combined with the localization of the most-abundant plant species identified during our survey, indicate that the New River plant community could be vulnerable to Grass Carp herbivory. Beyond our observations during 2012, the overall migration rates of Claytor Lake Grass Carp are unknown. However, additional evidence indicates migration rates could increase as Hydrilla abundance declines in Claytor Lake, and as Grass Carp grow in size and approach sexual maturity. A telemetry study of juvenile Grass Carp stocked into Claytor Lake found that just 2 of 75 radio-tagged fish migrated into the New River over the 2-y study, although the instances of migration occurred in 2012 after Hydrilla abundance in Claytor Lake was significantly reduced (Weberg 2013). Thus, migration rates could increase as a result of Grass Carp searching for food if vegetation resources remain limited within Claytor Lake. Additionally, Grass Carp life stage is believed to influence movement patterns (Gorbach and Krykhtin 1988). For example, mature Grass Carp (600–730 mm total length [TL], 4.0–6.0 kg) stocked in Lake Guntersville, AL showed significantly higher rates of movement than juveniles, and completed migrations as far as 71 km upstream (Bain et al. 1990). Accordingly, 32 Grass Carp (mean TL = 716 mm) were sampled within the New River upstream of Claytor Lake in the spring and early summer 2013 during electrofishing assessments (J.R. Copeland, unpubl. data). During 2011–2012, the first 2 years following the initial stocking of Grass Carp in Claytor Lake, only 4 Grass Carp had been sampled in this reach. The New River was subject to high flows throughout the spring and early summer of 2013, and 27 of the Grass Carp collected in 2013 were captured within close proximity of Allisonia. Therefore, it is possible that the increase in Grass Carp collections may be a result of high flows allowing access to more habitats.

Research implications

Based on our examination of the aquatic-plant community in the New River upstream of Claytor Lake, it appears that greater monitoring is needed to fully understand the effects of Grass Carp in lotic ecosystems. We suggest that annual surveys of water quality and vegetation, fish, and invertebrate abundance, combined with continued monitoring of Grass Carp migration rates, could provide an important case study for resource managers. Grass Carp have been documented in numerous medium–large rivers throughout the US (Elder and Murphy 1997, Guillory and Gasaway 1978, Pflieger 1978), yet examinations of the effects Grass Carp have on the form and function of aquatic ecosystems has been limited to lakes and reservoirs. In Lake Conroe, TX, the complete removal of macrophytes by Grass Carp resulted in a major biomass shift to more-pelagic fish species (Bettoli et al. 1993), increased nutrient levels, and decreased water clarity due to higher algal biomass (Maceina et al. 1992). However, river systems differ greatly in structure and function compared to lentic environments, thus limiting comparability in the assessment of potential Grass Carp effects. Hydrilla continues to pose major threats to aquatic ecosystems at all scales, including to the integrity of riverine aquatic-macrophyte communities. Grass Carp will likely remain a major management tool for addressing invasive Hydrilla infestations and are also likely to spread outside of their introduced range as an invasive species. Future work on the effects of Grass Carp on the macrophyte communities of the New River could contribute to an important case study of the feasibility of Grass Carp as a management tool for Hydrilla balanced against the conservation needs of upstream ecological communities.

Acknowledgments

We thank B. Dickinson and P. Chrisman for assisting with field research. Funding for this project was provided by the Virginia Department of Game and Inland Fisheries through a Federal Aid in Sportfish Restoration grant from the US Fish and Wildlife Service, and also was supported by the USDA National Institute of Food and Agriculture, Hatch Project 230537. We also thank P. Kirk and an anonymous reviewer for their comments that greatly improved this manuscript.

Literature Cited

Allen, J.D., and M.M. Castillo. 2007. Stream Ecology: Structure and Function of Running Waters. Springer, Dordrecht, Netherlands. 436 pp.

Argentina, J.E., M.C. Freeman, and B.J. Freeman. 2010. The response of stream fish to local and reach-scale variation in the occurrence of a benthic aquatic macrophyte. Freshwater Biology 55:643–653.

Bain, M.B. 1993. Assessing impacts of introduced aquatic species: Grass Carp in large systems. Environmental Management 17:211–224.

Bain, M.B., D.H. Webb, M.D. Tangedal, and L.N. Mangum. 1990. Movements and habitat use by Grass Carp in a large mainstream reservoir. Transactions of the American Fisheries Society 119:553–561.

Bettoli, P.W., M.J. Maceina, R.L. Noble, and R.K. Betsill. 1993. Response of a reservoir fish community to aquatic vegetation removal. North American Journal of Fisheries Management 13:110–124.

Bunn, S.E., and A.H. Arthington. 2002. Basic principles and ecological consequences of altered flow regimes for aquatic biodiversity. Environmental Management 30:492–507.

Butcher, R.W. 1933. Studies on the ecology of rivers: On the distribution of macrophytic vegetation in the rivers of Britain. Journal of Ecology 21:58–91.

Capers, R.S., R. Selsky, G.J. Bugbee, and J.C. White. 2007. Aquatic-plant community invasibility and scale-dependent patterns in native and invasive species richness. Ecology 88:3135–3143.

Chilton II, E.W., and S.J. Magnelia. 2008. Use of an incremental stocking strategy for maintaining vegetation coverage in a riverine Texas reservoir. American Fisheries Society Symposium 62:543–555.

Clarke, S.J., and G. Wharton. 2001. Sediment-nutrient characteristics and aquatic macrophytes in lowland English rivers. Science of the Total Environment 266:103–112.

Copeland, J.R. 2014. An angler's guide to the lower New River. Available online at http://www.dgif.virginia.gov/fishing/waterbodies/reports. Accessed 4 October 2014.

Dukes, J.S. 2001. Biodiversity and invasibility in grassland microcosms. Oecologia 143:598–606.

Elder, H.S., and B.R. Murphy. 1997. Grass Carp in the Trinity River, Texas. Journal of Freshwater Ecology 12:281–289.

Franklin, P., M. Dunbar, and P. Whitehead. 2008. Flow controls on lowland river macrophytes: A review. Science of the Total Environment 400:369–378.

Gorbach, E.I., and M.L. Krykhtin. 1988. Migration of the White Amur, *Ctenopharyngodon idella*, and Silver Carp, *Hypophthalmichthys molitrix*, in the Amur River Basin. Journal of Ichthyology 28:47–53.

Gregg, W.W., and F.L. Rose. 1982. The effects of aquatic macrophytes on the stream microenvironment. Aquatic Botany 14:309–324.

Grenouillet, G., D. Pont, and K.L. Seip. 2002. Abundance and species richness as a function of food resources and vegetation structure: Juvenile fish assemblages in rivers. Ecography 25:641–650.

Guillory, V., and R.D. Gasaway. 1978. Zoogeography of the Grass Carp in the United States. Transactions of the American Fisheries Society 107:105–112.

Hill, B.H. 1981. Distribution and production of *Justicia americana* in the New River, Virginia. Castanea 46:162–169.

Hill, B.H., and J.R. Webster. 1982. Aquatic macrophyte breakdown in an Appalachian river. Hydrobiologia 89:53–59.

Hill, B. H., and J.R. Webster. 1983. Aquatic macrophyte contribution to the New River organic matter budget. Pp. 273–282, *In* T.D. Fontaine III and S.M. Bartell (Eds.). Dynamics of Lotic Ecosystems. Ann Arbor Science, Ann Arbor, MI. 494 pp.

Hill, B.H., and J.R. Webster. 1984. Productivity of *Podostemum ceratophyllum* in the New River, Virginia. American Journal of Botany 71:130–136.

Holmes, N.T.H, P.J. Boon, and T.A. Rowell. 1998. A revised classification system for British rivers based on their aquatic-plant communities. Aquatic Conservation: Marine and Freshwater Ecosystems 8:555–578.

Horsch, E.J., and D.J. Lewis. 2009. The effects of aquatic invasive species on property values: Evidence from a quasi-experiment. Land Economics 85:391–409.

Hutchens, J.J., Jr., J.B. Wallace, and E.D. Romaniszyn. 2004. Role of *Podostemum ceratophyllum* Michx. in structuring benthic macroinvertebrate assemblages in a southern Appalachian river. Journal of the North American Benthological Society 23:713–727.

Langeland, K.A. 1996. *Hydrilla verticillata* (L.F.) Royle (Hydrocharitaceae), "the perfect aquatic weed". Castanea 61(3):293–304.

Larson, D.L., J.B. Bright, P. Drobney, J.L. Larson, N. Palaia, P.A. Rabie, S. Vacek, and D. Wells. 2013. Using prairie restoration to curtail invasion of Canada Thistle: The importance of limiting similarity and seed-mix richness. Biological Invasions 15:2049–2063.

Maceina, M.J., M.F. Cichra, R.K. Betsill, and P.W. Bettoli. 1992. Limnological changes in a large reservoir following vegetation removal by Grass Carp. Journal of Freshwater Ecology 7:81–95.

Madsen, J.D., P.A. Chambers, W.F. James, E.W. Koch, and D.F. Westlake. 2001. The interaction between water movement, sediment dynamics, and submersed macrophytes. Hydrobiologia 444:71–84.

Minshall, G.W. 1978. Autotrophy in stream ecosystems. Bioscience 28:767–771.

Munch, S. 1993. Distribution and condition of populations of *Podostemum ceratophyllum* (Riverweed) in Pennsylvania. Journal of the Pennsylvania Academy of Science 67:65–72.

Nuebert, M.G., and H. Caswell. 2000. Demography and dispersal: Calculation and sensitivity analysis of invasion speed for structured populations. Ecology 81:1613–1628.

Opuszynski, K., and J.V. Shireman. 1995. Herbivorous Fishes: Culture and Use for Weed Management. CRC Press, Boca Raton, FL. 223 pp.

Osborne, J.A., and R.D. Riddle. 1999. Feeding and growth rates for triploid Grass Carp as influenced by size and water temperature. Journal of Freshwater Ecology 14:41–45.

Owens, C.S., J.D. Madsen, R.M. Smart, and R.M. Stewart. 2001. Dispersal of native and nonnative aquatic plant species in the San Marcos River, Texas. Journal of Aquatic Plant Management 39:75–79.

Parker, J.D., D.E. Burkepile, D.O. Collins, J. Kubanek, and M.E. Hay. 2007. Stream mosses as chemically defended refugia for freshwater macroinvertebrates. Oikos 116:302–312.

Pflieger, W.L. 1978. Distribution and status of the Grass Carp (*Ctenopharyngodon idella*) in Missouri streams. Transactions of the American Fisheries Society 107:113–118.

Pimentel, D., R. Zungia, and D. Morrison. 2005. Update on the environmental and economic costs associated with alien invasive species in the United States. Ecological Economics 52:273–288.

Riis, T., and K. Sand-Jensen. 2005. Dispersal of plant fragments in small streams. Freshwater Biology 51:274–286.

Rodgers, J.H., M.E. McKevitt, D.O. Hammerlund, K.L. Dickson, and J. Cairns. 1983. Primary production and decomposition of submergent and emergent aquatic plants of two Appalachian rivers. Pp. 283–301, *In* T.D Fontaine III and S.M. Bartell (Eds.). Dynamics of Lotic Systems. Ann Arbor Science, Ann Arbor MI.

Sand-Jensen, K., and T.V. Madsen. 1992. Patch dynamics of the stream macrophyte *Callitriche cophocarpa*. Freshwater Biology 27:277–282.

Santamaria, L. 2002. Why are most aquatic plants widely distributed? Dispersal, clonal growth, and small-scale heterogeneity in a stressful environment. Acta Oecologica 23:137–154.

Skarpaas, O., and K. Shea. 2007. Dispersal mechanisms and invasion-wave speeds for invasive thistles. The American Naturalist 170:421–430.

Sprenkle, E.S., L.A. Smock, and J.E. Anderson. 2004. Distribution and growth of submerged aquatic vegetation in the piedmont section of the James River, Virginia. Southeastern Naturalist 3:517–530.

Strange, E.M., K.D. Fausch, and A.P. Covich. 1999. Sustaining ecosystem services in human-dominated watersheds: Biohydrology and ecosystem processes in the South Platte River Basin. Environmental Management 24:39–54.

Vannote, R.L., G.W. Minshall, K.W. Cummins, J.R. Sedell, and C.E. Cushing. 1980. The river continuum concept. Canadian Journal of Fisheries and Aquatic Sciences 37:130–137.

Weberg, M.A. 2013. Analysis of Grass Carp dynamics to optimize Hydrilla control in an Appalachian Reservoir. M.Sc. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, VA. 127 pp.

Wilde, S.B., T.M. Murphy, C.P. Hope, S.K. Habrun, J. Kempton, A. Birrenkott, F. Wiley, W.W. Bowerman, and A.J. Lewitus. 2005. Avian vacuolar myelinopathy linked to exotic aquatic plants and a novel cyanobacterial species. Environmental Toxicology 20(3):348–353.

Aquatic Botany 139 (2017) 65–74

Contents lists available at ScienceDirect

Aquatic Botany

journal homepage: www.elsevier.com/locate/aquabot

Review

Ecology of the macrophyte *Podostemum ceratophyllum* Michx. (Hornleaf riverweed), a widespread foundation species of eastern North American rivers

James Wood [a,*], Mary Freeman [b]

[a] University of Georgia, Odum School of Ecology, 140 E. Green Street, Athens, GA, 30602, USA
[b] U.S. Geological Survey, Patuxent Wildlife Research Center, 180 E. Green Street, University of GA, Athens, GA 30602, USA

ARTICLE INFO

Article history:
Received 11 October 2016
Received in revised form 10 February 2017
Accepted 17 February 2017
Available online 22 February 2017

Keywords:
Podostemaceae
Herbivory
Macrophyte
Rheophyte
Torrenticolous

ABSTRACT

Podostemum ceratophyllum, commonly called Hornleaf Riverweed, occurs in mid-order montane and piedmont rivers of eastern North America, where the plant grows submerged and attached to rocks and stable substrates in swift, aerated water. Multiple studies, mostly conducted in the southern portions of the plant's range, have shown that *Podostemum* can variously influence benthic communities in flowing waters. However, a synthetic review of the biology and ecology of the plant is needed to inform conservation, particularly because *P. ceratophyllum* is reported to be in decline in much of its range, for mostly unknown reasons. We have thus summarized the literature showing that *Podostemum* provides substantial habitat for invertebrates and fish, may be consumed by invertebrates, turtles, and other vertebrates, removes and sequesters dissolved elements (i.e., nitrogen, phosphorus, calcium, zinc, etc.) from the water column, and contributes organic matter to the detrital pool. *Podostemum* may be tolerant to some forms of pollution but appears vulnerable to sedimentation, epiphytic over-growth, and hydrologic changes that result in desiccation, and possibly increased herbivory pressure. Much remains unknown about *Podostemum*, including aspects of morphological variation, seed dispersal, and tolerance to changes in temperature and water chemistry. Nonetheless, *Podostemum* may be considered a foundation species, whose loss from eastern North American rivers is likely to affect higher trophic levels and ecosystem processes.

Contents

* Corresponding author.
E-mail addresses: wood@uga.edu (J. Wood), mcfreeman@usgs.gov (M. Freeman).

http://dx.doi.org/10.1016/j.aquabot.2017.02.009
0304-3770/

1. Introduction

Macrophyte ecology is an active area of aquatic research and research has shown that plants influence aquatic community structure and species composition (Argentina et al., 2010b; Camp et al., 2014), nutrient cycling (Keitel et al., 2016), benthic foodwebs (Lodge, 1991) and ecosystem level processing, and the retention of elements within the system (Vila-Costa et al., 2016). However, there still exist large deficiencies in our understanding of how riverine macrophytes are influenced by land use and subsequent changes in water quality (Argentina et al., 2010a; Manolaki and Papastergiadou, 2013; Bakker et al., 2016). To maintain the ecological integrity of river systems, it is important to be able to identify stressors to riverine macrophytes and predict species persistence for a given environmental change. Here we review the available literature concerning what we believe to be the most ecologically influential macrophytes in mid-order montane and piedmont rivers of eastern North America. *Podostemum ceratophyllum* Michx., commonly called Hornleaf Riverweed, is a flowering plant (angiosperm) that grows submerged and attached to stable benthic substrate (Fig. 1a). The plant is most common in rivers with an open canopy and a cobble or bedrock substrate, but it can also be found in smaller tributaries in locations with abundant light and perennial flow (e.g., waterfalls and cascades). *Podostemum ceratophyllum*, henceforth referred to as *Podostemum* (except where inclusion of the specific epithet provides needed clarity) can cover vast areas of the streambed and provides habitat, and potentially food, for a diverse group of aquatic organisms. *Podostemum* may also influence nutrient and carbon dynamics in the swift-flowing rivers where it occurs (Fig. 2).

Dayton (1972) used the term "foundation species" to describe an organism that strongly influences community structure and function. Later Ellison et al. (2005) employed the foundation species concept to illustrate how the loss of certain tree species altered the local environment and important ecosystem processes like decomposition, nutrient flux, carbon sequestration and energy flow. Similarly, we propose that *Podostemum* can be considered a foundation species based on the plant's extensive geographic range and substantial influence on ecosystem processes and benthic community structure (Nelson and Scott, 1962; Everitt and Burkholder, 1991; Grubaugh and Wallace, 1995; Hutchens et al., 2004). *Podostemum* is morphologically and ecologically similar to riverine bryophytes, which also grow attached to stable substrates, provide substantial habitat for macroinvertebrates and epiphytic biofilms, and increase retention of organic matter and stream metabolism (Stream Bryophyte Group, 1999; Wood et al., 2016). However, we hypothesize that *Podostemum* has a stronger influence on ecosystem processes than bryophytes because it grows more quickly and in a broader range of light conditions, and sustains higher grazing pressure (Parker et al., 2007).

Podostemum is also of interest because the plant appears to be declining across much of its native range. Local extinction or substantial decline of *Podostemum* has been documented in several northern rivers including the Cocheco River near Dover, New Hampshire, the West River near Jamaica, Vermont (Philbrick and Crow, 1983), tributaries of the Roanoke River in Virginia (Connelly et al., 1999), several rivers in Pennsylvania (Munch, 1993) and possibly throughout much of the eastern Piedmont. The species is listed as *Endangered*, *Historical*, a *Species of Concern* or *Threatened* in many northern States (USDA, 2014). Decline and extirpation have been attributed to sedimentation, dewatering, inundation by water impoundment, and unspecified pollutants from industry, mining operations and urban runoff (Adams et al., 1973; Munch, 1993; Connelly et al., 1999). However, neither the underlying factors nor the ecological significance of changes in *Podostemum* abundance have been extensively investigated.

This review provides a synopsis of the biology and ecology of *Podostemum* and identifies research needed to understand the causes and consequences of changes in abundance of the plant across its native range. We review reports describing *Podostemum* occurrence, important life history traits, and its role as a foundation species in eastern North American rivers (Table 1). We then hypothesize how *Podostemum* will likely respond to future environmental change, and how changes in *Podostemum* occurrence will likely affect river ecosystems.

2. Distribution and biology of *Podostemum ceratophyllum*

2.1. Biogeography

The family Podostemaceae Rich. ex C. Agardh is the largest family of strictly aquatic flowering plants in the world (Philbrick and Novelo, 1995; Philbrick and Novelo, 2004). These plants possess distinctive morphological adaptions including specialized root structures and long, thin durable leaves well-adapted to their swift-water habitat (van Steenis, 1981). North, Central, and South America contain about 60% of the species in the family, with the remaining species distributed throughout Africa, Madagascar, and Southeast Asia (Philbrick and Alejandro, 1995). Recent investigations have concluded that the genus *Podostemum* is restricted to the New World (Philbrick and Novelo, 2004), with the greatest species diversity occurring in South America, mainly in Brazil. South American Podostemaceae taxonomy remains uncertain (Philbrick et al., 2010) and ecological studies on these species are sparse. Mexico is reported to have four genera (*Marathrum*, *Oserya*, *Podostemum, Tristicha*) with higher diversity in the Pacific coast slopes compared with Atlantic slopes (Novelo and Philbrick, 1997; Tippery et al., 2011). Altogether, the Americas are thought to contain about 135 species of Podostemaceae with only a single species, *Podostemum ceratophyllum,* known from the continental U.S.A. and Canada (Graham and Wood, 1975; Philbrick et al., 2010; Tippery et al., 2011).

Podostemum ceratophyllum's native range is confined to montane and piedmont regions of the eastern United States and Canada, ranging from Georgia to Ontario, with scattered populations westward as far as Arkansas, Oklahoma, Minnesota and North Dakota, and disjunct populations in Honduras and the Dominican Republic (Philbrick and Crow, 1983; Philbrick and Novelo, 2004). Reduced genetic variation (based on nucleotide markers and isozymes) in populations north of North Carolina indicates range expansion northward following the last glacial-maximum from refugia several hundred km south of the glacial boundary (Philbrick and Crow 1992; Fehrmann et al. 2012).

2.2. Morphology

Two of the earliest papers about *Podostemum* detailed the structure of the plant's vegetative and reproductive organs (Warming, 1881, 1882). *Podostemum* follows the Root-Shoot model with the presence of distinct roots, stems (shoots) and leaves (Rutishauser

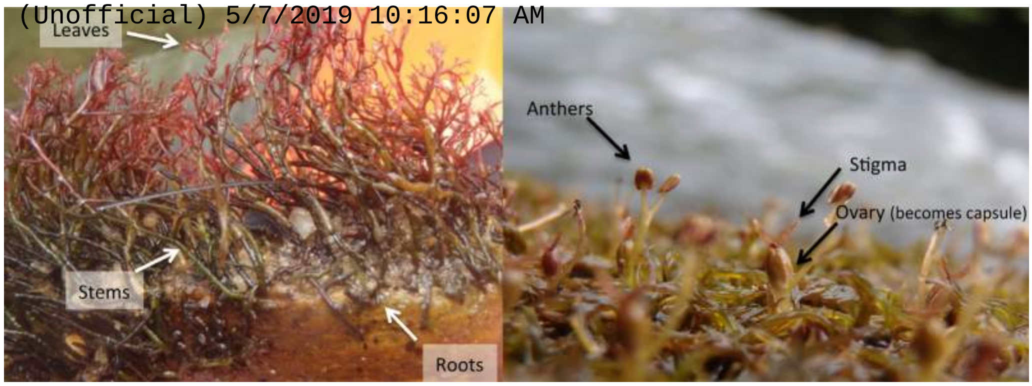


Fig. 1. (a) *Podostemum ceratophyllum* grows submerged, attached directly to rocks in fast flowing eastern rivers. Stems and leaves can be green, black and red and the leaves are deeply dichotomously lobbed. Roots are also green, black and red and attach the plant to the rock with structures called haptera. (b) Flowers emerge as water levels expose the plant above the water's surface. Flowers are small with reduced petals and prominent anthers above the stigma and ovary. Photo by J. Wood. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

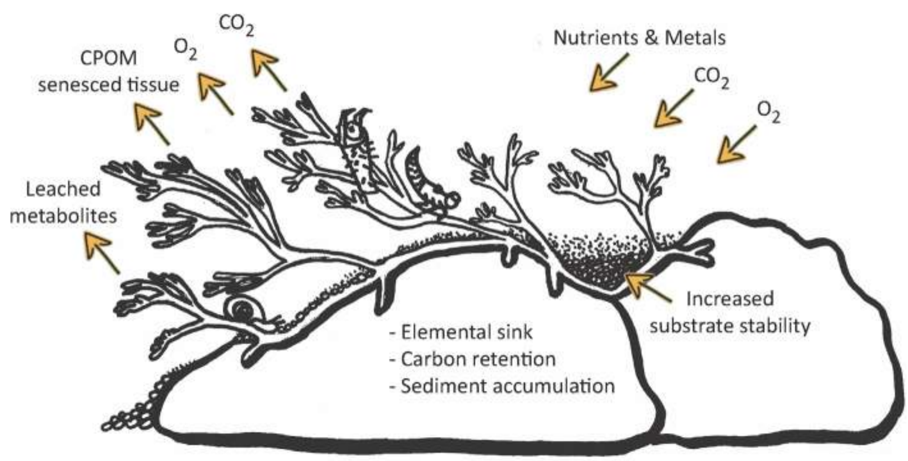


Fig. 2. A diagram illustrating *Podostemum ceratophyllum*'s interactions with the benthic environment. *Podostemum* provides structure and increases habitat complexity over bare rock, which attracts riverine biota. *Podostemum* influences elemental cycling through: retention of detrital material in plant colonies; assimilation of elements from the water column into plant tissue; and leaching of metabolites into the water column. *Podostemum* also increases substrate stability by binding gravels and cobbles together.

et al., 2003). The stems may be heavily cutinized (hardened), appearing dark green to black, often in stark contrast to its leaves, which can be a vibrant green. Cutinization can result from damage to the stem (Hammond, 1937), and heavily cutinized stems may correlate with abrasion from suspended sediments in swift current. New growth is often a luxuriant green in spring and summer, while in the winter leaves often are completely senesced or take on a deep reddish color (Hammond, 1937). The red coloration is caused by an increase in the light-absorbing pigment anthocyanin, which reduces tissue damage from UV light but may have other functions. Production of anthocyanin is a common stress response in plants and has also been linked to nutrient imbalance (Marschner, 1986). Supportive of this conclusion, Munch (1993) only found *Podostemum* exhibiting the red coloration in surface water that had a total nitrate-N to total phosphorous ratio of more than 18:1.

The roots of *Podostemum* attach to stable substrates (rock, wood, and other debris) with distinct root hairs called haptera (Rutishauser et al., 2003). While the root hairs were once thought to exude a sticky substance that attached the plant to rocks, a study of Old World species of Podostemaceae proposed that attachment is facilitated by a film of cyanobacteria (Jäger-Zürn and Grubert, 2000). The nature of this relationship is not understood, and has not been investigated in *P. ceratophyllum*.

Fig. 3. Examples of the morphological variation, from extended, narrow leaves to short, broader leaves, common in *Podostemum ceratophyllum.* These stems were collected on the same day and in close proximity to each other. Small squares in the background are 1 mm × 1 mm. Photo by J. Wood.

Aside from the basic root-stem-leave structure, *Podostemum* is highly variable in appearance (Fig. 3). Four varieties have been described based on this variation (van Royen, 1951) but these varieties have been condensed into one species with highly plastic morphology (Philbrick and Novelo, 2004). *Podostemum* can have long leaves (4–20 cm) in the form once recognized as *P. ceratophyllum* var. *ceratophyllum*, or shorter leaves that are densely

Table 1
Papers on the ecology of *Podostemum ceratophyllum* Michx. or that contain ecologically relevant information on the ecology the plant.

Topic	Foci	Author	Study Location
Macroinvertebrates	secondary production and community composition	Nelson and Scott (1962)	GA, Middle Oconee River
	habitat preference and density of black flies (*Simulium decorum* Walker)	Hudson and Hays (1975)	AL, Alabama Agricultural Experimental Station at Auburn University, Farm Pond no 1. artificial channel
	habitat preference of riverine snails (*Oxytrema (=Goniobasis) suturalis* Haldeman)	Kreiger and Burbanck (1976)	GA, Yellow River
	secondary production and community composition	Grubaugh and Wallace (1995)	GA, Middle Oconee River
	secondary production and impact of plant removal treatment	Hutchens et al. (2004)	NC, Little Tennessee River
	habitat of the caddisfly (*Brachycentrus etowahensis* Wallace)	Duncan PhD Dissertation (2008)	GA, Upper Etowah River
	dietary preference and habitat of Hydropsychid caddisflies	Tinsley BS Thesis (2012)	KY, Upper Green River
Macrophyte community dynamics and regrowth	interspecific competition between benthic autotrophs	Everitt and Burkholder (1991)	NC, Main stem and Cedar Fork of the Little River
	regrowth from root fragments	Philbrick et al. (2015)	CT, Pootatuck River
Fishes	habitat use by Riverweed Darter (*Etheostoma podostemone* Jordan & Jenkins)	Connelly et al. (1999)	VA, North and South Fork of Roanoke River
	habitat preference of riverine fish and influence of *Podostemum*	Argentina et al. (2010b)	GA & TN, Conasauga River
	habitat preference of the Snail Darter (*Percina tanasi* Etnier)	Ashton and Lazer (2010)	TN, French Broad and Hiwassee Rivers
Flow	flow alteration and plant recovery	Pahl MS thesis (2009)	GA, Middle Oconee River, Honeycutt Creek
Herbivory	consumption by River Cooter (*Pseudemys concinna* (LeConte))	Fahey (1987) in Aresco and Dobie (2000)	AL, Tallapoosa River
	consumption by Canada geese, crayfish, & amphipods	Parker et al. (2007)	GA, Chattahoochee River and in the laboratory
	consumption by triploid Grass Carp (*Ctenopharyngodon idella* (Valenciennes))	Weberg et al. (2015)	VA, Upper New River
Habitat	influence of land use, light, and substrate size	Argentina et al. (2010a)	GA & TN, Conasauga River
	influence of channel morphology and substrate size	Duncan et al. (2011)	GA, Upper Etowah River
Decomposition rate	*P. ceratophyllum* breakdown rate	Hill and Webster (1982)	NC & VA New River
		Rodgers et al. (1983)	TN, Watauga & VA, New Rivers
Productivity	*P. ceratophyllum* production	Hill and Webster (1984)	NC & VA New Rivers
Elemental	plant elemental composition	Adams et al. (1973)	DE, Susquehanna
	copper and lead bioaccumulation	Heisey and Damman (1982)	CT, Natchaug, Willimantic and Shetucket Rivers
Biogeography	species distribution	Philbrick and Crow (1983)	Eastern US, Arkansas, Honduras, Dominican Republic
	isozyme variation	Philbrick and Crow (1992)	Eastern US
	interspecific nucleotide diversity	Fehrmann et al. (2012)	Eastern US, Arkansas and Honduras
Other	cyanobacterial symbiotic relationship	Jager-Zurn and Grubert (2000)	herbarium samples (Old World species only)
	carbon Isotope fractionation	Ziegler and Hertel (2007)	herbarium samples

clustered at the end of the stem, giving the plant a distinctly bristly appearance (in the form once recognized as *P. ceratophyllum* var. *circumvallatum*). Hammond (1937) notes that these different forms can grow side by side but that plants in a given colony are generally uniform in size and structure. We hypothesize that specific aspects of the habitat such as flow velocity, herbivory, or both may exert a large influence on growth form.

2.3. Reproduction

Flower buds open as water levels decline and the plant is exposed above the water surface (Philbrick, 1984). Flowers emerge from an enclosed spanthellae, and mature flowers (Fig. 1b) have obvious anthers subtended by an enlarged ovary with two stigma (Philbrick, 1984). Pollination is most likely facilitated by wind or insects, but not water, and pre-anthesis cleistogamy (pollination before the flower opens) has also been reported (Philbrick, 1984). After pollination maturation of the seed capsule is reported to take 2–3 weeks (Philbrick, 1984) and seed capsules may appear mature while still developing (Philbrick and Novelo, 1995). The seeds are small and the seed coat produces a sticky mucilaginous coating when wetted, allowing seeds to stick to suitable substratum. While pollination and seed dispersal mechanisms have not been intensively investigated (Philbrick, 1984), gene flow between populations appears erratic (Fehrmann et al., 2012) and seed dispersal is presumably facilitated by migrating wildlife (birds & large mammals), while long distance dispersal is probably limited to avian vectors (Philbrick and Crow, 1992).

Philbrick and Novelo (1994) propose that Podostemads use the type 1 seed germination strategy, first proposed by Thompson and Grime (1979), where seeds germinate soon after being released from the capsule. Indeed, the seeds lack an endosperm, show no need for cold stratification or dormancy, and seem unlikely to persist for years before germination (Philbrick, 1984). Additionally, asexual reproduction is facilitated by root fragmentation, where detached root segments can reattach to rocks over time (Philbrick et al., 2015). For additional details about morphology, development and reproduction refer to (Graham and Wood, 1975; Philbrick, 1984; Philbrick and Alejandro Novelo, 1997; Rutishauser, 1997; Rutishauser et al., 2003; Philbrick and Novelo, 2004).

2.4. Physiology

Information about oxygen and carbon dioxide uptake rate and almost all other physiological responses of Podostemaceae is limited. Unlike most other aquatic plants which can utilize bicarbonate in addition to dissolved carbon dioxide, *Podostemum* may only be able to absorb dissolved carbon dioxide from the water column (Pannier, 1960; Hill and Webster, 1984) – a trait shared with bryophytes. Thus, a study on the New River attributed reduced ^{14}C uptake at soft-water sites to reduced availability of free CO_2 compared to hard-water sites (Hill and Webster, 1984). While the respiration rate of *Podostemum* has not been investigated, the neo- and paleotropical taxon (*Tristicha trifaria* (Bory ex Willd.) Spreng.) is reported to have an ability to absorb oxygen at an extremely high rate (14 mg O_2 g dry wt^{-1} h^{-1}) in oxygen-saturated water (Pannier, 1960).

3. *Podostemum* as a foundation species

3.1. High biomass and productivity

Several studies have indicated that *Podostemum* is highly productive and capable of obtaining large standing stock biomass, although variation among locations, seasons and years may be substantial. Hill and Webster (1983) estimated that *Podostemum* contributed 1154 T ash free dry weight (AFDM) yr^{-1} to their New River, Virginia study area, approximately 80% of the total macrophyte contribution. *Podostemum* production was 10 times that of periphyton on an aerial basis and the ratio of production to biomass (P/B) was as high as 4 (most aquatic macrophytes are closer to 2; Hill and Webster 1984). The authors interpreted this high production relative to biomass as indicative of substantial biomass loss to scouring (Hill and Webster, 1984), although the potential influence of herbivory was not measured. Not surprisingly, measures of productivity have varied substantially, likely reflecting the influences of flow, water chemistry and location within the channel. For example, estimated productivity spanned 3 orders of magnitude (0.05 g C m^{-2} d^{-1} to 1.08 g C m^{-2} d^{-1}) on the New River and Watauga River (Tennessee) (Hill and Webster, 1984).

Biomass measurements have also varied widely, likely reflecting multiple influences. Rodgers et al. (1983) reported a seasonal maximum biomass between 22 and 98 g AFDW m^{-2} on the New River and Watauga River, in contrast to substantially higher mean monthly standing stocks (between 386 and 587 g AFDM m^{-2}, to a maximum of just over 1000 g AFDM m^{-2} in November) on the Middle Oconee River, Georgia, (Grubaugh and Wallace 1995). Biomass measurements at the same Middle Oconee River site during a prolonged drought were an order of magnitude lower (Pahl, 2009).

3.2. Influences on benthic biota

For almost 100 years, ecologists have known that macroinvertebrates utilize the habitat produced by *Podostemum* (Hammond, 1937) and more recent studies have shown strong correlations between *Podostemum* and abundances of some riverine biota (Hutchens et al., 2004; Argentina et al., 2010b). A study in the Little Tennessee River, North Carolina, found *Podostemum* enhanced the surface area of macroinvertebrate habitat on bedrock by at least 3–4 times, and that removal of *Podostemum* reduced macroinvertebrate biomass by over 90% and abundance by almost 88% (Hutchens et al., 2004). A wide diversity of macroinvertebrates are associated with *Podostemum*. Rocks colonized by *Podostemum* in the Middle Oconee River contained at least thirty-four genera of aquatic insects (plus an additional 13 taxa only identified to family level or the order Hemiptera) representing all major aquatic insect orders, as well as Cnidaria, Tubellaria, Mollusca, Annelida, Hydracarina, Cladocera, and Copepoda (Nelson and Scott, 1962; Grubaugh and Wallace, 1995).

Podostemum may particularly enhance habitat availability for filter-feeding insects by providing points of attachment with access to swiftly-flowing water. The silk nets of hydropsychid caddisfly larvae are commonly observed in *Podostemum* mats (*pers. obs.* J.W.), and the plant is reported to support significantly higher abundances of hydropsychids (Tinsley, 2012) than bare rock. Similarly, densities of the filter-feeding Etowah caddisfly, *Brachycentrus etowahensis Wallace,* have been positively correlated with *Podostemum* (Willats, 1998; Duncan, 2008). The plant also appears to be a preferred habitat for filtering black fly larvae (*Simulium*), with measured densities of 4.2–4.5 individuals per square cm of *Podostemum* stem, among the highest densities recorded for the 54 plant taxa examined in a mesocosom study (Hudson and Hays, 1975). Furthermore, Hutchens et al. (2004) report that filterers were the best represented macroinvertebrate functional feeding group (FFG) in *Podostemum* by biomass.

Podostemum may also attract other FFGs because the plant traps organic matter and provides a substrate for epiphytic overgrowth of diatoms and other algae (Fig. 4). Thus, insects that feed by scraping periphyton (scrapers) or by collecting fine detrital particles (collector-gatherers) can be the most abundant FFGs associated with *Podostemum* (Hutchens et al., 2004; Grubaugh and Wallace, 1995). Similarly, snails, which are among the most endemic and threatened riverine invertebrates in eastern rivers (Johnson et al., 2013), are frequently observed grazing on *Podostemum*. In a study on the Yellow River, Georgia, Krieger and Burbanck (1976) found that *Podostemum* created the optimum habitat for the freshwater snail *Pleurocera catenaria* (Say) and other investigators have concluded that the presence of *Podostemum* and stable benthic substrates were the most important factors in predicting pleurocerid (especially *Elimia* spp.) snail distribution (Mulholland and Lenat, 1992; citing Krieger and Burbanck's 1976 study).

Associations between fish and *Podostemum* have been noted (Freeman and Freeman, 1994; Connelly et al., 1999; Skelton and Albanese, 2006; Argentina et al., 2010b; Ashton and Layzer, 2010) but a general lack of experimental research prohibits definitive conclusions. Short-term experimental manipulations of *Podostemum* in the Conasauga River, Georgia, by Argentina et al. (2010b) showed declines or increases in local benthic fish densities where *Podostemum* was reduced or augmented, respectively. The increased habitat complexity provided by *Podostemum* may benefit fishes by increasing densities of insect prey and by providing shelter from larger predators. However, species associations with *Podostemum* at landscape-scales can be difficult to untangle from other basin wide stressors that negatively influence species (Argentina et al., 2010a).

Podostemum may influence aquatic flora other than epiphytic algae, although we know of only a single study of competition with other submerged macrophytes. Everitt and Burkholder (1991) conclude that *Podostemum* uses a strategy of niche preemption to maintain habitat and prevent invasion by other species such as the red alga *Lemanea australise* Atkinson. In cool temperature months *Lemanea* and *Podostemum* are co-dominant, however, *Podostemum* grows most readily in the spring and summer months wherever light permits. *Podostemum* then dominates during the warm sea-

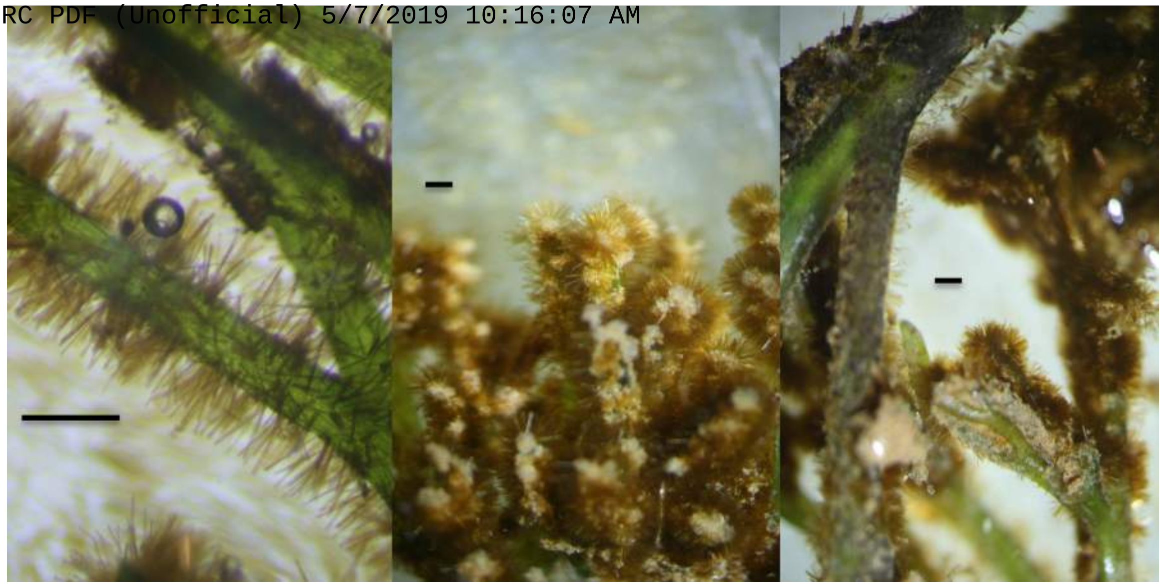


Fig. 4. Magnified images of *Podostemum ceratophyllum* stems with diatom (*Synedra ulna* c.f.) overgrowth. *Synedra ulna* cell length approximately 0.3 mm, scale bar approximately 5 mm in each picture. Fine sediments have accumulated between diatom cells and have encapsulated *Podostemum*'s stems and leaves in a nearly complete overcoating. Photos taken by J. Wood on November 11, 2013 from samples collected on a bedrock shoal on the Middle Oconee River, at Ben Burton Park, Athens, GA.

son but loses ground to other species in the fall and winter (Everitt and Burkholder, 1991).

3.3. Contributions to detrital and autotrophic foodwebs

Podostemum contributes to foodwebs directly and indirectly. *Podostemum* may indirectly enhance organic detritus retention by trapping particles entrained in the water column and accumulating fine sediments around the base of the plant. Stems and leaves directly contribute to detrital pathways (Nelson and Scott, 1962) and may senesce at biologically important times, i.e. late fall and early winter (Hill and Webster, 1982). Indeed, studies of seasonal changes in *Podostemum* biomass generally indicate that biomass is highest in early fall then declines as the plant senesces sensitive tissue (Rodgers et al., 1983; Grubaugh and Wallace, 1995) (*but see* Nelson and Scott, 1962). Seasonal changes in biomass may also be related to minimum water temperature, light availability, or other biotic and abiotic factors.

The leaves and stems of *Podostemum* decompose relatively quickly and contribute to the detrital pool. Rodgers et al. (1983) report a breakdown rate (K) between 0.05 and 0.08 $g\,g^{-1}\,d^{-1}$ (5–8% per day, depending on water temperate), and a 95% loss interval of 60 days in the New and Watauga rivers. Hill and Webster (1982) found a similar breakdown rate of 0.04 $g\,g^{-1}\,d^{-1}$, with a 95% loss interval of 81 days on the New River. These breakdown rates are an order of magnitude (or more) greater than the rate for allochthonous material, where $K < 0.02$ (Petersen and Cummins, 1974; Rodgers et al., 1983; Kominoski et al., 2007), indicating that carbon stored in *Podostemum* tissues is more rapidly recycled through the ecosystem compared to terrestrially-derived leaf litter.

The importance of *Podostemum*'s direct contribution to the food web is uncertain. Herbivory by Canada geese (*Branta canadensis* (Linnaeus)) and White Tubercled crayfish (*Procambarus spiculifer* (LeConte)) has been reported (Parker et al., 2007), and Weberg et al. (2015) raised the possibility of consumption by introduced triploid Grass Carp (*Ctenopharyngodon idella* (Valenciennes)) in the New River. We and others have observed aquatic turtles (e.g., *Pseudemys* spp; Fahey (1987) in Aresco and Dobie (2000)), White-tail deer (*Odocoileus virginianus* (Zimmermann)) and Beaver (*Castor canadensis* Kuhl) grazing on *Podostemum* (*pers. obs.* M.F.). However, quantitative studies of herbivory rates or the relative contribution of *Podostemum* to aquatic primary consumers are lacking.

The nutritional value of *Podostemum* is not well known. At present, only two published studies are known to have reported the elemental composition of *Podostemum* tissue. A study conducted in Pennsylvania rivers by Adams and coauthors (1973) reported concentrations of P, K, Ca, Fe, Mg, B, Cu, Mn, Al, Zn, and Na, while Heisey and Damman (1982) investigated copper and lead accumulation in aquatic plants including *Podostemum* downstream of industrial outfall into the Shetucket and Natchaug Rivers, CT. Adams and coauthors (1973) report that *Podostemum* was 0.25% P by dry mass, while K, Ca, and Mg were 1.63, 1.38 and 0.24% respectively. Unpublished data (J.W.) indicate that on average *Podostemum* is 2.7% nitrogen and 36.4% carbon, with a molar carbon:nitrogen ratio of 16.2:1 (*Unpublished* J.W.), similar to other submerged freshwater plants (Bakker et al., 2016). While only limited inferences can be made from these studies, *Podostemum* may be a source of ecologically important elements for grazing organisms, especially nitrogen, phosphorus, calcium, and trace metals.

4. Environmental stressors

4.1. Sedimentation and flow alteration

Fast-flowing water, stable benthic substrate and sufficient light are the major factors consistently correlated with the occurrence of *Podostemum* (Everitt and Burkholder, 1991; Connelly et al., 1999; Argentina et al., 2010a; Duncan et al., 2011). *Podostemum* commonly occurs on coarse sediments of sandstone, shale, or granite (but rarely limestone (Meijer, 1976)), as well as other submerged substrates including wood, tires, plastics, aluminum, ceramics and other debris (*per. obs.* J.W.). Excessive sedimentation either through increased sediment load in the river or reduced sediment transport capacity, has been cited as a reason for *Podostemum* decline. For example, Connelly et al. (1999) cite sedimentation and streambed instability as possible reasons for declines in *Podostemum* abundance in the Roanoke River, Virginia. Similarly, Grubaugh and Wallace (1995) attribute an increase in *Podostemum* biomass on shoals in the Middle Oconee River to declining agriculture, and presumably sedimentation, in the watershed.

Hydrologic alteration can reduce *Podostemum* cover by decreasing wetted instream habitat and influencing flow velocity. Substantial dieback of *Podostemum* has been documented during a severe drought in the southeast U.S. that resulted in extended exposure of *Podostemum* above the waterline (Pahl, 2009), and flow manipulations downstream from a reservoir are reported to have resulted in the extirpation of a population of *Podostemum* in the West River at Jamaica, VT (Countryman, 1978). Although *Podostemum* has subsequently been found at other locations in the West River (Zika and Thompson, Zika and Thompson, 1986) (*pers. obs.* J.W.), flow regulation may influence population dynamics for many kilometers downstream of the source of regulation. Periodic exposure to drying and substantial reductions in water velocity may be mechanisms by which flow regulation reduces *Podostemum* cover and biomass. Supportive of this idea, Everitt and Burkholder (1991) report that *Podostemum* in their study could not tolerate even short periods of desiccation. Furthermore, slack water behind impoundments may permanently extirpate populations. For example, two populations of *Podostemum* in New Brunswick, Canada are reported to have been inundated to a depth that prevented persistence (Philbrick and Crow, 1983). Collectively, these studies support a conceptual model that includes flow as an important ecological variable, with diminution in water level and flow velocity potentially reducing *Podostemum* occurrence and biomass.

4.2. Influences of temperature and water chemistry

The influence of water temperature and dissolved gas concentration on *Podostemum* have not been evaluated but may be important given predictions of increasing water temperature with climate change (Ficke et al., 2007) and watershed urbanization (Wenger et al., 2009). Munch (1993) reports finding *Podostemum* in rivers in PA between 0 and 30 °C, but some southern populations likely experience water temperatures routinely exceeding 30 °C during summer months. Restricted CO_2 availability, such as in slow moving water or with dense epiphytic algal overgrowth (Fig. 4) may also reduce *Podostemum* growth rate and accrual of biomass. Furthermore, Hill and Webster (1984) hypothesize that differences in water hardness are responsible for a two-fold difference in biomass between study sites on the New River, NC (*see* Section 2.3. *Physiology*). Investigations of variation in stable carbon ratios could elucidate differences in CO_2 availability among habitats. Ziegler and Hertel (2007) argue that observed variation of $\delta^{13}C$ in *Podostemum* leaf tissue reflects variation in boundary layer "diffusional resistance" because the plant appears to preferentially utilize the ^{12}C isotope of CO_2 compared to the heavier ^{13}C isotope.

4.3. Tolerance to environmental pollutants

Meijer (1976) reports that *Podostemum* is generally found in clear streams with good aeration and sufficient light, and speculates that *Podostemum* might be useful as an indicator of clean water. However, Philbrick and Crow (1983) note that several populations have been found in polluted water, including in the Mousam River in Kennebunk Maine, where the river is polluted by domestic sewage. Similarly, a study of nutrient levels in Mexican rivers containing Podostemaceae documented occurrences of *Podostemum ricciiforme* (Liebm.) P. Royen at sites ranging from ultraoligotrophic to hypertrophic (Quiroz et al., 1997), showing that certain species of *Podostemum* can tolerate high nutrient levels or other forms of water pollution. Nonetheless, road salts (Jackson and Jobbagy, 2005; Kaushal et al., 2005), deicers (Fay and Shi, 2012) and other aspect of urbanization (Walsh et al., 2005; Chin, 2006) may constitute significant stressors to *Podostemum*.

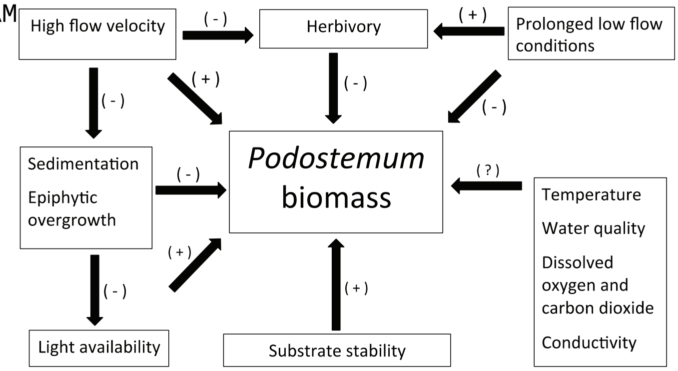


Fig. 5. Hypothesized relationships between *Podostemum ceratophyllum* and the dominant environmental variables of the habitat. Arrows indicate the directional nature of the relationship; positive associations are shown as (+) and negative associations are shown as (−).

4.4. Response to climate and land use change

A warming climate may facilitate the spread of *Podostemum* northward, continuing historical range expansion patterns (Philbrick and Crow, 1992; Fehrmann et al., 2012), Climate change may also exacerbate stresses already experienced by the plant, such as increased flow alteration, increased water temperature and increased sedimentation resulting from intense precipitation events. Accurately predicting the future distribution of *Podostemum* is complicated by the complexity of interacting stressors and the differing scales of controls on species migration (Pearson and Dawson, 2003).

Investigations into how *Podostemum* responds to changes in land use are needed in light of the rapid landscape changes occurring in many parts of this species' range. Isotopic nitrogen signature ($\delta^{15}N$) has been used to investigate the impacts of urbanization and land use on microbial biofilms (Kaushal et al., 2006), fish (Northington and Hershey, 2006) and riparian plants (Kohzu et al., 2008), and could be useful in assessing land use impacts on *Podostemum*, as well as measuring *Podostemum*'s role in food chains (Cabana and Rasmussen, 1996). Urban runoff can also contain high concentrations of metals (Davis et al., 2001; Sörme and Lagerkvist, 2002; Rule et al., 2006) available for uptake by primary producers. If *Podostemum* bioaccumulates metals then herbivory would facilitate the transfer of water column pollutants into higher trophic levels, with possible ecological and human health concerns.

5. Synthesis: causes and consequences of changes in *Podostemum* abundance

Known and hypothesized influences on *Podostemum* biomass include several interacting factors: severity and duration of low-flow periods, water velocity, herbivory, sedimentation, light and nutrient availability, and substrate stability (Fig. 5). Previous studies have shown that prolonged reductions in discharge reduce plant biomass (Nelson and Scott, 1962; Pahl, 2009), thus we hypothesize that high-velocity habitats support higher *Podostemum* biomass by limiting herbivory by consumers unable to hold position in swift currents, and by reducing sedimentation and algal build-up that, in turn, reduce light availability. Discharge and water velocity may also influence water temperature, conductivity and dissolved gases (CO_2 and O_2) but the direct effects of these variables on *Podostemum* are not well known (Fig. 5).

Understanding effects of more frequent and prolonged periods of low-flow may be essential to predicting persistence of *Podostemum* in areas experiencing declining rainfall or increased water diversions for human uses. We expect that *Podostemum* responds

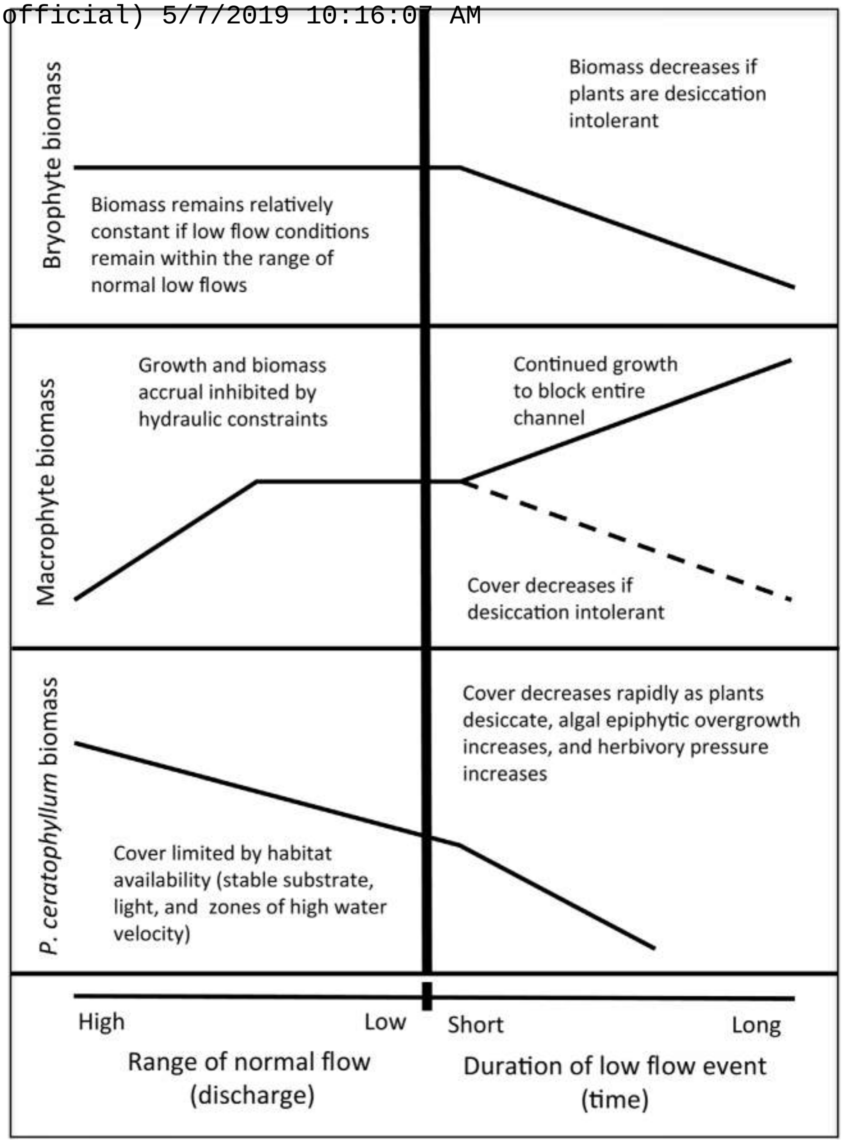


Fig. 6. Hypothesized relationships and comparisons between flow (discharge) and the duration of low flow events (time) for bryophyte, macrophyte, and *Podostemum ceratophyllum* Michx. biomass (modified from Suren and Riis, 2010).

differently to low-flow periods than other aquatic plants, and uniquely different from the macrophyte model proposed by Suren and Riis (2010). Specifically, we hypothesize that *Podostemum* biomass declines as rivers move into seasonal low flow periods, whereas rooted macrophytes exhibit a general increase in biomass with low flow conditions, and bryophytes maintain relatively stable biomass through the river's normal range of flow (Fig. 6). We also hypothesize that *Podostemum* biomass rapidly declines as the duration of low-flow conditions increases in response to increased herbivory, epiphytic overgrowth, and risk of drying, with the effect exacerbated by other water quality stressors.

One challenge for understanding *Podostemum* response to stressors is that field measurements may differ among local habitat types. Rivers in the eastern montane and piedmont regions are frequently characterized by alternating shoal (cascade, riffle, rapid) and pool habitats, and we hypothesize that these two habitats expose *Podostemum* to differing stressors as a result of differences in flow velocity and water depth. We speculate that biomass in pool habitats is strongly controlled by herbivory pressure, light availability and sedimentation rate, whereas shoal habitats provide increased protection from herbivory and sedimentation but expose the plant to increased risk of drying during periods of low flow.

We conclude that evidence supports the notion that *Podostemum* acts as a foundation species in many eastern rivers, removing nutrients from the water column, accumulating substantial benthic biomass, and shuttling resources into the food chain, in addition to providing habitat for a diverse flora and fauna. Loss of the plant from rivers where it presently occurs could thus reduce: 1) invertebrate biomass and resources for aquatic and terrestrial insectivores; 2) retention of nutrients in the benthos, influencing carbon balance and nutrient spiraling length; 3) retention of organic matter and resources for aquatic detritivores; 4) stream bed stability and complexity, increasing the severity of flood scour on the benthos; and, 5) export of autochthonous organic matter and thus resources available downstream. However, much of what we know about the ecology of *Podostemum* derives from studies in the southern portion of the species range (Table 1) and regional differences in genetics may influence responses to stressors. Information on responses of the plant to environmental changes throughout its range is essential to understanding how to conserve or restore populations. Conservation efforts would also benefit from better documentation of *Podostemum* populations, a long-recognized deficiency in our understanding of the plant (Muenscher and Maguire, 1931). As pressures on freshwater resources increase, conserving *Podostemum* appears crucial for preserving and improving the health and vitality of many eastern North American Rivers.

Acknowledgments

We would like to thank Alan Covich, Seth Wenger, Megan Hagler, Phillip Bumpers, John Skaggs, Tom Philbrick, two anonymous reviewers, and the many others that have provided feedback for the manuscript and helped with fieldwork. Thank you to Kasey Christian for editorial suggestions and assistance with figures. We would also like to thank the University of Georgia Odum School of Ecology and River Basin Center for support provided to J.W. Use of trade, firm, or product names does not imply endorsement by the U.S. Government. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

Adams, F.S., Cole Jr, H., Massie, L.B., 1973. Element constitution of selected aquatic vascular plants from Pennsylvania: submersed and floating leaved species and rooted emergent species. Environ. Pollut. (1970) 5, 117–147.
Aresco, M.J., Dobie, J.L., 2000. Variation in shell arching and sexual size dimorphism of river cooters, *Pseudemys concinna*, from two river systems in Alabama. J. Herpetol., 313–317.
Argentina, J.E., Freeman, M.C., Freeman, B.J., 2010a. Predictors of occurrence of the aquatic macrophyte *Podostemum ceratophyllum* in a southern Appalachian river. Southeastern Nat. 9, 465–476.
Argentina, J.E., Freeman, M.C., Freeman, B.J., 2010b. The response of stream fish to local and reach-scale variation in the occurrence of a benthic aquatic macrophyte. Freshwater Biol. 55, 643–653.
Ashton, M., Layzer, J., 2010. Summer microhabitat use by adult and young-of-year snail darters (*Percina tanasi*) in two rivers. Ecol. Freshwater Fish 19, 609–617.
Bakker, E.S., Wood, K.A., Pagès, J.F., Veen, G.C., Christianen, M.J., Santamaría, L., Nolet, B.A., Hilt, S., 2016. Herbivory on freshwater and marine macrophytes: a review and perspective. Aquat. Bot. 135, 18–36.
Cabana, G., Rasmussen, J.B., 1996. Comparison of aquatic food chains using nitrogen isotopes. Proc. Natl. Acad. Sci. U. S. A. 93, 10844–10847.
Camp, E.V., Staudhammer, C.L., Pine III, W.E., Tetzlaff, J.C., Frazer, T.K., 2014. Replacement of rooted macrophytes by filamentous macroalgae: effects on small fishes and macroinvertebrates. Hydrobiologia 722, 159–170.
Chin, A., 2006. Urban transformation of river landscapes in a global context. Geomorphology 79, 460–487.
Connelly, W.J., Orth, D.J., Smith, R.K., 1999. Habitat of the riverweed darter, *Etheostoma podostemone* Jordan, and the decline of riverweed, *Podostemum ceratophyllum*, in the tributaries of the Roanoke River, Virginia. J. Freshwater Ecol. 14, 93–102.
Countryman, W.D., 1978. Rare and endangered vascular plant species in Vermont. Acta Bot. Bor. Occ. Sin. 24, 2312–2320.
Davis, A.P., Shokouhian, M., Ni, S., 2001. Loading estimates of lead, copper, cadmium, and zinc in urban runoff from specific sources. Chemosphere 44, 997–1009.
Dayton, P.K., 1972. Toward an understanding of community resilience and the potential effects of enrichment to the benthos at McMurdo Sound, Antarctica. In: Parker, B.C. (Ed.), Proceedings of the Colloquium on Conservation Problems in Antarctica. Allen Press, Lawrence, Kansas.
Duncan, W.W., Goodloe, R.B., Meyer, J.L., Prowell, E.S., 2011. Does channel incision affect in-stream habitat? examining the effects of multiple geomorphic variables on fish habitat. Restor. Ecol. 19, 64–73.
Duncan, W.W., 2008. Geomorphic and Hydrologic Factors Influencing the Distribution of River Shoals and Associated Biota. Ph.D. Thesis. Institute of Ecology, University of Georgia.
Ellison, A.M., Bank, M.S., Clinton, B.D., Colburn, E.A., Elliott, K., Ford, C.R., Foster, D.R., Kloeppel, B.D., Knoepp, J.D., Lovett, G.M., Mohan, J., Orwig, D.A., Rodenhouse, N.L., Sobczak, W.V., Stinson, K.A., Stone, J.K., Swan, C.M., Thompson, J., Von Holle, B., Webster, J.R., 2005. Loss of foundation species: consequences for the structure and dynamics of forested ecosystems. Front. Ecol. Environ. 3, 479–486.
Everitt, D., Burkholder, J., 1991. Seasonal dynamics of macrophyte communities from a stream flowing over granite flatrock in North Carolina, USA. Hydrobiologia 222, 159–172.
Fahey, K.M., 1987. Aspects of the life history of the river cooter, *Pseudemys concinna* (Le Conte). In: the Tallapoosa River, Tallapoosa County, Alabama. Ph.D. Thesis. Auburn University.
Fay, L., Shi, X., 2012. Environmental impacts of chemicals for snow and ice control: state of the knowledge. Water Air Soil Pollut. 223, 2751–2770.
Fehrmann, S., Philbrick, C.T., Halliburton, R., 2012. Intraspecific variation in *Podostemum ceratophyllum* (Podostemaceae): evidence of refugia and colonization since the last glacial maximum. Am. J. Bot. 99, 145–151.
Ficke, A.D., Myrick, C.A., Hansen, L.J., 2007. Potential impacts of global climate change on freshwater fisheries. Rev. Fish Biol. Fish. 17, 581–613.
Freeman, B., Freeman, M., 1994. Habitat use by an endangered riverine fish and implications for species protection. Ecol. Freshwater Fish 3, 49–58.
Graham, S.A., Wood, J.C.E., 1975. The Podostemaceae in the southeastern United States [Musci]. J. Arnold Arboretum 56, 456–465.
Grubaugh, J.W., Wallace, J.B., 1995. Functional structure and production of the benthic community in a piedmont river: 1956–1957 and 1991–1992. Limnol. Oceanogr. 40, 490–501.
Hammond, B.L., 1937. Development of *Podostemon ceratophyllum*. Bull. Torrey Bot. Club 64, 17–36.
Heisey, R.M., Damman, A.W., 1982. Copper and lead uptake by aquatic macrophytes in eastern Connecticut, USA. Aquat. Bot. 14, 213–229.
Hill, B.H., Webster, J.R., 1982. Aquatic macrophyte breakdown in an Appalachian river. Hydrobiologia 89, 53–59.
Hill, B.H., Webster, J.R., 1983. Aquatic macrophyte contribution to the New River organic matter budget. In: Fontaine, T.D., Bartell, S.M. (Eds.), Dynamics of Lotic Systems. Ann Arbor Science Publishers, Ann Arbor, MI, pp. 273–282.
Hill, B.H., Webster, J.R., 1984. Productivity of *Podostemum ceratophyllum* in the New River, Virginia. Am. J. Bot. 71, 130–136.
Hudson, D.K.M., Hays, K.L., 1975. Some factors affecting the distribution and abundance of black fly larvae in Alabama. J. Georgia Entomol. Soc. 10, 110–122.
Hutchens, J.J., Wallace, B.J., Romaniszyn, E.D., 2004. Role of *Podostemum ceratophyllum* Michx. in structuring benthic macroinvertebrate assemblages in a southern Appalachian river. J. N. Am. Benthol. Soc. 23, 713–727.
Jäger-Zürn, I., Grubert, M., 2000. Podostemaceae depend on sticky biofilms with respect to attachment to rocks in waterfalls. Int. J. Plant Sci. 161, 599–607.
Jackson, R.B., Jobbagy, E.G., 2005. From icy roads to salty streams. Proc. Natl. Acad. Sci. U. S. A. 102, 14487–14488.
Johnson, P.D., Bogan, A.E., Brown, K.M., Burkhead, N.M., Cordeiro, J.R., Garner, J.T., Hartfield, P.D., Lepitzki, D.A.W., Mackie, G.L., Pip, E., Tarpley, T.A., Tiemann, J.S., Whelan, N.V., Strong, E.E., 2013. Conservation status of freshwater gastropods of Canada and the United States. Fisheries 38, 247–282.
Kaushal, S.S., Groffman, P.M., Likens, G.E., Belt, K.T., Stack, W.P., Kelly, V.R., Band, L.E., Fisher, G.T., 2005. Increased salinization of fresh water in the northeastern United States. Proc. Natl. Acad. Sci. U. S. A. 102, 13517–13520.
Kaushal, S.S., Lewis Jr, W.M., McCutchan Jr, J.H., 2006. Land use change and nitrogen enrichment of a Rocky Mountain watershed. Ecol. Appl. 16, 299–312.
Keitel, J., Zak, D., Hupfer, M., 2016. Water level fluctuations in a tropical reservoir: the impact of sediment drying, aquatic macrophyte dieback, and oxygen availability on phosphorus mobilization. Environ. Sci. Pollut. Res. 23, 6883–6894.
Kohzu, A., Miyajima, T., Tayasu, I., Yoshimizu, C., Hyodo, F., Matsui, K., Nakano, T., Wada, E., Fujita, N., Nagata, T., 2008. Use of stable nitrogen isotope signatures of riparian macrophytes as an indicator of anthropogenic N inputs to river ecosystems. Environ. Sci. Technol. 42, 7837–7841.
Kominoski, J.S., Pringle, C.M., Ball, B.A., Bradford, M.A., Coleman, D.C., Hall, D.B., Hunter, M.D., 2007. Nonadditive effects of leaf litter species diversity on breakdown dynamics in a detritus-based stream. Ecology 88, 1167–1176.
Krieger, K., Burbanck, W., 1976. Distribution and dispersal mechanisms of *Oxytrema (= Goniobasis) suturalis* Haldeman (Gastropoda: pleuroceridae) in the Yellow River Georgia, USA. American Midland Naturalist 95, 49–63.
Lodge, D.M., 1991. Herbivory on freshwater macrophytes. Aquat. Bot. 41, 195–224.
Manolaki, P., Papastergiadou, E., 2013. The impact of environmental factors on the distribution pattern of aquatic macrophytes in a middle-sized Mediterranean stream. Aquat. Bot. 104, 34–46.
Marschner, H., 1986. Mineral Nutrition of Higher Plants. Academic Press, Orlando, Florida.
Meijer, W., 1976. A note on *Podostemum ceratophyllum* Michx.: as an indicator of clean streams in and around the Appalachian Mountains. Castanea 41, 319–324.
Muenscher, W., Maguire, B., 1931. Notes on some New York plants. Rhodora 33, 165–167.
Mulholland, P.J., Lenat, D.R., 1992. Streams of the Southeastern Piedmont, Atlantic Drainage. Wiley and Sons, New York.
Munch, S., 1993. Distribution and condition of populations of *Podostemum ceratophyllum* (riverweed) in Pennsylvania. J. Pennsylvania Acad. Sci. 67, 65–72.
Nelson, D.J., Scott, D.C., 1962. Role of detritus in the productivity of a rock-outcrop community in a piedmont stream. Limnol. Oceanogr. 7, 396–413.
Northington, R.M., Hershey, A.E., 2006. Effects of stream restoration and wastewater treatment plant effluent on fish communities in urban streams. Freshwater Biol. 51, 1959–1973.
Novelo, R.A., Philbrick, C.T., 1997. Taxonomy of Mexican Podostemaceae. Aquat. Bot. 57, 275–303.
Pahl, J.P., 2009. Effects of Flow Alteration on the Aquatic Macrophyte *Podostemum ceratophyllum* (riverweed): Local Recovery Potential and Regional Monitoring Strategy. M.S. Thesis. Institute of Ecology, University of Georgia.
Pannier, F., 1960. Physiological respones of Podostemaceae in their natural habitat. Internationale Revue der gesamten Hydrobiologie und Hydrographie 45, 347–354.
Parker, J.D., Burkepile, D.E., Collins, D.O., Kubanek, J., Hay, M.E., 2007. Stream mosses as chemically-defended refugia for freshwater macroinvertebrates. Oikos 116, 302–312.

Pearson, R.G., Dawson, T.P., 2003. Predicting the impacts of climate change on the distribution of species: are bioclimate envelope models useful? Global Ecol. Biogeogr. 12, 361–371.

Petersen, R.C., Cummins, K.W., 1974. Leaf processing in a woodland stream. Freshwater Biol. 4, 343–368.

Philbrick, C.T., Alejandro Novelo, R., 1997. Ovule number, seed number and seed size in Mexican and North American species of Podostemaceae. Aquat. Bot. 57, 183–200.

Philbrick, C.T., Alejandro, N.R., 1995. New World Podostemaceae: ecological and evolutionary enigmas. Brittonia 47, 210–222.

Philbrick, C.T., Crow, G.E., 1983. Distribution of *Podostemum ceratophyllum* Michx. *Podostemaceae*). Rhodora 85, 325–341.

Philbrick, C.T., Crow, G.E., 1992. Isozyme variation and population structure in *Podostemum ceratophyllum* Michx. (Podostemaceae): implications for colonization of glaciated North America. Aquat. Bot. 43, 311–325.

Philbrick, C.T., Novelo, A.R., 1994. Seed germination of Mexican Podostemaceae. Aquat. Bot. 48, 145–151.

Philbrick, C.T., Novelo, R.A., 1995. New World Podostemaceae: ecological and evolutionary enigmas. Brittonia 47, 210–222.

Philbrick, C.T., Novelo, A.R., 2004. Monograph of *Podostemum* (Podostemaceae). Syst. Bot. Monogr., 1–106.

Philbrick, C.T., Bove, C.P., Stevens, H.I., 2010. Endemism in neotropical Podostemaceae. Ann. Missouri Bot. Garden, 425–456.

Philbrick, C.T., Philbrick, P.K., Lester, B.M., 2015. Root fragments as dispersal propagules in the aquatic angiosperm *Podostemum ceratophyllum* Michx. (Hornleaf Riverweed, Podostemaceae). Northeastern Nat. 22, 643–647.

Philbrick, C.T., 1984. Aspects of floral biology, breeding system, and seed and seedling biology in *Podostemum ceratophyllum* (Podostemaceae). Syst. Bot. 9, 166–174.

Quiroz, A.F., Novelo, A.R., Philbrick, C.T., 1997. Water chemistry and the distribution of Mexican Podostemaceae: a preliminary evaluation. Aquat. Bot. 57, 201–212.

Rodgers, J.H., McKevitt, M.E., Hammerlund, D.O., Dickson, K.L., Cairns Jr., J., 1983. Primary production and decomposition of submergent and emergent aquatic plants of two Appalachian rivers. In: Fontaine, T.D., Bartell, S.M. (Eds.), Dynamics of Lotic Ecosystems. Ann Arbor Science Publishers, Ann Arbor, MI, pp. 283–301.

Rule, K.L., Comber, S.D.W., Ross, D., Thornton, A., Makropoulos, C.K., Rautiu, R., 2006. Diffuse sources of heavy metals entering an urban wastewater catchment. Chemosphere 63, 64–72.

Rutishauser, R., Pfeifer, E., Moline, P., Philbrick, C.T., 2003. Developmental morphology of roots and shoots of *Podostemum ceratophyllum* (Podostemaceae-Podostemoideae). Rhodora 105, 337–353.

Rutishauser, R., 1997. Structural and developmental diversity in Podostemaceae (river-weeds). Aquat. Bot. 57, 29–70.

Sörme, L., Lagerkvist, R., 2002. Sources of heavy metals in urban wastewater in Stockholm. Sci. Total Environ. 298, 131–145.

Skelton, C.E., Albanese, B., 2006. Field Guide to Fishes of the Conasauga River System. US Forest Service.

Stream Bryophyte Group, 1999. Roles of bryophytes in stream ecosystems. J. N. Am. Benthol. Soc. 18, 151–184.

Suren, A.M., Riis, T., 2010. The effects of plant growth on stream invertebrate communities during low flow: a conceptual model. J. N. Am. Benthol. Soc. 29, 711–724.

Thompson, K., Grime, J., 1979. Seasonal variation in the seed banks of herbaceous species in ten contrasting habitats. J. Ecol. 67, 893–921.

Tinsley, B., 2012. The Ecological Roles of *Podostemum ceratophyllum* and Cladophora in the Habitat and Dietary Preferences of the Riverine Caddisfly *Hydropsyche simulans*. B.S. Thesis. Western Kentucky University.

Tippery, N.P., Philbrick, C.T., Bove, C.P., Les, D.H., 2011. Systematics and phylogeny of neotropical riverweeds (Podostemaceae: Podostemoideae). Syst. Bot. 36, 105–118.

USDA, 2014. National Resources Conservation Services – Plants Database.

Vila-Costa, M., Pulido, C., Chappuis, E., Calviño, A., Casamayor, E.O., Gacia, E., 2016. Macrophyte landscape modulates lake ecosystem-level nitrogen losses through tightly coupled plant-microbe interactions. Limnol. Oceanogr. 61, 78–88.

Walsh, C.J., Allison, H.R., Feminella, J.W., Cottingham, P.D., Groffman, P.M., Ii, R.P.M., 2005. The urban stream syndrome: current knowledge and the search for a cure. J. N. Am. Benthol. Soc. 24, 706–723.

Warming, E., 1881. Familien Podostemaceae. Kongel. Dansk. Videnskab. Selskabs Skrifter. Sjette Raekke 1, 1–34.

Warming, E., 1882. Familien Podostemaceae. Kongel. Dansk. Videnskab. Selskabs Skrifter. Sjette Raekke 2.

Weberg, M.A., Murphy, B.R., Rypel, A.L., Copeland, J.R., 2015. A survey of the New River aquatic plant community in response to recent triploid grass carp introductions into Claytor Lake, Virginia. Southeastern Nat. 14, 308.

Wenger, S.J., Roy, A.H., Jackson, C.R., Bernhardt, E.S., Carter, T.L., Filoso, S., Gibson, C.A., Hession, W.C., Kaushal, S.S., Martí, E., Meyer, J.L., Palmer, M.A., Paul, M.J., Purcell, A.H., Ramírez, A., Rosemond, A.D., Schofield, K.A., Sudduth, E.B., Walsh, C.J., 2009. Twenty-six key research questions in urban stream ecology: an assessment of the state of the science. J. N. Am. Benthol. Soc. 28, 1080–1098.

Willats, A.J.B., 1998. Production, Diet and Microhabitat Use of *Brachycentrus etowahensis* Wallace (Trichoptera: Brachycentridae). M.S. Thesis. University of Georgia.

Wood, J.L., Pattillo, M., Freeman, M.C., 2016. Organic-matter retention and macroinvertebrate utilization of seasonally inundated bryophytes in a mid-order piedmont river. Southeastern Nat. 15, 403–414.

Ziegler, H., Hertel, H., 2007. Carbon isotope fractionation in species of the torrenticolous families Podostemaceae and Hydrostachyaceae. Flora – morphology distribution. Funct. Ecol. Plants 202, 647–652.

Zika, P.F., Thompson, E.H., 1986. Notes on the flora of Windham county, Vermont. Rhodora, 517–523.

van Royen, P., 1951. The Podostemaceae of the New World. Van Royen, [S.l.].

van Steenis, C.G.G.J., 1981. Rheophytes of the world. Sijthoff & Noordhoff.

Secretary Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Byllesby-Buck Project (P-2514-186) Comments on Pre-Application Document, Scoping Document 1, and Study Requests

Dear Secretary Bose:

New River Conservancy (NRC) appreciates the opportunity to comment on the Byllesby-Buck Hydroelectric Project (Number 2514-186) Pre-Application Document (PAD), Scoping Document 1 (SD1), and the opportunity to provide Study Requests for this relicensing project. We attended the Scoping Site Visit and the public meeting on April 10, 2019 in Galax, Virginia, and reviewed the PAD and SD1. We offer the following comments on the PAD and SD1 and then provide Study Requests.

General Comments on PAD

The impounded reaches of the New River encompassed by the Byllesby-Buck Project have displaced habitat important to a variety of aquatic insects, freshwater mussels, crayfish, Eastern Hellbender, native fishes, and fish spawning areas, including the native New River walleye. By blocking fish migration, disrupting freshwater mussel populations and associated fish host species from dispersing upstream and downstream in the New River. Lack of sand and gravel areas in bypass reaches, combined with high levels of sedimentation in the reservoirs, diminish habitat for freshwater mussels and other aquatic life. None of these impacts are discussed in the PAD

Specific Comments on PAD

1. **Project Area:** The Byllesby-Buck Project area necessary for project operations in Figure 4.2.1 of the PAD ignores more than a mile-long section of the upper area of Buck Reservoir. The entire river reach between Byllesby and Buck Dams is affected and used by project operations, thus should be included in the project area. There is a direct nexus between project operations and ecological and recreational effects in this reach of the New River. AEP may not own the upland forest area but certainly owns and manages the river that runs between the dams.

2. **Project Influence:** The Byllesby-Buck Project affects a large area of the New River up and downstream from the project area. New River ecological and geologic processes are influenced by the projects for some distance upstream and downstream from the project area. Examples include: (1). The project reservoirs influence on ambient New River water temperature and other water quality parameters, with habitat effects on resident coolwater flora and fauna, including New River endemic fishes; (2) Liberation of reservoir sediment deposits during operations result in increased turbidity in downstream reaches influenced by project flow, disrupting ecological processes, suspending contaminants like PCB's, and negatively affecting angling and recreational use; (3) New

River walleye populations are affected by project placement, with the dams likely inundating historic New River walleye spawning areas; (4) Project dams block New River walleye migration, and, (5) Loss of upstream mussel fauna due to Project dams blocking migration of host fishes.

The magnitude and spatial scale of this Project Influence is not adequately addressed in the PAD. Determining the spatial scale of Project Influence will help determine adequate reference conditions for ecological comparisons during multiple study efforts. Determining downstream spatial influence will involve consideration of project flow attenuation and downstream turbidity effects of project operations, as well as other downstream water quality and recreational impacts.

3. **Section 4.3.1 Reservoirs:** The description of the project reservoirs lacks recent bathymetric information, including average depth of the reservoirs, citing surveys done in 1990. Current information is needed to determine sedimentation rates and effects on project operations, effects on reservoir biota and recreational use. Direct observation indicates that the reservoirs have been substantially modified by sediment deposition, raising concerns about what rehabilitation is needed to restore aquatic habitat, with resulting floral and faunal improvements and fisheries benefits.

4. **Section 4.4.1 Current Operations:** Ramping rate operations for the Buck Dam bypass reach are described on page 4-21 but no estimates of resulting downstream flows are included in the description of spillway gate opening sizes.

5. **Section 4.4.2 Proposed Operations:** A brief evaluation of lower normal pool operations in winter months (December through March) is discussed, but no consideration given to potential effects during that period. Lower winter pool elevation may inhibit recreational access during winter resulting in bank erosion effects within the Project Area with limited riparian buffer.

6. **Section 5.3 Water Resources:** PAD section 5.3.2 titled Flows does not characterize the range of flows typical for the Project Area, which inhibits analysis of needed bypass reach flows. More information should be provided over a longer period of record than 30 years, providing likely dry, wet, and average year conditions that should be replicated in bypass reach flow management.

7. **Section 5.4.6 Freshwater Mussels**
   Section 5.4.6.1 Mussel Surveys from 2002 to 2017
   This PAD review of recent mussel surveys in the New River failed to include the following: (1) VDGIF and Appalachian Power Company Claytor Lake drawdown assessments starting in 2006, and subsequent mussel salvages during alternating year Claytor Lake drawdowns, that included collection of Eastern Elliptio (*Elliptio complanata*); and, (2) A 2017 mussel relocation conducted by Environmental Solutions & Innovations, Inc. at the I-81 bridge downstream from Claytor Dam, where upwards of 8 species were collected, including the state threatened Pistolgrip (*Tritogonia verrucosa*) and where Eastern Elliptio was documented in the mainstem river for the first time. In

addition, an assessment of this area by Stantec in 2017 turned up 1 state threatened Green Floater (*Lasmigona subviridis*).

8. **Section 5.4.8**
5.4.8.1 Fish and Aquatic Resources: *Entrainment*: There is no mention of potential entrainment of larval mussels. Information on and potential for bivalve entrainment should be included in the PAD.

5.4.8.2 Bypass Reach Habitat and Flows: The description of existing environmental and resource impacts on the bypass reach does not discuss what flows are provided by spillway gate openings at Buck Dam, nor is there discussion of the need for minimum flow to the bypass reach, particularly a concern below Buck Dam. The bypass reaches are primarily bedrock, lacking sand, gravel, and cobbles essential for supporting local fauna. This PAD section does not discuss bypass reach habitat adequately to provide a context for understanding flow needs in these channels.

9. **Section 5.6 Wetlands, Riparian, and Littoral Habitat:** This section lacks specifics on littoral habitat, including documentation of emergent and submersed aquatic vegetation. Adjacent New River reaches are known to be inhabited by foundational native aquatic vegetation species such as *Podostemum ceratophyllum* (hornleaf riverweed) *Justicia americana* (water willow), *Elodea canadensis* (common elodea), and *Vallisneria americana* (eelgrass or water celery) that create aquatic habitat and food web benefits for riverine fauna, but this PAD section lacks description of aquatic vegetation species in the reservoirs or river reaches in the Project Area and there is no description of recreational use, including for wildlife viewing and waterfowl hunting.

10. **Section 5.7 Rare, Threatened, and Endangered Species:**
5.7.1.1 Candy Darter
As noted in the PAD, the Candy Darter (*Etheostoma osburni*) was listed as endangered under the federal Endangered Species Act on November 21, 2018. New River Conservancy supports VDGIF's request for protection, mitigation, and enhancement (PME) measures to aid in this species' recovery. Such PME measures are especially appropriate within the New River drainage where the species is endemic, and will also benefit the closely related endemic Kanawha darter.

5.7.2.2 Mussels
NRC also supports including the Green Floater in its references to species with state legal status as a state threatened species which is known from the project vicinity. This species is also being reviewed for federal listing, which should also be discussed in the PAD.

5.7.2.3 Herpetofauna
NRC strongly supports VDGIF in requesting a multi-taxa biological survey study be performed within the Project Area which should include searches for Eastern Hellbender and its habitat due to its status federally and Tier I a status in Virginia's Wildlife Action Plan.

11. Section 5.8 Recreation and Land Use
NRC supports VDGIF's requests for upgrades of boat launches and canoe portages at both Byllesby and Buck Dams.

Studies Proposed in the PAD

NRC supports VDGIF comments below:

1. *Shoreline Stability Assessment*: This study lacks a sedimentation assessment aspect. Sedimentation has a significant effect on habitat that needs assessment. Downstream sediment effects and reservoir rehabilitation needs could potentially be addressed by removal of sediment from the Project Area, but cannot be assessed through a Shoreline Stability Assessment study alone. NRC requests a comprehensive shoreline stability and sediment study resulting in development of a sediment management plan.

2. *Water Quality*: This study needs a thermal context to consider project effects on coolwater endemic fish, including the federally endangered Candy Darter. In addition, the study needs to examine turbidity effects of project operations. Finally, it needs to include analysis of chlorophyll a levels in the reservoirs and downstream transport.

3. *Bypass Reach Aquatic Habitat and Flow Assessment*: Due to changes in New River fish populations since 1997, including increased numbers of New River walleye downstream from Buck Dam, this evaluation needs to look at stranding issues after bypass reach spill events, with field data collection. It should also evaluate how spill gates can be used to limit stranding and create upstream and downstream connectivity in the bypass reaches and how bypass reach habitat is modified relative to reference conditions, particularly as it relates to the lack of sand, gravel, and cobble substrates important to multiple faunal groups. In addition, the study needs a flow modeling component to evaluate how spillway gates can be used to create seasonally appropriate flows.

4. *Inflatable Obermeyer Crest Gate Operational Effectiveness Evaluation*: This study should be integrated with the Bypass Reach Aquatic Habitat and Flow Assessment study to determine how the crest gates can be used to provide improved bypass reach flows.

5. *Wetland and Riparian Habitat Characterization*: This study needs to include documentation of emergent and submersed aquatic vegetation beds in the Project Area and should evaluate ways to enhance these areas for wildlife and recreational use, particularly wildlife viewing and waterfowl hunting opportunities.

6. *Recreational Needs Assessment*: Currently available recreational use information is not adequate to assess existing recreational opportunities and potential improvements to facilities. During the current license term, closure of the U.S. Forest Service campground area on Buck Reservoir and the development of an improved Byllesby Pool Boat Launch alone have likely shifted use. A more complete assessment of current use is needed as a foundation for a recreational needs assessment.

   We state elsewhere in our comments the need for angling access in desirable fishing locations, including the tailrace areas of both dams. These areas, including the Buck

Dam tailrace, need to be examined as potential fishing access areas. VDGIF currently manages the Loafer's Rest Access area downstream from the Buck Dam tailrace, but this access site is not reasonably close to the tailrace, nor is the parking area located close enough to the New River to be useful to most anglers. Handicapped angler access is also not available at the Project. In addition, paddlers and anglers on the New River need riverside camping areas. The former U.S. Forest Service campground area on Buck Reservoir is a likely site. Other sites should be identified as well.

Studies Not Proposed in the PAD

Because the Byllesby-Buck Project is located in a more remote area of the New River than the Fries Project, knowledge of the New River fauna in the Byllesby-Buck Project area is limited. The New River supports a unique fauna of coolwater fish, invertebrates (including, but not limited to freshwater mussels), and the Eastern Hellbender, and ecologically important aquatic vegetation beds. The lack of broad faunal and aquatic plant surveys with corresponding reference sites outside the area of Project Influence leaves a critical informational need unfilled. Reasonable efficiencies could be achieved by performing these surveys in concert with one another. This information need should be addressed by relicensing studies.

Comments on SD1

General Comments

The New River supports a unique fauna of coolwater fish, invertebrates, the Eastern Hellbender, and ecologically important aquatic vegetation beds. The lack of focus by Appalachian Power on broad faunal and aquatic plant surveys with corresponding reference sites outside the area of Project Influence leaves a critical informational need unfilled. This information need should be considered in the EA.

Specific Comments

***Section 3.2.1 Proposed Project Facilities and Operation*:** Lower winter pool elevation could inhibit recreational access during winter months. In addition, lower winter pool elevation could result in bank erosion effects within the Project Area in areas with a limited riparian buffer.

***Section 4.1.1 Resources that could be Cumulatively Affected*:** NRC supports VDGIF's recommendation of examining the following list of cumulatively affected resources: (1) Sedimentation impacts to reservoir habitat; (2) Downstream sediment transport due to project operations with multiple ecological and recreational effects; (3) Temperature and other water quality parameters affected by the existence of the Project; and, (4) Riverine habitat and biota altered by the Project reservoirs and in the bypass reaches.

***Section 4.2 Resource Issues*:** VDGIF agrees that the preliminary list of resource issues to be addressed in the EA is as complete as possible at this time with the following suggestions for additional considerations under each resource section.

4.2.1 Geologic and Soils Resources: Sedimentation is a significant effect on habitat in the Project that needs assessment. A shoreline erosion assessment needs to include examination of sedimentation sources and habitat impacts, including how the current state of sedimentation contributes to downstream sediment transport and related impacts downstream on riverine biota and recreational and angling use.

4.2.2 Aquatic Resources:
Bullet 1 (Water Quality): Water quality issues need to include a consideration of turbidity effects of project operations on downstream resources as well as examining chlorophyll a levels in the reservoirs and downstream transport.

Bullet 2 (Adequacy of 360-cfs minimum flow): Analysis of the existing 360-cfs minimum flow for aquatic resources needs to include an examination of how power generation flow fluctuations affect aquatic resources in terms of turbidity and flow fluctuation effects on fish and mussel spawning. In addition, this analysis needs to include an examination of flow fluctuation impacts on recreational use.

Bullets 3 and 7 (Minimum flow and Ramping Rates in the Buck Bypass Reach): Due to changes in New River fish populations since 1997, including increased numbers of New River walleye downstream from Buck Dam, analysis needs to include: (1) Examination of stranding issues after bypass reach spill events; (2) Effective utilization of spill gates to limit stranding and create upstream/downstream connectivity in the bypass reach; and, (3) How bypass reach habitat is modified relative to reference conditions, particularly as it relates to the lack of sand, gravel, and cobble substrates important to multiple faunal groups. In addition, this analysis needs to evaluate how spillway gates can be used to create seasonally appropriate flows.

4.2.3 Terrestrial Resources: Analysis of continued project operation and maintenance on riparian and wetland habitat needs to include consideration of emergent and submersed aquatic vegetation beds as well as the importance of these beds to terrestrial and aquatic species.

4.2.4 Threatened and Endangered Species: Both the Candy Darter and the Eastern Hellbender need to be considered in this analysis. The Green Floater mussel is also a species being reviewed for federal listing, so it should be included as well.

Candy Darter
Note our earlier comments on the inadequacy of the information on this species in the PAD. VDGIF will consider requesting PME measures to aid in this species' recovery. Such PME measures are especially appropriate within the New River drainage where the species is endemic, and will also benefit the closely related endemic Kanawha darter.

Eastern Hellbender
Note our earlier comments on the PAD with regard to specifics on this species importance. VDGIF is requesting a multi-taxa biological survey study be performed within the Project Area. This survey effort should include searches for Eastern Hellbender and its habitat due to its federal Species of Concern status and its Tier I a status (Species of Critical Conservation Need) in Virginia's Wildlife Action Plan.

***Section 5.0 Proposed Studies*:**

During the Scoping meeting, VDGIF noted that the Wetland and Riparian Habitat Characterization study is not included in the proposed list of studies in SD1. It needs to be included under the Terrestrial Resources Section of SD1. Our comments relative to this proposed study under the specific PAD comments section of this letter should also be noted here.

Shoreline Stability Assessment: This study lacks a sedimentation assessment aspect. Sedimentation is a significant effect on habitat at the Project that needs assessment. Downstream sediment effects and reservoir rehabilitation needs could potentially be addressed by removal of sediment from the Project Area, but cannot be assessed through a Shoreline Stability Assessment study alone.

Water Quality Study: This study needs a thermal context that considers how the project affects the thermal regime of the New River due to likely project effects on coolwater endemic fish, including the federally endangered Candy Darter. In addition, the study needs to examine turbidity effects of project operations. Finally, it needs to include analysis of chlorophyll a levels in the reservoirs and downstream transport.

Bypass Reach Aquatic Habitat and Flow Assessment and Inflatable Obermeyer Crest Gate Operational Effectiveness Evaluation: These separate studies need to be integrated as much as possible due to the need to include gate operation considerations in bypass reach habitat and flow assessment. Due to changes in New River fish populations since 1997, including increased numbers of New River walleye downstream from Buck Dam, this evaluation needs to examine: (1) Stranding issues after bypass reach spill events, (2) How spill gates can be used to limit stranding and create upstream and downstream connectivity in the bypass reaches; and, (3) How bypass reach habitat is modified relative to reference conditions, particularly as it relates to the lack of sand, gravel, and cobble substrates important to multiple faunal groups. In addition, the study needs to evaluate how spillway gates can be used to create seasonally appropriate flows.

Recreational Needs Assessment A more complete assessment of current use is needed as a foundation for a recreational needs assessment due to changes in use patterns over time associated with changing availability of river access. Analysis of recreational needs should include consideration of most desirable fishing locations, handicapped accessible facilities, and riverside camping opportunities.

NRC supports both of VDGIF’s study requests as follows:

<u>Biological and Aquatic Vegetation Surveys within the Project Area</u>
Goals and Objectives:

- **Goal:** Gather current distributional information on multiple fauna and foundational aquatic vegetation beds within the Project Area.
    - **Objective:** Conduct biological surveys of fish, crayfishes, Odonates, freshwater mussels, Eastern hellbender and associated habitat within the Project Area with appropriate reference sites for comparison.
    - **Objective:** Conduct survey of foundational aquatic vegetation beds within the Project Area with appropriate reference sites for comparison.

<u>Comprehensive Sediment Study to Develop a Sediment Management Plan</u>

Goals and Objectives:

- Determine volume of sediment deposited in the impounded reaches to-date.
- Determine average annual rate of deposition in the impounded reaches.
- Determine the projected remaining lifespan of the impoundments at current sedimentation rates.
- Assess the magnitude and spatial extent of the coarse-substrate deficit in the bypass reaches and mainstem channels downstream of the dams and powerhouses relative to the historic rate of transport and sediment-size distribution prior to construction of the dams and the resultant disruption to sediment transport processes.
- Analyze ecological, recreational, and economic impacts resulting from sediment accumulation upstream of the dams and sediment deficit downstream of the dams.
- Evaluate potential sediment-budget impact mitigation opportunities including removal of accumulated sediment in the impounded reaches and augmentation of gravel/coarse sediment downstream of the dams and powerhouses.

In closing, if the decision is made by controlling authorities that the Byllesby-Buck Project will be decommissioned or removed, we respectfully request the opportunity to propose additional studies addressing information needs germane to that decision.

If you have questions regarding our comments and study requests, please contact me at the address and phone number listed below.

Sincerely,

Laura W Walters
New River Conservancy
Claytorlakegirl@gmail.com
540 230-6272

VirginiaTech
College of Natural Resources
and Environment

Conservation Management Institute
1900 Kraft Drive, Suite 105 (0534)
Blacksburg, Virginia 24061
(540) 231-7348 Fax: (540) 231-7019
www.cmi.vt.edu or www.vt.edu

May 1, 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Dear Ms. Bose:

This letter details my comments on the Pre-Application Document, and study requests, for the **Byllesby-Buck Project (P-2514-186)**.

Summary of Comments and Study Requests

<u>Comments & Study Requests on the Pre-Application Document</u>

4.2 Project Location

While the project boundary may only encompass lands owned by Appalachian Power Company surrounding Byllesby Dam and Buck Dam, this boundary does not include all areas influenced by project operations; i.e., it does not encompass the footprint of the project. Specifically, the Project Boundary does not cover a ~1.2 RM stretch of the New River between Byllesby Dam and Buck Dam. The natural habitat in this reach has been modified as a result of dam construction and continues to be influenced by current project operations. When evaluating the potential impacts that these dams pose to the environment (e.g., water quality and habitat suitability) and resources (e.g., recreational opportunities), the entire stretch of river between the dams should be assessed.

5.1.2 Major Land and Water Uses

The applicant states that there are no federal lands within the Project Boundary. However, there are several instream islands and shoals along the banks within the Project Boundary that are considered part of the Jefferson National Forest (U.S. Forest Service owned land).

5.2.5 Project Area Soils

Dams disrupt sediment transport processes by serving as sediment and nutrient traps which have created sediment-filled reservoirs above and sediment-starved reaches immediately downstream. The PAD indicates that the rate of sedimentation in the reservoirs has stabilized over recent decades and that sediment loads entering the Project Boundary "is expected to pass through the Project and be deposited downstream (i.e., in Claytor Lake)" [PAD 5.2.5; 5.2.7; 6.2.1.1]. This statement can be misleading as it suggests that the dams are no longer influencing sediment transport. During high flow events these accumulated sediments within the reservoirs can be mobilized and, consequently, result in large deposits of sediments downstream. For aquatic invertebrates, particularly freshwater mussels, these depositions can smoother or cause stress in individuals that results in mortality, reduce growth, or disruption to reproduction (Bogan 1993; Neves et al. 1997; Watters 2000). In addition, while dams and impoundments trap nutrients and accumulate sediments in their reservoirs, they lose their ability to trap nutrients and sediments effectively as they approach capacity over time; subsequently increasing sediment, metals, and nutrient loads into downstream habitats (Stanley and Doyle 2003).

5.3.2 Flows

How are flows at the Project estimated using the upstream USGS gage station 03164000? Are Byllesby and Buck dam operation records/daily generation and forebay elevations considered when estimating discharge capacity of the powerhouse? Does it account for the Fries Project (which has no minimum flow requirements) operations or contributions from upstream tributaries (including those found between the two dams)? Section 4.4.1 of the PAD states that the applicant monitors the upstream U.S. Geological Survey (USGS) gage at Galax and Byllesby and Buck forebay elevations to plan gate openings in the event inflow exceeds powerhouse discharge capacity. If inflows and powerhouse discharge (i.e., outflows) are known for each dam, why aren't these values presented in the PAD? Table 5.3-1 doesn't provide statistics for each individual dam and it is unclear if these values represent estimated inflow discharge or powerhouse discharges.

It would be informative to see daily trends of inflow and outflow discharge from the individual Projects to better understand the modifications to the natural flow regime. Alterations to the flow regime (i.e., the magnitude, frequency, duration, timing, or flashiness of flow releases [Poff et al. 1997]) can have cascading impacts to the ecosystem through changes to habitat and water quality (Williams and Wolman 1984).

5.3.7 Existing Water Quality Data

The maximum water temperature and minimum D.O. requirements in the New River associated with Project waters is 29°C and 4.0 mg/L, respectfully (noted in PAD Table 5.3-3). The PAD does not address the fact that water quality monitoring data collected for Appalachian Power in 2017 shows that temperatures exceeded the 29°C threshold (PAD Figure 5.3-6) and D.O. measurements fell below the 4.0 mg/L threshold approximately 1 mile downstream of Buck Dam. This area falls within the Project Boundary and readings are likely influenced to some degree by dam operations. If these water quality parameters ~1 mile below Buck Dam violated criteria set for the New River, it stands to reason that temperature and D.O. immediately below the dam or bypass reach, or in the impoundment, would have been similar—if not more extreme—given the proximity to the dam and habitat characteristics. Additional water quality monitoring is warranted throughout the Project Footprint (e.g., collection of long-term, continuous data by deploying loggers or Sondes).

5.4.1 Fish and Aquatic Resources

The applicant lists sportfish species found in the vicinity of the Project Boundaries based on a VaFWIS database search (VDGIF 2017a citation). Why were non-game fishes from the database search not presented? Although the Appalachian 1990 fish study results (that include non-game species) are presented, are there not more recent records on non-game fish distributions within the Project Boundaries? If not, additional studies are needed to assess their distributions across Project influenced waters. It has been nearly three decades since the last comprehensive fish survey was conducted within the Project Boundaries. Additionally, the Project Boundary encompasses the lower reaches of several tributaries yet there is no data presented on the aquatic community assemblage within these tributaries. The 1990 fish study did not sample these tributaries which could be supporting a different diversity of aquatic fauna that prefer cooler tributary habitats (e.g., New River endemic sculpins; Jenkins and Burkhead 1994).

Other than the 1990 fish study, have any other fish surveys been completed between the two dams? Note that sampling efforts by the Virginia Department of Game and Inland Fisheries (VDGIF), as described in PAD Section 5.4.1.2, did not cover the stretch of the New River between Byllesby Dam and Buck Dam. In addition, these surveys conducted by the VDGIF (as cited in the PAD, VDGIF 2015) report only statistics on gamefish species. This report describes surveys conducted by electroshocking and assesses trends in catch-rate overtime for gamefish populations (i.e., does not provide data on non-game fishes). Lack of information on non-game species within the influence of the Project dams is a gap in knowledge that needs to be addressed.

PAD page 5-33: "A decline in Walleye was reflected in spring electrofishing catch rates, and the collection of limited numbers of naturally-reproducing Walleye indicated the necessity of continued stocking to maintain a viable recreational fishery."

The stocking of the native strain of New River Walleye has met one of the criteria of a successful reintroduction—post-release survival of stocked individuals. However, there is evidence indicating the native Walleye population has not reached self-sustaining levels of natural recruitment to maintain a long-term viable population without intervention which suggests there may be factors limiting successful recruitment. These factors may include lack of suitable spawning or juvenile habitat. Studies on factors that limit recruitment in river spawning walleye suggest that temperature and flow may drive recruitment success (Mion et al. 1998; Gillenwater et al. 2006; Rutherford et al. 2016). Hence, modification to natural pH, thermal, and flow regimes caused by the Byllesby-Buck dams may be disrupting Walleye reproduction or limiting successful recruitment.

5.4.2 Essential Fish Habitat

While there are no obligate migratory fish species or federal managed fishery in the vicinity of the Project dams that would fall under NOAA regulation, it can be argued that the Project Boundary contains essential habitat for native Walleye unique to the upper New River under the Magnuson-Stevens Act definition of "Essential Fish Habitat":

"Pursuant to the Magnuson-Stevens Act, each fishery management plan (FMP) must identify and describe Essential Fish Habitat (EFH) for the managed fishery, and the statute defines EFH as "*those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity*." 16 U.S.C. § 1853(a)(7) and § 1802(10)."

Additionally, the Upper New River serves as essential fish habitat for 8 endemic fish species (i.e., species which exist only in the New River). Was the VDGIF database (VaFWIS) or State Wildlife Action Plan reviewed to see if this section of the Project Boundary overlaps with essential habitat identified for state protected species or Species of Greatest Conservation Need (SGCN)?

5.4.4.5 Walleye

"Walleye in the New River are known to migrate upstream to spawn, but are inhibited by the Byllesby and Buck dams. However, they will also spawn in lakes over rocky or gravel shoals or clean, low-growing emergent vegetation."

The non-native Walleye strain will spawn in lakes, such as Claytor Lake. The native, unique New River Walleye strain (the one VDGIF is working to reestablish through genetic marker assistance and stocking efforts) is a river-spawner.

5.4.5 Benthic Macroinvertebrates Habitat and Life-History Information

5.4.5.1 Crustaceans

- Jones et al. (1998) and the VaFWIS database should be consulted for a review of crayfishes and snails in the vicinity of the two Project dams. The diversity of crayfishes appears to be declining in the Upper New River and there are many gaps in knowledge on species distributions and the impacts non-native crayfishes are having on native species. An excerpt on the endemic New River crayfish (*Cambarus chasmodactylus*) taken from Russ et al. (2017):

"It is clear that monitoring and surveys are needed for this species especially in West Virginia where it is limited to the Greenbrier River sub-basin and in Virginia where the least is known about the current range. Future work in all three states should focus on monitoring the introduction of nonnative crayfish and devoting resources into the prevention of the spread of all aquatic nuisance species."

- Correction to results described in third paragraph (page 5-39). It should state that crayfish *were* collected in the Fries Project bypass reach.

"Over 800 live Spiny Stream Crayfish were collected within the study reaches upstream and downstream of the Fries Project (Reaches 1, 3, 4, and 5), but not within the Fries Project reservoir or bypass reach (Reaches 2 and 3)."

5.4.6 Freshwater Mussels

- The taxonomic name for pistolgrip is *Tritogonia verrucosa.*
- Correction on Page 5-43. Dive searches were also completed in the impoundment, Reach 2
- The Project Boundary includes Chestnut Creek however this tributary was not assessed for mussels during surveys for the Byllesby water drawdown (Stantec 2018a).
- Habitat below both Project dams was not surveyed for mussels during recent surveys conduct for water drawdowns (Stantec 2018a, 2018b).
- The last mussel survey conducted below Byllesby Dam was in 1997 (Jones et al. 1998; Pinder et al. 2002) in which 1 purple wartyback mussel was collected. The last mussel survey conducted below Buck Dam was in 2008 (Alderman 2008) where notably >100 State Threatened pistolgrip (among other species) were collected. Both of these areas need updated status assessments.
- The furthest upstream section of the New River within the Project Boundary (above Byllesby Dam) was not searched for freshwater mussels during recent surveys (Stantec 2018a; Appendix B, Figure 1)
- It is unclear how far upstream into Brush Creek and Crooked Creek that mussel searches were conducted (Stantec 2018a). Did it cover the entire ~0.2 RM reach of Brush Creek and ~1.5 RM reach of Crooked Creek found within the Project Boundary? Both of these creeks have been identified as "Habitat Predicted for Aquatic WAP Tier I & II Species" by the VDGIF (VaFWIS).
- Additional mussel surveys are needed to cover the entire habitat within the Project Boundary.

5.4.8.2 Bypass Reach Habitat and Flows (& 5.7.3)

"During the previous licensing, FERC noted that that the Buck bypass reach is characterized by exposed bedrock and that the Commission had no evidence that this reach provided any unique or outstanding characteristics of fish habitat relative to nearby reaches." -PAD 5.4.8.2

"Additionally, Appalachian notes that due to existing topographic and substrate conditions, the existing bypass reaches are not expected to provide habitat for the aquatic species described in the section above." -PAD 5.7.3

- The reason the bypasses don't contain unique or species-specific suitable habitat was undoubtedly caused by the Project dams which diverted and essentially eliminated flows in the reach. "The bypasses don't contain suitable habitat" is not a justification for not mandating a minimum flow requirement in the bypasses and implementing efforts to restore riverine habitat in the bypasses. The photographs below (Byllesby top, Buck bottom) depict the extensive loss of river habitat caused by the Project dams. The Project dams have left these reaches scoured and sediment starved. Habitat restoration to these reaches should be considered as a requirement of the new license.

6.2.3.3 Proposed Studies

Bypass Reach Aquatic Habitat and Flow Assessment: "Appalachian proposes, therefore, to perform a desktop aquatic habitat assessment of each Project bypass reach."

- These assessments should not be limited to a desktop. Field surveys should be conducted.
- Habitat restoration should be considered (e.g., restoring flows, aquatic vegetation plantings).

Water level loggers

- These should be installed at several locations in the Project Boundary for continuous monitoring (along with water quality parameters) over a minimum 1 year study period. Water level loggers should be permanently be installed above and below the powerhouses and in the bypasses reaches.

Virginia spiraea surveys

- Field surveys were last conducted in July 2017. "Appalachian requested that the negative results remain valid for 2 years, based on the guidelines established by the USFWS Virginia Field Office" (Stantec 2018a). These results will soon be outdated and updated surveys will be needed to assess the presence/absence of Virginia spiraea within the Project Boundaries. Given the dispersal and life-history of the species, and the presence of suitable habitat within the Project

Boundary, Virginia spiraea may be present. In addition, while the previous surveys were within the time window (May-early July when it is blooming) established suitable for conducting field assessments, the 2017 survey was conducted right at the tail-end of this window (early July). Future surveys should start earlier in the season and be conducted at several intervals within the time window.

Other

- There is no mention in the PAD on the status of native aquatic plants within the Project vicinity. Several species found in the New River are considered foundation species that can significantly influence aquatic community structure and composition. The hornleaf riverweed (*Podostemum ceratophyllum*), American water-willow (*Justicia americana*), and American water celery (or eel-grass; *Vallisneria americana*) are three ecologically important species (Hill 1981; Fritz et al. 2004; Strayer et al. 2013; Wood and Freeman 2017) found in the New River whose distribution is impacted by the Project dams and operations. The loss of these species can negatively impact other aquatic biota through declining habitat and water quality, disruptions to the trophic web, and loss of ecosystem services. Wood and Freeman (2017) note that hornleaf riverweed is in decline throughout much of its range and that "Information on responses of the plant to environmental changes throughout its range is essential to understanding how to conserve or restore populations. Conservation efforts would also benefit from better documentation of *Podostemum* populations, a long recognized deficiency in our understanding of the plant (....). As pressures on freshwater resources increase, conserving *Podostemum* appears crucial for preserving and improving the health and vitality of many eastern North American Rivers."

- Aquatic biota assessments should be extended across the entire reach between the Project dams and in an up- and downstream reference site.

- There is a need to assess native and non-native crayfish distributions across the Project Boundary. The endemic New River crayfish is a species of special interest.

- Freshwater mussel population restoration efforts (e.g., laboratory propagation) should be considered, particularly for state threatened pistolgrip and green floater. If an updated survey below Buck dam determines pistolgrip have significantly declined or been extirpated, then mussel population restoration efforts should be a mandatory requirement of the Project license.

Sincerely,

Caitlin S. Carey
Research Associate
Conservation Management Institute,
Department of Fish and Wildlife Conservation
Virginia Tech

Literature Cited

Alderman, J.M. 2008. Freshwater Mussel and Crayfish Surveys for Appalachian Power Company Claytor Lake Relicensing. Prepared for Devine Tarbell & Associates. 2008.

Bogan, A.E. 1993. Freshwater bivalve extinctions: search for a cause. American Zoologist 33:599–609.

Fritz, K.M., Gangloff, M.M., and J.W. Feminella. 2004. Habitat modification by the stream macrophyte *Justicia americana* and its effects on biota. Community Ecology 140:388–397.

Gillenwater, D., T. Granata, and U. Zika. 2006. GIS-based modeling of spawning habitat suitability for walleye in the Sandusky River, Ohio, and implications for dam removal and river restoration. Ecological Engineering 28:311–323.

Hill, B. 1981. Distribution and production of Justicia americana in the New River, Virginia. Southern Appalachian Botanical Society. 46:162–169.

Jenkins, R.E. and N.M. Burkhead. 1994. Freshwater Fishes of Virginia. American Fisheries Society, Bethesda, Maryland. 1079 pp.

Jones, J., Pinder, M., and J. Young. 1998. The VDGIF project on the distribution and abundance of freshwater mussels, snails, and crayfish of the Virginia section of the New River. Project Summary.

Mion, J.B., R.A. Stein, R. A., and EA. Marschall. 1998. River discharge drives survival of larval walleye. Ecological Applications 8: 88–103.

Neves, R.J., A.E. Bogan, J.D. Williams, S.A. Ahlstedt, and P.W. Hartfield. 1997. Status of Aquatic Mollusks in the Southeastern United States: A Downward Spiral of Diversity. Aquatic Fauna in Peril: The Southeastern Perspective. 554 pp.

Pinder, M.J., E.S. Wilhelm, and J.W. Jones. 2002. Status survey of the freshwater mussels (Bivalvia: Unionidae) in the New River drainage, Virginia. Walkerana 13:189–223.

Poff, N. L., J. D. Allan, M. B. Bain, J. R. Karr, K. L. Prestegaard, B. D. Richter, R. E. Sparks, and J. C. Stromberg. 1997. The Natural Flow Regime. BioScience 47:769–784.

Russ, W.T., Z.J. Loughman, R.F. Thoma, B.T. Watson, and T.D. Ewing. New River crayfish range wide status assessment. Journal of the Southeastern Association of Fish and Wildlife Agencies 3:39–45.

Rutherford, E.S., J. Allison, C. R. Ruetz III, J. R. Elliott, J. K. Nohner, M. R. DuFour, R. P. O'Neal, D. J. Jude & S. R. Hensler (2016) Density and Survival of Walleye Eggs and

Larvae in a Great Lakes Tributary. *Transactions of the American Fisheries Society* 145: 563–577.

Stanley, E.H., and M.W. Doyle. 2003. Trading off: the ecological effects of dam removal. Frontiers in Ecology and the Environment 1:15–22.

Stantec Consulting Services, Inc. (Stantec). 2018a. Byllesby/Buck Project No. 2514 Byllesby Dam Repair Mussel Rescue. Prepared for Appalachian Power Company.

Stantec Consulting Services, Inc. (Stantec). 2018b. Byllesby/Buck Project No. 2514 Buck Dam Repair Mussel Survey and Relocation: Survey and Relocation Results. Prepared for Appalachian Power Company.

Strayer, D.L., C. Lutz, H. M. Malcom, K. Munger, and W. H. Shaw. 2003. Invertebrate communities associated with a native (*Vallisneria americana*) and an alien (*Trapa natans*) macrophyte in a large river. Freshwater Biology 48: 1938–1949.

Virginia Department of Game and Inland Fisheries (VDGIF). 2015. The Upper New River in Virginia: A Tale of Two Rivers. Online [URL]: https://www.dgif.virginia.gov/wp-content/uploads/Upper-New-River-Report-2015.pdf.

Virginia Department of Game and Inland Fisheries (VDGIF). 2017a. Fish and Wildlife Information Service. Online [URL]: http://vafwis.org/fwis/?Menu=Home.Geographic+Search.

Watters, G.T. 2000. Freshwater mussels and water quality: a review of the effects of hydrologic and instream habitat alterations. Proceedings of the First Freshwater Mollusk Conservation Society Symposium:261–274.

Williams, G.P., and M.G. Wolman. 1984. Downstream Effects of Dams on Alluvial Rivers. Geological Survey Professional Paper 1286.

Wood, J., and M. Freeman. 2017. Ecology of the macrophyte *Podostemum ceratophyllum Michx.* (Hornleaf riverweed), a widespread foundation species of eastern North American rivers. Aquatic Botany 139:65–74.

Molly Joseph Ward
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of Administration and Finance

David C. Dowling
Deputy Director of Soil and Water Conservation and Dam Safety

Thomas L. Smith
Deputy Director of Operations

May 7, 2019

Kimberly Bose
Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington DC 20426

Re: P-2514-186, Byllesby-Buck Hydroelectric Project

Dear Ms. Bose:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the New River – Big Branch Stream Conservation Unit (SCU) is located within the project site. SCUs identify stream reaches that contain aquatic natural heritage resources, including 2 miles upstream and 1 mile downstream of documented occurrences, and all tributaries within this reach. SCUs are also given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain. The New River – Big Branch SCU has been given a biodiversity ranking of B4, which represents a site of moderate significance. Natural heritage resources associated with this site are:

Gomphus adelphus	Moustached clubtail	G4G5/S1/NL/NL
Ophiogomphus howei	Pygmy snaketail	G3/S1S2/NL/NL

The Moustached Clubtail is a gray-green and black dragonfly which inhabits mostly rapid clear rocky streams and rivers and occasionally the exposed shorelines of lakes (Dunkle, 2000). The Moustached Clubtail occurs in the northeastern United States and southeastern Canada, extending its range southward along the Appalachian Mountains rarely reaching into North Carolina and Georgia (Lasley accessed 25 February 2010). In Virginia, *G. adelphus* is known from areas of the New River (Grayson, Carroll, and Wythe counties) and has historical occurrences in Augusta and Bath counties. As with all dragonflies, its larvae are aquatic and adults emerge from the water to forage and mate (Dunkle, 2000). Because of their aquatic lifestyle and limited mobility, the larvae are particularly vulnerable to shoreline disturbances that cause the loss of shoreline vegetation and siltation. They are also sensitive to alterations that result in poor water quality, aquatic substrate changes, and thermal fluctuations.

The Pygmy snaketail is a very small sized, stocky dragonfly with amber basal field hindwings, ranging from northeast Maine west to Wisconsin, and south to Virginia and Kentucky. This species requires big, clear rivers with high water quality and stable flow over coarse cobbles and periodic rapids. The larva of this species is unique due to the small size and lack of a dorsal abdominal spine. These larvae overwinter and take flight late April to early June. The major threat to this species is habitat degradation by the impoundment of running waters from poorly drained roads, damming, and channelization (NatureServ, 2009).

Adult Odonata (dragonflies and damselflies), commonly seen flitting and hovering along the shores of most freshwater habitats, are accomplished predators. Adults typically forage in clearings with scattered trees and shrubs near the parent river. They feed on mosquitoes and other smaller flying insects, and are thus considered highly beneficial. Odonates lay their eggs on emergent vegetation or debris at the water's edge. Unlike the adults, the larvae are aquatic and typically inhabit the sand and gravel substrates. Wingless and possessing gills, the larvae crawl about the submerged leaf litter and debris stalking their insect prey. The larvae seize unsuspecting prey with a long, hinged "grasper" that folds neatly under their chin. When larval development is complete, the aquatic larvae crawl from the water to the bank, climb up the stalk of the shoreline vegetation, and the winged adult emerges (Hoffman 1991; Thorpe and Covich 1991).

Because of their aquatic lifestyle and limited mobility, the larvae are particularly vulnerable to shoreline disturbances that cause the loss of shoreline vegetation and siltation. They are also sensitive to alterations that result in poor water quality, aquatic substrate changes, and thermal fluctuations.

In addition, the New River has been designated by the VDGIF as a "Threatened and Endangered Species Water" for the Pistolgrip.

Due to the legal status of the Pistolgrip, DCR recommends coordination with the VDGIF, Virginia's regulatory authority for the management and protection of this species to ensure compliance with the Virginia Endangered Species Act **(**VA ST §§ 29.1-563 – 570).

DCR reiterates the presence of Virginia spiraea (*Spiraea virginiana*,G2/S1/LT/LE) in the New River and additional suitable habitat for this rare plant as indicated in the 2017 survey report. Any change of water levels and/or drastic flow alterations could have potential negative impacts on this species. Therefore, DCR supports updated surveys during the relicensing process to inform any protection, mitigation and enhancement measures related to threatened and endangered species for the Byllesby-Buck Project and recommends coordination with VDGIF and USFWS to ensure compliance with protected species legislation.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. Survey results should be coordinated with DCR-DNH and USFWS. If it is determined the species is present, and there is a likelihood of a negative impact on the species, DCR-DNH will recommend coordination with VDACS to ensure compliance with Virginia's Endangered Plant and Insect Species Act.

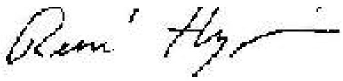
There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

New and updated information is continually added to Biotics. Please re-submit a completed order form and project map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The VDGIF maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov.

Should you have any questions or concerns, feel free to contact me at 804-371-2708. Thank you for the opportunity to comment on this project.

Sincerely,



S. René Hypes
Natural Heritage Project Review Coordinator

CC: Ernie Aschenbach, VDGIF
Troy Andersen, USFWS
Keith Tignor, VDACS
Valerie Fulcher, EIR-DEQ

Literature Cited

Dunkle, Sidney W. 2000. Dragonflies through Binoculars: A field guide to dragonflies of North America. Oxford University Press, New York, NY. Pages 74-75.

Hoffman, R. 1991. Arthropods. Pp. 173 in: K. Terwilliger (ed.), Virginia's Endangered Species: proceedings of a symposium. The McDonald and Woodward Publishing Company, Blacksburg, VA.

Lasley, Greg. 2009. Greg Lasley nature photography at: http://www.greglasley.net/moustachedclub.html.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: August 9, 2010).

Thorpe, J.H., and A.P. Covich. 1991. Ecology and Classification of North American Freshwater Invertebrates. Academic Press, Inc., San, Diego, California.

UNITED STATES OF AMERICA

FEDERAL ENERGY REGULATORY COMMISSION

OFFICE OF ENERGY PROJECTS

\- - - - - - - - - - - - - - - - - - x

Appalachian Power Company : Project No. 2514-186

\- - - - - - - - - - - - - - - - - - x Virginia

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Hampton Inn-Galax

205 Cranberry Road

Galax, Virginia 24333

Wednesday, April 10, 2019

The public scoping meeting, pursuant to notice, convened at 7 p.m.

P R O C E E D I N G S

MS. SANGUNETT: All right, let's get started, folks. I'm going to leave this door open. Hopefully it will get some air flow going. Can't change the temperature.

So you're here at the Byllesby-Buck Hydroelectric Project scoping meeting, in case you weren't sure; that's what we're here for tonight. Let me just introduce our FERC staff real quick. I'm Brandi Sangunett, I'm the project coordinator for this and I'm also doing terrestrial and soil resource, geology and soil. Terrestrial resources, geology and soils, and rare, threatened and endangered species.

Want to start over there by the wall?

MS. WARDEN: I'm Rachael Warden, I'm from FERC and I'm the attorney assigned to the project.

MS. CONNER: I'm Allyson Conner and I am on the recreation resources, as well as cultural, and aesthetics.

MR. CALLIHAN: Jody Callihan, I'm a fish biologist at FERC working on aquatics on this project. Water quality, fisheries.

MS. SANGUNETT: And we're having another meeting tomorrow morning at 9 if you just can't get enough of us. Before we get started. There's a sign in sheet. I think everyone signed in. We do have a court reporter so we're going to have transcripts of tonight's meeting and it will be available in a couple of weeks. You do need to clearly state your name and affiliation so the court reporter can get your name right and get that correct on the transcripts. The sign in sheet will help him out as well. We do have handouts about the scoping document. We have this Guide to Getting Involved With Hydropower Licensing. And we also have your Guide to Electronic Information at FERC.

So, we're going to go over who FERC is, what our mandate is, what scoping is. We'll discuss the licensing process for this project. And the purpose of scoping tonight. Then we'll go through each of the resource issues and discuss what we're planning on evaluating for our EA, and open it up for discussions and comments. We'll tell you how to submit your comments and stay informed, and we will go over important deadlines for filing your comments and some other things that are important to the project. And final questions or comments.

Let's get right into what is FERC? FERC is the Federal Energy Regulatory Commission. It's an independent federal agency that regulates the interstate transmission of natural gas, oil, and electricity. FERC also regulates natural gas in hydropower projects and other non-federal hydropower projects. So, things like, Bonneville Dam is owned by the Corps, we don't regulate.

The Commission is lead by five commissioners that are appointed by the president and supported by 12 offices and a staff of about 1,500 employees. Our headquarters is in Washington D.C. We do have regional offices throughout the country. Those are usually the locations for our engineers and inspectors. And the engineers and the inspectors are usually with the Division of Dam Safety and Inspection. One of the three divisions under the Office of Energy Projects that deals with hydropower. The Division of Hydropower Licensing is who we are with; FERC staff that introduced themselves. We all work for that division.

Once a project gets its license, then the Division of Hydropower Administration and Compliance would deal with the project. We derive our authority from the Federal Power Act and we're mandated to balance all of the uses of the resource. Licenses are usually issued for a term of 30 to 50 years and we are in charge of about 2,500 licensed or exempted projects throughout the country.

So the purpose of scoping-- and please feel free to stop me if you have any questions-- the purpose of scoping tonight is to gather information for the relicensing of the Byllesby-Buck Project. Scoping is required by the National Environmental Policy Act. The original license was for a 30 year term and that was issued in 1994, so it's going to expire on February 29th, 2024. It's about a five year process, so that's why we're starting early.

And this particular project is going to be following the Integrated Licensing Process. And there are three important principles to consider what this process is meant to accomplish. Early identification and resolution of studies is the number one principle. The second is to integrate agency and tribal permitting-processing needs, NEPA, and any pre-filing consultation or federal or state permitting needs. We want to try to get everybody on the same schedule and the same page as soon as possible. And then finally, it establishes definitive time frames for completion of each step of the process.

Here is an overview of the timelines for the ILP. We divided up into pre-filing and post-filing. Under pre-filing which is where we're at right now in the process, it begins with the applicant filing their NOI and PAD; Notice of Intent and Pre-Application Document. And the next step is scoping, which is what we're doing here. We gather public comments and then we develop the study plan that's the next The applicant develops their study plan based on public comments and study requests. And that process all takes about a year. And then finally, the studies are conducted and the application is prepared and studies can take one to two years, depending on needs.

Then we jump to the post-filing process which begins when the applicant files their application with the

Commission. Then we review it for adequacy and make sure it meets all of the requirements of our regulations and any other regulations. Other regulations, etcetera. And then we also open it up to public comment again. We use those public comments for our environmental document. Usually, an environmental assessment. And then we issue the EA and open it up for public comment again.

And the final step in the process, which is what our end goal is, is a license order is issued by FERC. So, as you can see the whole process takes about five years. And in the scoping document, in Appendix B, there is a more detailed schedule, with specific dates and all of the many, many steps required for pre-filing. So, this is all just pre-filing in this Appendix B. So, the first half of that diagram.

All right. Any questions about that?

What we've done so far, the pre-filing steps we've done so far is the NOI and PAD was filed on January 7th. We issued our scoping document which, hopefully, you've all seen. And we're holding scoping meetings today. And your comments, either written or verbal, which we would get tonight, are due May 7th. So, that's a very important date to remember. And then these are some of the other dates. We will have meetings after the proposed study plan is filed so that the applicant can present their proposed study plan and gather comments on that. So, each step of the way there's lots of opportunity to comment. All right? And again, like I said, this is in Appendix B.

So, the point of the scoping is to identify any environmental issues or concerns; look at potential effects of the project or on resources such as aquatic or terrestrial and human environments. We need to figure out what kind of information is needed to analyze these potential effects for NEPA purposes. And we do that by looking at both existing information and any new information we can gather. So, existing information might be a resource report or survey data, new information could be comments from agencies or other stakeholders. All right?

Also involved, identifying and receiving input on resources that might be cumulatively affected. So, if you have a river system with multiple dams, you want to think about, for example, what's happening to the fish as they go through many projects. That would be considered a cumulative effect. We also look at reasonable alternatives to what the applicant has proposed. That's a very important part of the NEPA process. And we also look at resources that we don't really need to do detailed analysis for, so, if something's not really relevant to the project, then we can eliminate that from the EA. So, think about those things as we go through our presentation of each resource area.

These are the different resource areas that we typically focus on. Geology and Soil. Aquatics. Terrestrial. Threatened and endangered species. Rec and land use. Cultural resources and developmental resources.

And now I'm going to turn it over to Liz. I'm going to pull up the presentation for you. Liz?

MS. PARCELL: Good evening, everyone. I'm Liz Parcell. I'm with American Electric Power. The two leads on this project, and I have a couple of coworkers here that I'd like to introduce. We have Dino in the back. Dino was kind enough to give us a tour earlier of the facility. Frank Simms, who is with YES Energy. Not an active employee, but he's a former hydro manager. Jim Thrasher, special projects. Back here, the paparazzi -- and he takes really good pictures. Fred Colburn is from operations in Columbus. Henry is over the Buck- Byllesby Project. And I think that's about it.

We're going to go over a few topics today. The project facilities. The recreation facilities and operations. The Byllesby-Buck Project is licensed to Appalachian Power Company which is a unit of American Electric Power. Our current Federal Energy Regulatory license expires February 29th, 2024, and as noted earlier we filed the Notice of Intent and Pre-application Document with

FERC on January 7th of this year. We are using the integrated licensing process, and this is FERC project 2514. One thing that you should note is that in all your filings with the Federal Energy Regulatory Commission, you should add a subdocket number, which is 186. So, it's going to be P-2514-186.

Byllesby-Buck is unique in that it has two dams associated with the project. We call each of those dams a development. So, this two-development project is located on the Upper New River entirely within Carroll County, Virginia. The Byllesby development is located about 9 miles north of the City of Galax. And the Buck development is located 3 river miles downstream of Byllesby and 43.5 river miles upstream of the Claytor Dam. The Byllesby development operates in a run-of-river mode. It has an installed capacity of 21.6 megawatts and the primary features include a 528 foot long concrete dam with a height of 64 feet. Topped with four sections of nine foot high flashboards. Five sections of nine foot high inflatable Obermeyer crest gates. And six bays of 10 foot high Tainter gates. There's a 239 acre reservoir with 2,000 acre-feet of storage at normal maximum surface elevation, 2,079.2. The auxillary spillway includes six sections of nine foot high flashboards. And the powerhouse contains four vertical Francis turbine generator units.

Here's an overview. You can see the dam and spillway to the left and then the powerhouse and the dam and spillway below the powerhouse. The Buck development is also a run-of-river project. It has an authorized installed capacity of 8.5 megawatts.

The primary features include a 353-foot long concrete dam with a height of about 42 feet, 1,005 foot long spillway section with a height of 19 feet topped with 20 sections of flashboards with a height of 9 feet. Four sections of 9-feet high inflatable Obermeyer crest gates and six bays of 10 feet Tainter gates. There's a 66-acre reservoir with 661 acre feet storage capacity at normal maximum surface elevation of 2,003.4. The powerhouse contains three vertical Francis turbine generator units. Then there's also a 4,100 foot long bypass reach.

Here's an overview of the Buck facilities. The ripples below the powerhouse there is the bypassed reach. There are six attributes pertaining to recreation within the Buck-Byllesby Project, and four of those are maintained by the Virginia Department of Conservation and Recreation. There is a Byllesby Virginia Department of Conservation and Recreation boat launch. And that's within the Town of Galax, and it's on the opposite side of the majority of all the activities. And then we maintain - Appalachian Power Company maintains the Byllesby canoe portage and the Buck

Dam canoe portage. The other facilities are the New River Canoe Launch, and that's a picture of this area, right here. And the New River Trail picnic area which we saw being used today. And then the Buck Dam picnic area. And here is a picture of all those facilities on the New River. You can see the New River Trail borders the project.

With regards to operations, license article 401 requires the project to be operated in a run-of-river mode. And the Byllesby reservoir operates between 2,078.2 and 2,079.2, and the Buck-Byllesby reservoir between 2,002.4 and 2003.4. License article 403 requires a minimum release of 360 CFS or inflow, whichever is less, downstream of both powerhouses. The Buck development is approximately 3 miles downstream from the Byllesby development and therefore it's dependent upon flows from Byllesby.

The operation of the two developments is closely coordinated. Tainter gate operation and generation at both Byllesby and Buck are remotely operated from the AEP center located in Columbus, Ohio -- i.e., Fred. Operators are stationed at the control center 24 hours a day, 7 days a week. Plant personnel are also present at the Byllesby-Buck Project, four days a week, 10 hours a day to perform their duties.

Gate openings are planned and based on monitoring of the stream USGS gage at Galax and Byllesby-Buck forebay elevations. When the inflow exceeds the discharge capacity of the powerhouse, the Tainter gates are open to pass the excess flow. If inflows exceed the capacity of the Tainter gates, the inflatable Obermeyer crest gates are then operated, followed by manual tripping of the wooden flashboards. The Byllesby emergency spillway is operated after release of all inflatable crest gate and wooden flashboard sections. And this is typically at flows in excess of 46,690 CFS.

PARTICIPANT: Are the Obermeyers remotely controlled?

MR. AEC: No.

PARTICIPANT: No, they're not?

MR. AEC: We will have the capability of doing that, but they're currently not remotely controlled.

PARTICIPANT: When do you think you will have the capability to do that?

PARTICIPANT: We have installed the hardware to do that and we just haven't hooked it up to the remote operation in Columbus yet; so Fred, you may want to address that part of that.

MR. COLBURN: We're tentatively thinking, scheduled for May of this year.

PARTICIPANT: And they are able to be controlled individually?

MR. COLBURN: Correct.

PARTICIPANT: Of course, each section?

MR. COLBURN: Yes.

MS. PARCELL: So, when a spillway gate at the Buck development has been opened two feet or more, Appalachian is required to discharge flows through a two foot wide gate opening for at least three hours. And this is commonly referred to as a ramping rate, for the protection of fish resources. And then Appalachian is required to reduce the opening to one foot for at least an additional three hours, after which Appalachian may close the gate.

And that is it, and if you have any questions, I'm available; and Fred, and Jim Thrasher, also.

MS. SANGUNETT: Thank you.

All right. I'm going to switch back over.

So again, the preliminary list of resources that we're going to go over in more detail are also listed in the scoping document. You can follow along on page 13. Starts towards the middle of the page. So, as we go through each of these resource areas, think about any additional issues or concerns you might have and any identified issues that you might disagree with. All right. Thank you.

Anybody else need one? All right. And again, if you have questions or anything, feel free to stop me.

The first resource area is geology and soils, and we're just going to look at the effects of continued project operations and maintenance on shoreline erosion at each of the impoundments. Any comments or questions on geology and soils? All right.

Our next resource area is aquatic resources. There's a lot of these,so we have two slides to cover. The first one is going to be handled by Jody, there's a picture of him there, doing his favorite thing. So, we're going to be evaluating the effects of continued project operation and maintenance on water quality, dissolved oxygen, water temperature, both upstream and downstream of each development, including the bypass reach at Buck. We're going to look at the adequacy of the existing minimum flows, 360 CFS-- cubic feet per second-- and how that might impact aquatic resources including resident fish species downstream of each development. We'll also look at whether there is a need for a minimum flow beyond leakage at Buck bypassed reach. And finally, we'll be looking at the effects of continued project maintenance including periodic impoundment drawdowns to replace the flashboards and periodic dredging to reduce sediments on the impoundments on aquatic resources. And especially freshwater mussels and fish spawning habitat in the impoundments in the development.

We will also look at entrainment and impingement mortality of resident fish. And any effects on the Eastern Hellbender and the adequacy of the existing ramping rate at the bypass, at the Buck bypassed reach. All right.

Any other additional comments or concerns on this resource area?

PARTICIPANT: I have a comment.

MS. SANGUNETT: Okay. Please proceed.

PARTICIPANT: Two or three years ago we had an instance where I was checking a USGS gage, and I think the water level got down to like 250 or 300, I can't remember the exact CFS, but I sent John a message and he checked with AEP, and the problem was black -- had shorted out the equipment, and there was decreased water flow downstream. And I'm just wondering, is there any safeguard? I mean, I know something is going to malfunction from time-to-time but is there any safeguards to be sure we maintain river flow at an adequate level? It's a concern. It may not happen again, but it did happen once.

MS. PARCELL: As long as I've been working with American Electric Power, that was an anomaly. That was most unusual. And

PARTICIPANT: I check it about every day when I go kayaking. Not every day, but frequently, and I just happened to think, what happened here?

MS. PARCELL: Well, we appreciate it.

PARTICIPANT: I thought it was --

MS. PARCELL: I think our Operations does an excellent job of maintaining the elevations. And we get a lot of high flow events, and I do believe that the Obermeyer gate installation is going to help regulate those flows even more in the future. I believe with regards to the snake, we did call the pest control and have some increased services there. Is that right, Dino?

DINO: Yes, that's correct.

MS. SANGUNETT: Any other questions? Yes?

MR. SIMMS: Frank Simms, Young Energy Services. I know it's a concern that people should identify themselves -

MS. SANGUNETT: Yes.

MR. SIMMS: -- and who they're with.

MS. SANGUNETT: Yes.

MR. SIMMS: So would that be possible?

MS. SANGUNETT: Okay.

MS. NORMAN: I'm happy to volunteer because I spoke up earlier. I'm Janet Norman from the US Fish & Wildlife Service. And just as a, kind of overall caveat, I came to this night meeting to listen and see if there were any community members who want to provide their input; so I was not planning on speaking a whole bunch, and a majority of our comments are going to be contained within our written letters. But I appreciate the people being here to explain some of the operations.

MS. SANGUNETT: We missed you at our Fries scoping meeting.

MS. NORMAN: Yes.

MS. SANGUNETT: That was a weird circumstance.

MS. NORMAN: A morning prohibition.

MS. SANGUNETT: Doesn't happen very often.

All right. Any other comments on this resource area before we move on to the next? All right.

Terrestrial resources is what I'll be working on and we'll be looking at the effects of continued project operations including impoundment fluctuations on riparian and wetland habitat and associated wildlife. We'll also be looking at upland wildlife habitat especially Bald Eagles and what effects continued project operations and maintenance will have on those resources. Any comments or questions on terrestrial?

All right. Moving on.

T and E species. We have three identified at this project: the Indiana Bat, Northern Long-eared Bat, and Virginia Spirea. And I believe there was some spirea found. Is that right?

MR. MAGALSKI: Yes. This is Jon Magalski, AEP. We did a habitat assessment survey, I believe, in 2016 or

2017 and no Virginia Spirea was found.

MS. SANGUNETT: All right.

MR. MAGALSKI: There's an old record upstream of the Byllesby development, but it was never confirmed.

MS. SANGUNETT: Okay. So, we'll be looking at the effects of project operation and maintenance on those critters and plants. Any comments or questions on those? All right. Next resource area is Allyson's purview; recreation and land use. We'll be looking at the effects of project operations and maintenance on recreation, land use, and aesthetics. The adequacy of existing recreation facilities and public access to the projects to meet current and future recreation demands.

Any comments or question on rec and land use and aesthetics?

All right. Next one.

Also, Allyson's purview: cultural resources. We'll be looking at the project effects on anything currently listed or eligible for the National Register and also anything that has not been identified previously to be included in the National Register of Historic Places.

Any questions or comments? Yes?

PARTICIPANT: I just saw in today's filing about the letter from Harold Peterson of BIA, Bureau of Indian Affairs. So, have you initiated any consultation?

MS. CONNER: This is Allyson Conner with FERC, and I saw it as well; and approximately a year ago we did a tribal consultation and there's a memo filed in our record of all the tribes and nations that we contacted, and the Monacan was one of the tribes that we contacted. So if it wasn't, then I would send a letter at this point, but it has been covered.

PARTICIPANT: All right.

MS. CONNER: Yes. And they are one of the more newly recognized tribes?

MS. SANGUNETT: Yes, it was like January of 2018 so, yes, getting them in the rotation takes a little -- but they were included. All right.

Any other questions or comments? For cultural resources, all right.

And finally, developmental resources. That's basically the economics of the project and any effects of any recommended environmental measures on the project's economics. And this is Lucy, another team member who didn't come with us for this trip, but she will be covering that area.

Any comments or questions on developmental resources? All right.

Not only are we going to be requesting comments, we're also going to be requesting studies. Any additional studies that you think need to be done at the project. So, when you submit a study request, you must follow these seven criteria. Each of these seven points needs to be covered in order for us to include your study in our analysis.

So, the first one is it's important to describe the goals and objectives. This is a slightly abbreviated version of the regs. And, by the way, you can see the full description in Appendix A of your scoping document. Number two is to explain the relevant resource management goals. And then you need to explain any relevant public interest considerations. Describe any existing information. Describe the nexus between project operations and effects. What's the connection between how the project operates and how it's affecting your resource. Explain the proposed study methodology, be specific about how you expect the study to be conducted. And describe the level of effort and costs.

Any questions on the study request criteria? All right. Very important.

Another important thing to keep in mind is May 7th. That is the deadline for when written comments and study requests are due. And again, we will be collecting all of your oral comments today for our court reporter, and that will go into the record as well and be considered in our NEPA document.

it's very important that you use the project number and name to identify, to be included in your written comments or study requests. And like Liz said, you need to use the full project number. 2514-186. Very important so it doesn't get lost in our database. And you can file electronically or by mail. The mailing address is below but we really prefer electronic filings. And, I think the next slide will be talking specifically about how to do that. All right. So, May 7th everybody.

How to stay informed. I mentioned that we had a brochure about your guide, called Your Guide to Electronic Information at FERC. All of the information in this slide is in this brochure. The easiest way to stay informed is to eSubscribe. So, you sign up to get email notifications of any filings or issuances that come through our eLibrary system. elibrary is where we store all of our public documents, under the specific docket number and that is the wrong number, please ignore that. Sorry about that. It's 2514. The website is www.ferc.gov to access that information.

Also, you can be added to our official mailing list to receive hardcopies of all project issuances. And we included a copy of our current mailing list in the scoping document, and let's see what page, page 26. So, check and see if you're on there and if you're not and you would like to be on there then you can send an email and request to be added or removed to eFiling@ferc.gov. And again, make sure you include the project number so they know exactly which one you want information about. All right. Now let's get a little bit

MS. PARCELL: I have a question about the mailing list.

MS. SANGUNETT: Yes.

MS. PARCELL: This is Liz Parcell. We submitted a revised mailing list, a service list. Is there any way that we can get this updated?

MS. SANGUNETT: So, service list and mailing lists are a little bit different; but if you want the mailing list changed at all that's the way to do it. And we can't really help you out with that; it has to go through that channel.

MS. PARCELL: Thank you.

MS. SANGUNETT: So, this is what our document and -- this is what our FERC Online. That's what our website looks like. [Indicating on slide] So, the first thing you need to do is register if you are not already registered. If you have already registered then you can just log in. Once you register then you can eSubscribe. That's listed up here. It's a little fuzzy. eSubscription is right there. You can also file your comments electronically through eComment, which is a text submission and it has a character limit and I cannot remember

PARTICIPANT: 6,000.

MS. SANGUNETT: 6,000. All right. If you have a lengthier comment or document you want to --

MS. NORMAN: Third one is eFiling.

MS. SANGUNETT: There you go. If you have, like, a PDF or a Word document that you want to submit you do that through eFiling. Let's see what else.

MS. NORMAN: Before we move completely off the mailing list. Janet Norman. So, I'm getting your official mailing but my name is not on here and another coworker name is on there.

MS. SANGUNETT: So, what I, so, there was a supplemental mailing list created just for the scoping document. So, anybody that was not in the official mailing list that was in a distribution list, they were added to that supplemental mailing list but it's just a one-time thing. So, if you want a permanent change you'll need to submit something to that email address.

MS. NORMAN: To this e

MS. SANGUNETT: eFiling@ferc.gov.

MS. NORMAN: eFiling@ferc.gov.

MS. SANGUNETT: Yes.

MS. NORMAN: Okay.

MS. SANGUNETT: I wanted to make sure everyone at least got the scoping document so that they can tell us if they wanted to get added. All right.

MS. NORMAN: And we can check our presence on the service list also?

MS. SANGUNETT: Yes. Actually that's a good thing to point out that, that you can pull up the service list and the mailing list for the project and you can search there on this same website as you see if you're on there. If you're not, you can request to be added.

MS. NORMAN: I've done it but I forget how to do it.

MS. SANGUNETT: All right.

MS. NORMAN: It's within --

MS. SANGUNETT: It's in here. It's under let's see. In eSubscription.

MS. NORMAN: An eSubscription?

MS. SANGUNETT: Ferc online consists of -- eService All right, eService is where you'll see the service list and the mailing list.

MS. NORMAN: Okay.

MS. SANGUNETT: Yes. So, eService is listed there. Wow, that's really blurry. All right.

Any questions on our electronic document

MS. NORMAN: Sure, as long as we're on it. So, submitting comprehensive plans

MS. SANGUNETT: Yes.

MS. NORMAN: - for consideration.

MS. CONNER: Yes. That's a different process. And I don't know what that is, actually. I know -- but how does it get filed?

MS. SANGUNETT: They are still getting filed. And then it's a different docket; you make sure that you label it as a comprehensive plan and it gets a ZZ docket, and that goes to Rachael McNamara, who is the one that oversees the whole the comprehensive list of comprehensive plans, and then it gets added by that way. So, by submitting it on the record then we have an actual copy of the plan.

MS. NORMAN: Right. Do you have a, do you have a process cheat sheet on that that you could provide to make-

MS. CONNER: It's just like submitting any other comment. It really, like -

MS. SANGUNETT: We can send you that docket number that you need, is that what you're wondering about? I can email that to you.

MS. NORMAN: Right. So, just like a comment letter, I would go into eFiling and I would --

MS. SANGUNETT: Yes, but you have to use that special docket number.

MS. NORMAN: Sub-docket?

MS. CONNER: No. Well, you would still use the same project number, or you would submit it under that, but the ZZ comes from -- I think there's probably a drop down box that gives it. You don't have to know the ZZ part.

MS. NORMAN: Oh.

MS. CONNER: But you still use the same project number, 2514. And it just -

MS. SANGUNETT: Well, I guess -- it's state-wide, I guess.

MS. CONNER: Oh, right.

MS. SANGUNETT: Once you select the type of document that you're filing, which will be 'comprehensive plan,' then the ZZ shows up and that's all you need. Yes.

MS. NORMAN: And it's not a comprehensive plan but it is a journal article to this project in particular.

MS. SANGUNETT: You would file it just as you would your comments.

MS. NORMAN: Through the eFiling

MS. SANGUNETT: Yes.

MS. SANGUNETT: With the project number. We welcome any additional information like that.

Any other questions or comments on the FERC Online system? I think that's it. Yes.

MR. KITTRELL: Bill Kittrell with the Department of Game and Inland Fisheries. And I've just got a question about something in the scoping document, would this be an appropriate time to ask that question?

MS. SANGUNETT: Sure, absolutely. What page are you on?

MR. KITTRELL: I'm on page 10 and we'll probably reserve comments until the meeting tomorrow, but I just wanted to clarify a question on page 10 about the - under aquatic resources, it's the last bullet where it's talking about the ramping rate with the current FERC, under the current FERC license.

MS. SANGUNETT: The modified, the order modifying it?

MR. KITTRELL: Well, the question I have is when a spillway gate has been open two feet or more, water will continue to be released into the bypass reach, is that any of the Tainter gates, is that the gates that you're talking about when it says: any spillway gate has been opened two feet or more? Is that a Tainter gate that you're talking about there?

MR. COLBURN: Correct.

MR. KITTRELL: So, and it says water will be released into the bypassed reach through a two-foot gate opening. Is that the exact same gate that has been opened? Will be closed to a two-foot opening?

MR. COLBURN: That's only one gate has been opened.

MR. KITTRELL: Is there any rhyme or reason about which of those five or six gates open at any particular time? Is there one that opens first, for example, or is it just -

MR. COLBURN: Not necessarily.

MR. KITTRELL: - random.

MR. COLBURN: Yes.

MR. KITTRELL: All right.

MS. SANGUNETT: Can you identify yourself?

MR. COLBURN: Fred Colburn.

MR. KITTRELL: And so, that same Tainter gate will be open for three hours at the two-foot level no matter how much it's cracked to begin with, then it will be left open for another three hours at one foot?

MR. COLBURN: Right.

MR. KITTRELL: All right. I just wanted to clarify that. And one additional question. On the -

MS. NORMAN: Bill, before we move on from that topic, so, yes, I'd love to have that explained a little bit more. Janet Norman, Fish and Wildlife Service. Exactly, the selection of which gate is used has an effect on the downstream small channels, which is less prone to stranding versus other bedrock configurations and you want channel downstream to be looking - so if we don't know which gates are being used, how do we know how appropriate the water flow is going to effect stranding?

MS. SANGUNETT: I'm not -- don't look at me.

MR. CALLIHAN: It seems like more an operations question.

MS. NORMAN: It is an operation question. So if they're worried about the operations, how does that --

MR. CALLIHAN: If you're asking me now if AEP has a strategic way that they, which gates gets open to spill -

MS. NORMAN: Looking at the downstream --

MR. CALLIHAN: Yes.

MS. SANGUNETT: So there's -- is that the gates, essentially?

MR. CALLIHAN: Contrast -- right now they are in -- your innards are off to one side, looking down the river -- to the rise right.

MR. KITTRELL: This is Bill Kittrell again with the Department of Game and Inland Fisheries, and for example, if you have a thousand foot long spillway section, the Tainter gates may have five Tainter gates down on one end, for example, and their, whatever the width is on those gates, I can't remember. Ten feet, or I can't remember what the --

MR. COLBURN: 33.

MR. KITTRELL: 33. So, you know, that certainly has an impact on, like, where the water is filling downstream of that, in the bypass reach. But I did have one more question but I wanted to get through before I forget.

MS. SANGUNETT: Let me just clear up for anybody who is here confused like I was just now, but page 10 is about the proposed environmental measures from the applicant, and I put up this slide for the resource bullet on page 13, so, I was thinking, "Oh my gosh, we missed something." And we did not. Just to clarify what we're talking about. Make sure everyone is on the same page. Go ahead.

MR. KITTRELL: My question is, if Appalachian is presently evaluating the feasibility and benefits of operating with a one foot lower impoundment level during the winter months, December, January, February, March, obviously that's being done for storage issues during the winter and ice and so forth, but I do think that it needs to be in that consideration and that evaluation, there is winter usage of the impoundments, particularly; and I think it would be useful to sort of consider what that impact is having on the wetlands that are in the impoundments, because those wetlands can be used for water fowl hunting and that sort of thing; so if there is any impact having a one foot lower impoundment level during the winter on the wetlands as well within the project boundaries. It might be worth considering and when is that decision or that feasibility going to be reported in this process?

MS. SANGUNETT: You're talking about the proposed--

MR. KITTRELL: They're currently doing a feasibility and I was wondering when that was going to be reported?

MS. PARCELL: Wouldn't that be reported during the study plan review process?

MR. KITTRELL: If it's incorporated into one of the study plans, it would be.

MS. SANGUNETT: Just for reference, the proposed study, the applicant's proposed studies are also listed in the scoping document.

MR. MAGALSKI: This is Jon Magalski at AEP. We are proposing a bypass reach aquatic habitat flow assessment as well as an evaluation of the Obermeyer gates.

MR. CALLIHAN: Jody Callihan for FERC. That was related more to the validating how much spill was -- but not moreso than the fluctuations during the bypass evaluation.

I think what Bill was referring to was how the impoundment habitat was changed if the pond was one foot lower for water fowl.

MR. KITTRELL: This is Bill Kittrell again. That could be reported in the recreational part of that as well because it would affect, maybe, potentially, winter recreation usage of the impoundment. But there may be other study reports that it could be incorporated in. I was just curious about when that feasibility study would be, how it would be reported. Thank you.

MS. SANGUNETT: Okay. Let me make sure I'm following what you're talking about. Are you talking about the proposed method of dealing with icing? When you draw down for --

MR. KITTRELL: No.

MS. SANGUNETT: - in the winter? No. You're not referring to that.

MR. KITTRELL: I'm referring to page 9 under 3.2.1, project operations. It says Appalachian is presently evaluating the feasibility and benefits of operating this development within a one foot lower impoundment level.

MS. SANGUNETT: Yes, that's the point was the purpose of that

MR. KITTRELL: Because the purpose of it in the winter is primarily, as I understand it, managing ice -

MS. SANGUNETT: Yes.

MR. KITTRELL: -- and managing potential storm flows; you know, if you have a lower impoundment level, you've got more storage capacity.

MS. SANGUNETT: So, you're wondering when they're going to decide if that's something that they want go through with? Okay.

MR. KITTRELL: Yes.

MS. SANGUNETT: You guys are still evaluating that possibility, correct?

MS. PARCELL: Correct. And the, I guess, personally, I would see it as being done at the same time the other studies would be done.

MS. SANGUNETT: Okay.

MR. KITTRELL: Thank you.

MR. CALLIHAN: But that was not included as a proposed study yet. Right?

MR. MAGALSKI: This is Jon Magalski, AEP. Those comments are great to have to incorporate into the proposed studies.

MR. KITTRELL: And we would be glad to provide comments on that winter recreational use, too.

MR. CALLIHAN: Yes, that's exactly what we would be looking for to develop those studies.

MR. CALLIHAN: I guess it would be preferable to get the idea and feasibility of it ironed out before filing your license application. It would go along with, it would integrate better with your other studies that are being done as far as the time frame if the studies were done that way. If there was a proposal later in the game and we didn't have the information we needed to evaluate the potential change to the impoundment habitat, but became a more concrete proposal later.

MS. SANGUNETT: Any other comments or questions?

All right. Well, if we have nothing further we're going to adjourn this meeting and like I said, we have another one tomorrow at 9 o'clock, same place.

[Whereupon at 7:55 p.m., the verbal comment session concluded.]

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceeding before the FEDERAL ENERGY REGULATORY COMMISSION in the Matter of:

Name of Proceeding:

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Docket No.: No. 2514-186

Place: Galax, Virginia

Date: Wednesday, April 10, 2019

were held as herein appears, and that this is the original transcript thereof for the file of the Federal Energy Regulatory Commission, and is a full correct transcription of the proceedings.

Dan Hawkins

Official Reporter

UNITED STATES OF AMERICA

FEDERAL ENERGY REGULATORY COMMISSION

OFFICE OF ENERGY PROJECTS

\- - - - - - - - - - - - - - - - x

Appalachian Power Company : Project No. 2514-186

\- - - - - - - - - - - - - - - - x Virginia

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Hampton Inn-Galax
205 Cranberry Road
Galax, Virginia 24333
Wednesday, April 10, 2019

The public scoping meeting, pursuant to notice, convened at 7 p.m.

P R O C E E D I N G S

MS. SANGUNETT: All right, let's get started, folks. I'm going to leave this door open. Hopefully it will get some air flow going. Can't change the temperature.

So you're here at the Byllesby-Buck Hydroelectric Project scoping meeting, in case you weren't sure; that's what we're here for tonight. Let me just introduce our FERC staff real quick. I'm Brandi Sangunett, I'm the project coordinator for this and I'm also doing terrestrial and soil resource, geology and soil. Terrestrial resources, geology and soils, and rare, threatened and endangered species.

Want to start over there by the wall?

MS. WARDEN: I'm Rachael Warden, I'm from FERC and I'm the attorney assigned to the project.

MS. CONNER: I'm Allyson Conner and I am on the recreation resources, as well as cultural, and aesthetics.

MR. CALLIHAN: Jody Callihan, I'm a fish biologist at FERC working on aquatics on this project. Water quality, fisheries.

MS. SANGUNETT: And we're having another meeting tomorrow morning at 9 if you just can't get enough of us. Before we get started. There's a sign in sheet. I think everyone signed in. We do have a court reporter so we're going to have transcripts of tonight's meeting and it will be available in a couple of weeks. You do need to clearly state your name and affiliation so the court reporter can get your name right and get that correct on the transcripts. The sign in sheet will help him out as well. We do have handouts about the scoping document. We have this Guide to Getting Involved With Hydropower Licensing. And we also have your Guide to Electronic Information at FERC.

So, we're going to go over who FERC is, what our mandate is, what scoping is. We'll discuss the licensing process for this project. And the purpose of scoping tonight. Then we'll go through each of the resource issues and discuss what we're planning on evaluating for our EA, and open it up for discussions and comments. We'll tell you how to submit your comments and stay informed, and we will go over important deadlines for filing your comments and some other things that are important to the project. And final questions or comments.

Let's get right into what is FERC? FERC is the Federal Energy Regulatory Commission. It's an independent federal agency that regulates the interstate transmission of natural gas, oil, and electricity. FERC also regulates natural gas in hydropower projects and other non-federal hydropower projects. So, things like, Bonneville Dam is owned by the Corps, we don't regulate.

The Commission is lead by five commissioners that are appointed by the president and supported by 12 offices and a staff of about 1,500 employees. Our headquarters is in Washington D.C. We do have regional offices throughout the country. Those are usually the locations for our engineers and inspectors. And the engineers and the inspectors are usually with the Division of Dam Safety and Inspection. One of the three divisions under the Office of Energy Projects that deals with hydropower. The Division of Hydropower Licensing is who we are with; FERC staff that introduced themselves. We all work for that division.

Once a project gets its license, then the Division of Hydropower Administration and Compliance would deal with the project. We derive our authority from the Federal Power Act and we're mandated to balance all of the uses of the resource. Licenses are usually issued for a term of 30 to 50 years and we are in charge of about 2,500 licensed or exempted projects throughout the country.

So the purpose of scoping-- and please feel free to stop me if you have any questions-- the purpose of scoping tonight is to gather information for the relicensing of the Byllesby-Buck Project. Scoping is required by the National Environmental Policy Act. The original license was for a 30 year term and that was issued in 1994, so it's going to expire on February 29th, 2024. It's about a five year process, so that's why we're starting early.

And this particular project is going to be following the Integrated Licensing Process. And there are three important principles to consider what this process is meant to accomplish. Early identification and resolution of studies is the number one principle. The second is to integrate agency and tribal permitting-processing needs, NEPA, and any pre-filing consultation or federal or state permitting needs. We want to try to get everybody on the same schedule and the same page as soon as possible. And then finally, it establishes definitive time frames for completion of each step of the process.

Here is an overview of the timelines for the ILP. We divided up into pre-filing and post-filing. Under pre-filing which is where we're at right now in the process, it begins with the applicant filing their NOI and PAD; Notice of Intent and Pre-Application Document. And the next step is scoping, which is what we're doing here. We gather public comments and then we develop the study plan that's the next The applicant develops their study plan based on public comments and study requests. And that process all takes about a year. And then finally, the studies are conducted and the application is prepared and studies can take one to two years, depending on needs.

Then we jump to the post-filing process which begins when the applicant files their application with the

Commission. Then we review it for adequacy and make sure it meets all of the requirements of our regulations and any other regulations. Other regulations, etcetera. And then we also open it up to public comment again. We use those public comments for our environmental document. Usually, an environmental assessment. And then we issue the EA and open it up for public comment again.

And the final step in the process, which is what our end goal is, is a license order is issued by FERC. So, as you can see the whole process takes about five years. And in the scoping document, in Appendix B, there is a more detailed schedule, with specific dates and all of the many, many steps required for pre-filing. So, this is all just pre-filing in this Appendix B. So, the first half of that diagram.

All right. Any questions about that?

What we've done so far, the pre-filing steps we've done so far is the NOI and PAD was filed on January 7th. We issued our scoping document which, hopefully, you've all seen. And we're holding scoping meetings today. And your comments, either written or verbal, which we would get tonight, are due May 7th. So, that's a very important date to remember. And then these are some of the other dates. We will have meetings after the proposed study plan is filed so that the applicant can present their proposed study plan and gather comments on that. So, each step of the way there's lots of opportunity to comment. All right? And again, like I said, this is in Appendix B.

So, the point of the scoping is to identify any environmental issues or concerns; look at potential effects of the project or on resources such as aquatic or terrestrial and human environments. We need to figure out what kind of information is needed to analyze these potential effects for NEPA purposes. And we do that by looking at both existing information and any new information we can gather. So, existing information might be a resource report or survey data, new information could be comments from agencies or other stakeholders. All right?

Also involved, identifying and receiving input on resources that might be cumulatively affected. So, if you have a river system with multiple dams, you want to think about, for example, what's happening to the fish as they go through many projects. That would be considered a cumulative effect. We also look at reasonable alternatives to what the applicant has proposed. That's a very important part of the NEPA process. And we also look at resources that we don't really need to do detailed analysis for, so, if something's not really relevant to the project, then we can eliminate that from the EA. So, think about those things as we go through our presentation of each resource area.

These are the different resource areas that we typically focus on. Geology and Soil. Aquatics. Terrestrial. Threatened and endangered species. Rec and land use. Cultural resources and developmental resources.

And now I'm going to turn it over to Liz. I'm going to pull up the presentation for you. Liz?

MS. PARCELL: Good evening, everyone. I'm Liz Parcell. I'm with American Electric Power. The two leads on this project, and I have a couple of coworkers here that I'd like to introduce. We have Dino in the back. Dino was kind enough to give us a tour earlier of the facility. Frank Simms, who is with YES Energy. Not an active employee, but he's a former hydro manager. Jim Thrasher, special projects. Back here, the paparazzi -- and he takes really good pictures. Fred Colburn is from operations in Columbus. Henry is over the Buck- Byllesby Project. And I think that's about it.

We're going to go over a few topics today. The project facilities. The recreation facilities and operations. The Byllesby-Buck Project is licensed to Appalachian Power Company which is a unit of American Electric Power. Our current Federal Energy Regulatory license expires February 29th, 2024, and as noted earlier we filed the Notice of Intent and Pre-application Document with

FERC on January 7th of this year. We are using the integrated licensing process, and this is FERC project 2514. One thing that you should note is that in all your filings with the Federal Energy Regulatory Commission, you should add a subdocket number, which is 186. So, it's going to be P-2514-186.

Byllesby-Buck is unique in that it has two dams associated with the project. We call each of those dams a development. So, this two-development project is located on the Upper New River entirely within Carroll County, Virginia. The Byllesby development is located about 9 miles north of the City of Galax. And the Buck development is located 3 river miles downstream of Byllesby and 43.5 river miles upstream of the Claytor Dam. The Byllesby development operates in a run-of-river mode. It has an installed capacity of 21.6 megawatts and the primary features include a 528 foot long concrete dam with a height of 64 feet. Topped with four sections of nine foot high flashboards. Five sections of nine foot high inflatable Obermeyer crest gates. And six bays of 10 foot high Tainter gates. There's a 239 acre reservoir with 2,000 acre-feet of storage at normal maximum surface elevation, 2,079.2. The auxillary spillway includes six sections of nine foot high flashboards. And the powerhouse contains four vertical Francis turbine generator units.

Here's an overview. You can see the dam and spillway to the left and then the powerhouse and the dam and spillway below the powerhouse. The Buck development is also a run-of-river project. It has an authorized installed capacity of 8.5 megawatts.

The primary features include a 353-foot long concrete dam with a height of about 42 feet, 1,005 foot long spillway section with a height of 19 feet topped with 20 sections of flashboards with a height of 9 feet. Four sections of 9-feet high inflatable Obermeyer crest gates and six bays of 10 feet Tainter gates. There's a 66-acre reservoir with 661 acre feet storage capacity at normal maximum surface elevation of 2,003.4. The powerhouse contains three vertical Francis turbine generator units. Then there's also a 4,100 foot long bypass reach.

Here's an overview of the Buck facilities. The ripples below the powerhouse there is the bypassed reach. There are six attributes pertaining to recreation within the Buck-Byllesby Project, and four of those are maintained by the Virginia Department of Conservation and Recreation. There is a Byllesby Virginia Department of Conservation and Recreation boat launch. And that's within the Town of Galax, and it's on the opposite side of the majority of all the activities. And then we maintain - Appalachian Power Company maintains the Byllesby canoe portage and the Buck

Dam canoe portage. The other facilities are the New River Canoe Launch, and that's a picture of this area, right here. And the New River Trail picnic area which we saw being used today. And then the Buck Dam picnic area. And here is a picture of all those facilities on the New River. You can see the New River Trail borders the project.

With regards to operations, license article 401 requires the project to be operated in a run-of-river mode. And the Byllesby reservoir operates between 2,078.2 and 2,079.2, and the Buck-Byllesby reservoir between 2,002.4 and 2003.4. License article 403 requires a minimum release of 360 CFS or inflow, whichever is less, downstream of both powerhouses. The Buck development is approximately 3 miles downstream from the Byllesby development and therefore it's dependent upon flows from Byllesby.

The operation of the two developments is closely coordinated. Tainter gate operation and generation at both Byllesby and Buck are remotely operated from the AEP center located in Columbus, Ohio -- i.e., Fred. Operators are stationed at the control center 24 hours a day, 7 days a week. Plant personnel are also present at the Byllesby-Buck Project, four days a week, 10 hours a day to perform their duties.

Gate openings are planned and based on monitoring of the stream USGS gage at Galax and Byllesby-Buck forebay elevations. When the inflow exceeds the discharge capacity of the powerhouse, the Tainter gates are open to pass the excess flow. If inflows exceed the capacity of the Tainter gates, the inflatable Obermeyer crest gates are then operated, followed by manual tripping of the wooden flashboards. The Byllesby emergency spillway is operated after release of all inflatable crest gate and wooden flashboard sections. And this is typically at flows in excess of 46,690 CFS.

PARTICIPANT: Are the Obermeyers remotely controlled?

MR. AEC: No.

PARTICIPANT: No, they're not?

MR. AEC: We will have the capability of doing that, but they're currently not remotely controlled.

PARTICIPANT: When do you think you will have the capability to do that?

PARTICIPANT: We have installed the hardware to do that and we just haven't hooked it up to the remote operation in Columbus yet; so Fred, you may want to address that part of that.

MR. COLBURN: We're tentatively thinking, scheduled for May of this year.

PARTICIPANT: And they are able to be controlled individually?

MR. COLBURN: Correct.

PARTICIPANT: Of course, each section?

MR. COLBURN: Yes.

MS. PARCELL: So, when a spillway gate at the Buck development has been opened two feet or more, Appalachian is required to discharge flows through a two foot wide gate opening for at least three hours. And this is commonly referred to as a ramping rate, for the protection of fish resources. And then Appalachian is required to reduce the opening to one foot for at least an additional three hours, after which Appalachian may close the gate.

And that is it, and if you have any questions, I'm available; and Fred, and Jim Thrasher, also.

MS. SANGUNETT: Thank you.

All right. I'm going to switch back over.

So again, the preliminary list of resources that we're going to go over in more detail are also listed in the scoping document. You can follow along on page 13. Starts towards the middle of the page. So, as we go through each of these resource areas, think about any additional issues or concerns you might have and any identified issues that you might disagree with. All right. Thank you.

Anybody else need one? All right. And again, if you have questions or anything, feel free to stop me.

The first resource area is geology and soils, and we're just going to look at the effects of continued project operations and maintenance on shoreline erosion at each of the impoundments. Any comments or questions on geology and soils? All right.

Our next resource area is aquatic resources. There's a lot of these,so we have two slides to cover. The first one is going to be handled by Jody, there's a picture of him there, doing his favorite thing. So, we're going to be evaluating the effects of continued project operation and maintenance on water quality, dissolved oxygen, water temperature, both upstream and downstream of each development, including the bypass reach at Buck. We're going to look at the adequacy of the existing minimum flows, 360 CFS-- cubic feet per second-- and how that might impact aquatic resources including resident fish species downstream of each development. We'll also look at whether there is a need for a minimum flow beyond leakage at Buck bypassed reach. And finally, we'll be looking at the effects of continued project maintenance including periodic impoundment drawdowns to replace the flashboards and periodic dredging to reduce sediments on the impoundments on aquatic resources. And especially freshwater mussels and fish spawning habitat in the impoundments in the development.

We will also look at entrainment and impingement mortality of resident fish. And any effects on the Eastern Hellbender and the adequacy of the existing ramping rate at the bypass, at the Buck bypassed reach. All right.

Any other additional comments or concerns on this resource area?

PARTICIPANT: I have a comment.

MS. SANGUNETT: Okay. Please proceed.

PARTICIPANT: Two or three years ago we had an instance where I was checking a USGS gage, and I think the water level got down to like 250 or 300, I can't remember the exact CFS, but I sent John a message and he checked with AEP, and the problem was black -- had shorted out the equipment, and there was decreased water flow downstream. And I'm just wondering, is there any safeguard? I mean, I know something is going to malfunction from time-to-time but is there any safeguards to be sure we maintain river flow at an adequate level? It's a concern. It may not happen again, but it did happen once.

MS. PARCELL: As long as I've been working with American Electric Power, that was an anomaly. That was most unusual. And

PARTICIPANT: I check it about every day when I go kayaking. Not every day, but frequently, and I just happened to think, what happened here?

MS. PARCELL: Well, we appreciate it.

PARTICIPANT: I thought it was --

MS. PARCELL: I think our Operations does an excellent job of maintaining the elevations. And we get a lot of high flow events, and I do believe that the Obermeyer gate installation is going to help regulate those flows even more in the future. I believe with regards to the snake, we did call the pest control and have some increased services there. Is that right, Dino?

DINO: Yes, that's correct.

MS. SANGUNETT: Any other questions? Yes?

MR. SIMMS: Frank Simms, Young Energy Services. I know it's a concern that people should identify themselves -

MS. SANGUNETT: Yes.

MR. SIMMS: -- and who they're with.

MS. SANGUNETT: Yes.

MR. SIMMS: So would that be possible?

MS. SANGUNETT: Okay.

MS. NORMAN: I'm happy to volunteer because I spoke up earlier. I'm Janet Norman from the US Fish & Wildlife Service. And just as a, kind of overall caveat, I came to this night meeting to listen and see if there were any community members who want to provide their input; so I was not planning on speaking a whole bunch, and a majority of our comments are going to be contained within our written letters. But I appreciate the people being here to explain some of the operations.

MS. SANGUNETT: We missed you at our Fries scoping meeting.

MS. NORMAN: Yes.

MS. SANGUNETT: That was a weird circumstance.

MS. NORMAN: A morning prohibition.

MS. SANGUNETT: Doesn't happen very often.

All right. Any other comments on this resource area before we move on to the next? All right.

Terrestrial resources is what I'll be working on and we'll be looking at the effects of continued project operations including impoundment fluctuations on riparian and wetland habitat and associated wildlife. We'll also be looking at upland wildlife habitat especially Bald Eagles and what effects continued project operations and maintenance will have on those resources. Any comments or questions on terrestrial?

All right. Moving on.

T and E species. We have three identified at this project: the Indiana Bat, Northern Long-eared Bat, and Virginia Spirea. And I believe there was some spirea found. Is that right?

MR. MAGALSKI: Yes. This is Jon Magalski, AEP. We did a habitat assessment survey, I believe, in 2016 or

2017 and no Virginia Spirea was found.

MS. SANGUNETT: All right.

MR. MAGALSKI: There's an old record upstream of the Byllesby development, but it was never confirmed.

MS. SANGUNETT: Okay. So, we'll be looking at the effects of project operation and maintenance on those critters and plants. Any comments or questions on those? All right. Next resource area is Allyson's purview; recreation and land use. We'll be looking at the effects of project operations and maintenance on recreation, land use, and aesthetics. The adequacy of existing recreation facilities and public access to the projects to meet current and future recreation demands.

Any comments or question on rec and land use and aesthetics?

All right. Next one.

Also, Allyson's purview: cultural resources. We'll be looking at the project effects on anything currently listed or eligible for the National Register and also anything that has not been identified previously to be included in the National Register of Historic Places.

Any questions or comments? Yes?

PARTICIPANT: I just saw in today's filing about the letter from Harold Peterson of BIA, Bureau of Indian

Affairs. So, have you initiated any consultation?

MS. CONNER: This is Allyson Conner with FERC, and I saw it as well; and approximately a year ago we did a tribal consultation and there's a memo filed in our record of all the tribes and nations that we contacted, and the Monacan was one of the tribes that we contacted. So if it wasn't, then I would send a letter at this point, but it has been covered.

PARTICIPANT: All right.

MS. CONNER: Yes. And they are one of the more newly recognized tribes?

MS. SANGUNETT: Yes, it was like January of 2018 so, yes, getting them in the rotation takes a little -- but they were included. All right.

Any other questions or comments? For cultural resources, all right.

And finally, developmental resources. That's basically the economics of the project and any effects of any recommended environmental measures on the project's economics. And this is Lucy, another team member who didn't come with us for this trip, but she will be covering that area.

Any comments or questions on developmental resources? All right.

Not only are we going to be requesting comments, we're also going to be requesting studies. Any additional studies that you think need to be done at the project. So, when you submit a study request, you must follow these seven criteria. Each of these seven points needs to be covered in order for us to include your study in our analysis.

So, the first one is it's important to describe the goals and objectives. This is a slightly abbreviated version of the regs. And, by the way, you can see the full description in Appendix A of your scoping document. Number two is to explain the relevant resource management goals. And then you need to explain any relevant public interest considerations. Describe any existing information. Describe the nexus between project operations and effects. What's the connection between how the project operates and how it's affecting your resource. Explain the proposed study methodology, be specific about how you expect the study to be conducted. And describe the level of effort and costs.

Any questions on the study request criteria? All right. Very important.

Another important thing to keep in mind is May 7th. That is the deadline for when written comments and study requests are due. And again, we will be collecting all of your oral comments today for our court reporter, and that will go into the record as well and be considered in our NEPA document.

it's very important that you use the project number and name to identify, to be included in your written comments or study requests. And like Liz said, you need to use the full project number. 2514-186. Very important so it doesn't get lost in our database. And you can file electronically or by mail. The mailing address is below but we really prefer electronic filings. And, I think the next slide will be talking specifically about how to do that. All right. So, May 7th everybody.

How to stay informed. I mentioned that we had a brochure about your guide, called Your Guide to Electronic Information at FERC. All of the information in this slide is in this brochure. The easiest way to stay informed is to eSubscribe. So, you sign up to get email notifications of any filings or issuances that come through our eLibrary system. elibrary is where we store all of our public documents, under the specific docket number and that is the wrong number, please ignore that. Sorry about that. It's 2514. The website is www.ferc.gov to access that information.

Also, you can be added to our official mailing list to receive hardcopies of all project issuances. And we included a copy of our current mailing list in the scoping document, and let's see what page, page 26. So, check and see if you're on there and if you're not and you would like to be on there then you can send an email and request to be added or removed to eFiling@ferc.gov. And again, make sure you include the project number so they know exactly which one you want information about. All right. Now let's get a little bit

MS. PARCELL: I have a question about the mailing list.

MS. SANGUNETT: Yes.

MS. PARCELL: This is Liz Parcell. We submitted a revised mailing list, a service list. Is there any way that we can get this updated?

MS. SANGUNETT: So, service list and mailing lists are a little bit different; but if you want the mailing list changed at all that's the way to do it. And we can't really help you out with that; it has to go through that channel.

MS. PARCELL: Thank you.

MS. SANGUNETT: So, this is what our document and -- this is what our FERC Online. That's what our website looks like. [Indicating on slide] So, the first thing you need to do is register if you are not already registered. If you have already registered then you can just log in. Once you register then you can eSubscribe. That's listed up here. It's a little fuzzy. eSubscription is right there. You can also file your comments electronically through eComment, which is a text submission and it has a character limit and I cannot remember

PARTICIPANT: 6,000.

MS. SANGUNETT: 6,000. All right. If you have a lengthier comment or document you want to --

MS. NORMAN: Third one is eFiling.

MS. SANGUNETT: There you go. If you have, like, a PDF or a Word document that you want to submit you do that through eFiling. Let's see what else.

MS. NORMAN: Before we move completely off the mailing list. Janet Norman. So, I'm getting your official mailing but my name is not on here and another coworker name is on there.

MS. SANGUNETT: So, what I, so, there was a supplemental mailing list created just for the scoping document. So, anybody that was not in the official mailing list that was in a distribution list, they were added to that supplemental mailing list but it's just a one-time thing. So, if you want a permanent change you'll need to submit something to that email address.

MS. NORMAN: To this e

MS. SANGUNETT: eFiling@ferc.gov.

MS. NORMAN: eFiling@ferc.gov.

MS. SANGUNETT: Yes.

MS. NORMAN: Okay.

MS. SANGUNETT: I wanted to make sure everyone at least got the scoping document so that they can tell us if they wanted to get added. All right.

MS. NORMAN: And we can check our presence on the service list also?

MS. SANGUNETT: Yes. Actually that's a good thing to point out that, that you can pull up the service list and the mailing list for the project and you can search there on this same website as you see if you're on there. If you're not, you can request to be added.

MS. NORMAN: I've done it but I forget how to do it.

MS. SANGUNETT: All right.

MS. NORMAN: It's within --

MS. SANGUNETT: It's in here. It's under let's see. In eSubscription.

MS. NORMAN: An eSubscription?

MS. SANGUNETT: Ferc online consists of -- eService All right, eService is where you'll see the service list and the mailing list.

MS. NORMAN: Okay.

MS. SANGUNETT: Yes. So, eService is listed there. Wow, that's really blurry. All right.

Any questions on our electronic document

MS. NORMAN: Sure, as long as we're on it. So, submitting comprehensive plans

MS. SANGUNETT: Yes.

MS. NORMAN: - for consideration.

MS. CONNER: Yes. That's a different process. And I don't know what that is, actually. I know -- but how does it get filed?

MS. SANGUNETT: They are still getting filed. And then it's a different docket; you make sure that you label it as a comprehensive plan and it gets a ZZ docket, and that goes to Rachael McNamara, who is the one that oversees the whole the comprehensive list of comprehensive plans, and then it gets added by that way. So, by submitting it on the record then we have an actual copy of the plan.

MS. NORMAN: Right. Do you have a, do you have a

process cheat sheet on that that you could provide to make-

MS. CONNER: It's just like submitting any other comment. It really, like -

MS. SANGUNETT: We can send you that docket number that you need, is that what you're wondering about? I can email that to you.

MS. NORMAN: Right. So, just like a comment letter, I would go into eFiling and I would --

MS. SANGUNETT: Yes, but you have to use that special docket number.

MS. NORMAN: Sub-docket?

MS. CONNER: No. Well, you would still use the same project number, or you would submit it under that, but the ZZ comes from -- I think there's probably a drop down box that gives it. You don't have to know the ZZ part.

MS. NORMAN: Oh.

MS. CONNER: But you still use the same project number, 2514. And it just -

MS. SANGUNETT: Well, I guess -- it's state-wide, I guess.

MS. CONNER: Oh, right.

MS. SANGUNETT: Once you select the type of document that you're filing, which will be 'comprehensive plan,' then the ZZ shows up and that's all you need. Yes.

MS. NORMAN: And it's not a comprehensive plan but it is a journal article to this project in particular.

MS. SANGUNETT: You would file it just as you would your comments.

MS. NORMAN: Through the eFiling

MS. SANGUNETT: Yes.

MS. SANGUNETT: With the project number. We welcome any additional information like that.

Any other questions or comments on the FERC Online system? I think that's it. Yes.

MR. KITTRELL: Bill Kittrell with the Department of Game and Inland Fisheries. And I've just got a question about something in the scoping document, would this be an appropriate time to ask that question?

MS. SANGUNETT: Sure, absolutely. What page are you on?

MR. KITTRELL: I'm on page 10 and we'll probably reserve comments until the meeting tomorrow, but I just wanted to clarify a question on page 10 about the - under aquatic resources, it's the last bullet where it's talking about the ramping rate with the current FERC, under the current FERC license.

MS. SANGUNETT: The modified, the order modifying it?

MR. KITTRELL: Well, the question I have is when a spillway gate has been open two feet or more, water will continue to be released into the bypass reach, is that any of the Tainter gates, is that the gates that you're talking about when it says: any spillway gate has been opened two feet or more? Is that a Tainter gate that you're talking about there?

MR. COLBURN: Correct.

MR. KITTRELL: So, and it says water will be released into the bypassed reach through a two-foot gate opening. Is that the exact same gate that has been opened? Will be closed to a two-foot opening?

MR. COLBURN: That's only one gate has been opened.

MR. KITTRELL: Is there any rhyme or reason about which of those five or six gates open at any particular time? Is there one that opens first, for example, or is it just -

MR. COLBURN: Not necessarily.

MR. KITTRELL: - random.

MR. COLBURN: Yes.

MR. KITTRELL: All right.

MS. SANGUNETT: Can you identify yourself?

MR. COLBURN: Fred Colburn.

MR. KITTRELL: And so, that same Tainter gate will be open for three hours at the two-foot level no matter how much it's cracked to begin with, then it will be left open for another three hours at one foot?

MR. COLBURN: Right.

MR. KITTRELL: All right. I just wanted to clarify that. And one additional question. On the -

MS. NORMAN: Bill, before we move on from that topic, so, yes, I'd love to have that explained a little bit more. Janet Norman, Fish and Wildlife Service. Exactly, the selection of which gate is used has an effect on the downstream small channels, which is less prone to stranding versus other bedrock configurations and you want channel downstream to be looking - so if we don't know which gates are being used, how do we know how appropriate the water flow is going to effect stranding?

MS. SANGUNETT: I'm not -- don't look at me.

MR. CALLIHAN: It seems like more an operations question.

MS. NORMAN: It is an operation question. So if they're worried about the operations, how does that --

MR. CALLIHAN: If you're asking me now if AEP has a strategic way that they, which gates gets open to spill -

MS. NORMAN: Looking at the downstream --

MR. CALLIHAN: Yes.

MS. SANGUNETT: So there's -- is that the gates, essentially?

MR. CALLIHAN: Contrast -- right now they are in -- your innards are off to one side, looking down the river -- to the rise right.

MR. KITTRELL: This is Bill Kittrell again with the Department of Game and Inland Fisheries, and for example, if you have a thousand foot long spillway section, the Tainter gates may have five Tainter gates down on one end, for example, and their, whatever the width is on those gates, I can't remember. Ten feet, or I can't remember what the --

MR. COLBURN: 33.

MR. KITTRELL: 33. So, you know, that certainly has an impact on, like, where the water is filling downstream of that, in the bypass reach. But I did have one more question but I wanted to get through before I forget.

MS. SANGUNETT: Let me just clear up for anybody who is here confused like I was just now, but page 10 is about the proposed environmental measures from the applicant, and I put up this slide for the resource bullet on page 13, so, I was thinking, "Oh my gosh, we missed something." And we did not. Just to clarify what we're talking about. Make sure everyone is on the same page. Go ahead.

MR. KITTRELL: My question is, if Appalachian is presently evaluating the feasibility and benefits of operating with a one foot lower impoundment level during the winter months, December, January, February, March, obviously that's being done for storage issues during the winter and ice and so forth, but I do think that it needs to be in that consideration and that evaluation, there is winter usage of the impoundments, particularly; and I think it would be useful to sort of consider what that impact is having on the wetlands that are in the impoundments, because those wetlands can be used for water fowl hunting and that sort of thing; so if there is any impact having a one foot lower impoundment level during the winter on the wetlands as well within the project boundaries. It might be worth considering and when is that decision or that feasibility going to be reported in this process?

MS. SANGUNETT: You're talking about the proposed--

MR. KITTRELL: They're currently doing a feasibility and I was wondering when that was going to be reported?

MS. PARCELL: Wouldn't that be reported during the study plan review process?

MR. KITTRELL: If it's incorporated into one of the study plans, it would be.

MS. SANGUNETT: Just for reference, the proposed study, the applicant's proposed studies are also listed in the scoping document.

MR. MAGALSKI: This is Jon Magalski at AEP. We are proposing a bypass reach aquatic habitat flow assessment as well as an evaluation of the Obermeyer gates.

MR. CALLIHAN: Jody Callihan for FERC. That was related more to the validating how much spill was -- but not moreso than the fluctuations during the bypass evaluation.

I think what Bill was referring to was how the impoundment habitat was changed if the pond was one foot lower for water fowl.

MR. KITTRELL: This is Bill Kittrell again. That could be reported in the recreational part of that as well because it would affect, maybe, potentially, winter recreation usage of the impoundment. But there may be other study reports that it could be incorporated in. I was just curious about when that feasibility study would be, how it would be reported. Thank you.

MS. SANGUNETT: Okay. Let me make sure I'm following what you're talking about. Are you talking about the proposed method of dealing with icing? When you draw down for --

MR. KITTRELL: No.

MS. SANGUNETT: - in the winter? No. You're not referring to that.

MR. KITTRELL: I'm referring to page 9 under 3.2.1, project operations. It says Appalachian is presently evaluating the feasibility and benefits of operating this development within a one foot lower impoundment level.

MS. SANGUNETT: Yes, that's the point was the purpose of that

MR. KITTRELL: Because the purpose of it in the winter is primarily, as I understand it, managing ice -

MS. SANGUNETT: Yes.

MR. KITTRELL: -- and managing potential storm flows; you know, if you have a lower impoundment level, you've got more storage capacity.

MS. SANGUNETT: So, you're wondering when they're going to decide if that's something that they want go through with? Okay.

MR. KITTRELL: Yes.

MS. SANGUNETT: You guys are still evaluating that possibility, correct?

MS. PARCELL: Correct. And the, I guess, personally, I would see it as being done at the same time the other studies would be done.

MS. SANGUNETT: Okay.

MR. KITTRELL: Thank you.

MR. CALLIHAN: But that was not included as a proposed study yet. Right?

MR. MAGALSKI: This is Jon Magalski, AEP. Those comments are great to have to incorporate into the proposed studies.

MR. KITTRELL: And we would be glad to provide comments on that winter recreational use, too.

MR. CALLIHAN: Yes, that's exactly what we would be looking for to develop those studies.

MR. CALLIHAN: I guess it would be preferable to get the idea and feasibility of it ironed out before filing your license application. It would go along with, it would integrate better with your other studies that are being done as far as the time frame if the studies were done that way. If there was a proposal later in the game and we didn't have the information we needed to evaluate the potential change to the impoundment habitat, but became a more concrete proposal later.

MS. SANGUNETT: Any other comments or questions?

All right. Well, if we have nothing further we're going to adjourn this meeting and like I said, we have another one tomorrow at 9 o'clock, same place.

[Whereupon at 7:55 p.m., the verbal comment session concluded.]

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceeding before the FEDERAL ENERGY REGULATORY COMMISSION in the Matter of:

Name of Proceeding:

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Docket No.: No. 2514-186

Place: Galax, Virginia

Date: Wednesday, April 10, 2019

were held as herein appears, and that this is the original transcript thereof for the file of the Federal Energy Regulatory Commission, and is a full correct transcription of the proceedings.

Dan Hawkins

Official Reporter

ERRATA SHEET

DEPOSITION OF: BYLLESBY-BUCK HYDROELECTRIC PROJECT public scoping meeting

DATE OF DEPOSITION: 04-10-2019 PAGE 1 of 1 pages

Page	Line	Correction
3	22	natural gas and hydropower projects; non-federal
3	24	owned by the Corps, we don't regulate that.
3	25	The Commission is led by five commissioners that
15	6	PARTICIPANT=Tom Peddy
15	8	PARTICIPANT=Tom Peddy
15	12	AEP, and the problem was a black snake had shorted out the
15	22	PARTICIPANT=Tom Peddy
16	1	PARTICIPANT=Tom Peddy
17	7	A national day of mourning.
18	23	PARTICIPANT=Janet Norman
19	8	PARTICIPANT=Janet Norman
19	9	MS. SANGUNETT:
19	11	MS. CONNER:
19	14	MS. SANGUNETT:
23	3	PARTICIPANT=MS. CONNER
25	4	MS. SANGUNETT:
25	7	MS. CONNER: They are still getting efiled.
29	18-20	MR. CALLIHAN: The Tainter gates are located on the river-right side of the dam - looking downstream.

UNITED STATES OF AMERICA

FEDERAL ENERGY REGULATORY COMMISSION

OFFICE OF ENERGY PROJECTS

- - - - - - - - - - - - - - - - - - x

Appalachian Power Company : Project No. 2514-186

- - - - - - - - - - - - - - - - - - x Virginia

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Hampton Inn-Galax

205 Cranberry Road

Galax, Virginia 24333

Thursday, April 11, 2019

The public scoping meeting, pursuant to notice, convened at 9:00 a.m.

P R O C E E D I N G S

MS. SANGUNETT: All right. I think we can get started. In case you are lost, you're in the Byllesby-Buck scoping meeting for the Federal Energy Regulatory Commission, and my name is Brandi Sangunett. I'm the project coordinator and I'm working on terrestrial and threatened and endangered species. And I'll have my team members introduce themselves starting with Rachael Warden.

MS. WARDEN: Hi, everyone. I'm Rachael Warden. I'm the FERC attorney on the project.

MS. CONNER: I am Allyson Conner. I am doing recreation, land use, aesthetics and cultural resources for this project.

MR. CALLIHAN: Jody Callihan. I'm a fish biologist with FERC working on water quality and fisheries on this project.

MS. SANGUNETT: All right. Make sure everybody has signed in. Has anybody not signed in? I'll pass around the sign in sheet. All right. And that will help the court reporter who is going to be providing a transcript of the meeting today. It will be available in a couple of weeks. So, when you speak please clearly state your name and affiliation so that we will know who you are in the transcript.

Also, we have some handouts. Anybody need a copy of the scoping document? I have plenty of copies. Does anybody need one? Then we have the Guide for Electronic Information at FERC. And then we have our Hydropower Licensing Guide. All right.

The agenda for today's meeting is just to go over some information about who FERC is, why we're here for scoping, what the licensing process is about, and then we'll get an overview of the project from the applicant. And we'll go over the purpose of scoping. We'll discuss the specific resource issues that we are considering for our environmental assessment, and I'll tell you how to stay involved and informed, and how to submit your comments. And we'll go over some important dates for those comments, and then any questions about comments that you might have at the end.

FERC stands for the Federal Energy Regulatory Commission. It is an independent federal agency that regulates the interstate transmission of natural gas, oil, and electricity. FERC also regulates natural gas and hydropower projects, but only non-federal projects. So, for example, the Bonneville Dam, out west, is owned by the Corps and they regulate themselves. We are led by five commissioners that are appointed by the president and they are supported by 12 offices and a staff of about 1,500 employees.

And specifically, our team works out of the Office of Energy Projects in the Division of Hydropower Licensing. We also work very closely with the Division of Hydropower Administration and Compliance. They usually deal with the project after it's been licensed. And throughout the whole process, the Division of Dam Safety and Inspections is involved. And there, there's quite a few regional offices where the inspectors and engineers are usually located.

We derive our authority from the Federal Power Act, and we are directed to balance all of the uses of the resource. Licenses are usually issued for a term of 30 to 50 years and we are in charge of about 2,500 licensed or exempted projects throughout the country.

The purpose of scoping is to gather all available information for the relicensing of the Byllesby-Buck Project. It is required by NEPA, the National Environmental Policy Act. This particular project had a 30 year license which was issued in 1994, it expires on February 29th, 2024. The licensing process takes about five years so that's why we're getting an early start.

This particular project is going to be following the Integrated Licensing Process. This process has three founding principles, the first of which is early identification and resolution of studies. We also want to integrate all agency and tribal permitting processing needs including NEPA and the applicant's pre-filing consultation and federal and state permitting needs. We want everybody to get on the same page, on the same schedule, so we can proceed all together.

And the final principle is to establish time frames to complete the process steps so we can move along and everybody knows exactly when everything is required to be finished. This is what the full process looks like. The first, the top of the-- here it shows the pre-filing, just a general overview of that. And that begins when the applicant files their NOI and PAD. N O I stands for Notice of Intent and P A D is Pre-Application Document. The next step, which is what we are completing today is this scoping meeting and we collect comments from the public about the PAD and any additional study requests.

Then the applicant will develop a study plan and then that full process there takes about a year. And then once everybody agrees on the study plan, the applicant will conduct the studies and prepare the application, and that can take one to two years. Once the application files their license application with the Commission, that starts the post-filing process. Then FERC staff will review the application and make certain it meets all of the minimum requirements of our regs, our regulations. And we will seek further public comment on that.

Once we feel like we have all the information we need, we will begin our environmental assessment and once that gets issued we, again, ask for public comment. And the final step in the process is a license order from FERC. And for this particular project, a very detailed process plan is included in the scoping document, only for pre-filing, though. And that is in Appendix B.

Any questions on that before I move on? All right.

Some of the steps that we've already completed in this process are filing the NOI and PAD, the applicant did that on January 7th. FERC staff issued Scoping Document 1 which hopefully you have all seen. That was on March 8th. We're holding the scoping meetings now. And your comments on scoping are due May 7th. Very important date to remember. And then, next we'll have our proposed study plan be filed and if we need to we will issue, staff will issue scoping Document 2. There will be meetings to discuss the proposed study plan and you will be able to comment on those, and then the final determination for the study plan, by FERC, will be November 18th.

So, what is scoping? The purpose of scoping is to identify environmental issues or concerns. To look at any potential effects of the project on aquatic, terrestrial, and the human environment. The kinds of information we're looking for are existing information, such as resource reports or survey data. We also want any new information which can include comments from stakeholders or agencies.

It also involves determining what resources might be cumulatively affected. So, for example, if you have a river that has multiple dams on it and the fish is going through all of those dams, that would be a cumulative effect. All of the impacts from each of those dams. We also want to look for any reasonable alternatives to the applicant's proposal. That's a very important part of the NEPA process, is alternatives.

And finally we want to look at what resources we don't really need to spend a lot of time analyzing; they just aren't relevant to the project. So, think about these topics as we go through each resource area. We're going to go through each one in detail and discuss what we're thinking about putting in our environmental assessment. And we need your feedback on that.

These are the resource areas that we're going to focus on. Geology and soils, aquatics, terrestrial, T & E species, wetland use, aesthetics, cultural resources and developmental resources. And I think I'll turn it over to Liz so she can give you an overview of the project and its developments. There we go.

MS. PARCELL: Good morning, everyone. Welcome back. I'm Liz Parcell and with me is Jon Magalski. We are the co-leaders, managers of this relicensing process. And we have several APCO people here as well as HDR who are here to assist us. I'll go over, if you have any questions, feel free to jump in and ask. And certainly if I can't answer them the people who are with me can.

We're going to run through the civil works, the recreation facilities, and operations. The licensee for this project is Appalachian Power Company. We are a unit of American Electric Power. Our currently Federal Energy Regulatory Commission license expires February 29th, 2024. And as Brandi mentioned, we filed our Notice of Intent and pre-application document on January 7th, 2019. We are using the Integrated Licensing Process. And we are FERC project number 2514. And be sure when you make any filings whatsoever to add the sub-docket number which is dash 186.

This project has two developments and it's located on the Upper New River in Carroll County, Virginia. The Byllesby development is located a nine miles north of the City of Galax, and the Buck development is located approximately 3 river miles downstream of Byllesby. And 43.5 river miles upstream of Claytor Dam, which is another one of the Appalachian Power Company's projects.

The Byllesby development operates in a run-of-river mode. It has an installed capacity of 21.6 megawatts. And the primary features include a concrete dam that's 528 feet long and 64 feet high. It has four sections of nine foot high flashboards. Five sections of nine foot high inflatable Obermeyer crest gates, and six bays of 10 foot Tainter gates. It has a 239-acre reservoir with 2,000 acre-feet of storage at normal maximum surface elevation, 2,079.2. It also has an auxiliary spillway which includes six sections of nine foot high flashboards. The powerhouse contains four vertical Francis turbine generator units. Here's a picture.

The Buck development operates in a run-of-river mode as well. It has an installed capacity of 8.5 megawatts, and the primary features include a concrete dam that's 353 feet long and 42 feet high. It also has a 1,005 foot long spillway section with a height of 19 feet topped with 20 sections of flashboards with a height of nine feet. Four sections of nine feet high inflatable Obermeyer crest gates, and six bays of 10 feet high Tainter gates. It also has a 66 acre reservoir with 661-acre feet of storage capacity at normal maximum surface elevation, 2,003.4. And this powerhouse contains three vertical Francis turbine generator units. There's also a 4,100 foot long bypass reach.

Here's a map of that area. There's six recreational amenities associated with this project, two of which Appalachian Power Company owns and operates and four which the Virginia Department of Conservation and Recreation manages. VDCR manages the Byllesby boat launch and then Appalachian Power Company maintains both the Byllesby canoe portage and Buck Dam canoe portage. The other three Virginia Department of Conservation and Recreation facilities include the New River Canoe launch, the New River trail picnic area, and the Buck Dam picnic area, which if you were able to go on the site visit yesterday, we saw someone at the New River Trail picnic area.

Here is a map of all of those facilities. The New River Trail parallels the river.

MS. CONNER: This is Allyson Conner with FERC. I want to just ask one quick question. Are the two canoe portages are the only facilities that are on APCO owned land, correct? Is that?

MS. PARCELL: Ownership, I'll have to verify.

MS. CONNER: Okay.

MS. PARCELL: But that's my understanding.

MS. CONNER: All right.

MS. PARCELL: We may know more. Or even Frank.

MR. SIMMS: That's my understanding.

MS. CONNER: Okay. That's one thing that would be great -- especially for the license application.

MR. SIMMS: Yes, that's one thing I wasn't sure about.

MS. CONNER: Right. Just making that clarification for future --. Thank you.

MS. PARCELL: With regards to operations. License article 401 requires that the project be operated in a run-of-river mode and have a one foot pool that we operate within. At Byllesby that's 2,078.2 and 2079.2 and then at Buck it's 2002.4 and 2003.4. License article 403 requires a minimum release of 360 CFS or inflows, whichever is less, downstream of the powerhouses. And the Buck development is approximately three miles downstream from the Byllesby development, therefore it is dependent upon flows from Byllesby; and so the operation of the two developments is closely coordinated. Tainter gate operation generation at both developments are remotely controlled from an AEP center located in Columbus, Ohio. And the operators are stationed at the control center 24 hours a day, 7 days a week. We also have plant personnel present at the Byllesby project four days a week, ten hours a day to perform routine maintenance. Gate openings are planned and based on monitoring of upstream USGS gauges. The gauge at Galax and the Byllesby and Buck forebay elevations. When inflow to either project exceeds the discharge capacity of the powerhouse, the Tainter gates are open to pass the excess flow. When inflows exceed the capacity of the Tainter gates, the inflatable Obermeyer crest gates are then operated followed by a manual tripping of the wooden flashboards.

The Byllesby emergency spillway is operated after releasing all available inflatable crest gates and wooden flashboard sections. Typically it flows in excess of 46,690 CFS. When a spillway gate at Buck development has been opened two feet or more, Appalachian is required to discharge flows through a two foot wide gate opening for at least three hours. And then Appalachian is required to reduce the opening to one foot for at least an additional three hours, after which Appalachian must close the gate.

If you have any questions, feel free to give me a call or email me, and I'll work closely with you. Thank you.

MS. SANGUNETT: So, if you want to follow along, we'll be going through section 4.2 of the scoping document, and that starts on page 13. I will go specifically through each resource area and what FERC staff has identified as issues to be examine, in an assessment with the NEPA document. So while we go through this list please keep in mind any additional issues or concerns and any identified issues that you might disagree with, and why.

MS. NORMAN: Brandi, would you like us to -- this is Janet Norman, Fish and Wildlife Service. U.S. Fish and Wildlife Service. Would you like us to interject while you are on that -

MS. SANGUNETT: Absolutely. Yes.

MS. NORMAN: - that little segment of the thing?

MS. SANGUNETT: Feel free to jump in any time and, yes, especially after I finish going through the bullets, that's a fine time to ask your --

MS. NORMAN: Do you want to go through all the bullets or each like, aquatic resources, you go through the bullets and then we can talk about it?

MS. SANGUNETT: Whatever you would like to do. However it helps you remember to ask your questions.

Yes. I'm very flexible about that. All right. So, let's start with geology and soils. FERC staff has identified that we would like to look at the effects of continued project operation and maintenance on shoreline erosion at the impoundments at each development.

MR. COPELAND: This is John Copeland at Department of Game and Inland Fisheries in Virginia. One question that we have is if you're going to study shoreline erosion, why are you not looking at sedimentation as well? We think sedimentation in these reservoirs in this particular region of the New River is important to examine.

MS. SANGUNETT: Okay.

MS. NORMAN: And U.S. Fish and Wildlife would agree with that comment, priority.

MS. SANGUNETT: All right.

MS. NORMAN: U.S. Fish and Wildlife Service also agrees there is a need for the shoreline stability assessment. MS. SANGUNETT: Oh, yes. We will also talk about additional study requests; and I'll just point out, too, that the applicant has proposed some studies which is one that Janet mentioned. And those are on page 16, and the shoreline stability assessment is one of the proposed studies that the applicant proposed. And it gives a bit of a description on that paper, as well.

MR. KITTRELL: This is Bill Kittrell with the Department of Game and Inland Fisheries. That brings up another point about the proposed study. In looking at the project boundary there is a gap between Byllesby and Buck in the boundary. And I think, I know our department is very concerned that that gap is there because I think there's project effects, including sedimentation and deposition of sediment between the projects. It's occurring but certainly maybe impacted by the project; I think that project boundary should include that middle section.

MS. SANGUNETT: I'm trying to pull that map up.

MS. NORMAN: U.S. Fish and Wildlife Service would agree with that project boundary extension to include those.

MS. SANGUNETT: So, you're specifically talking about this section right here?

MR. KITTRELL: Yes. You know, and on our field trip that we took you could see point, a large point bar; there's lots of sediments deposition, and so forth, in that area but there's certainly -- that would also impacts aquatic resources, and when you get to the recreation study I think there's also potential, there's a nexus there between the project and that area as far as recreation as well, so, I think our department certainly is going to make formal comments to recommend that that be included in part in the relicensing.

MS. SANGUNETT: All right. Liz, did you want to address why you guys decided not to include that in the project boundary?

MS. PARCELL: I would have to research it.

MS. SANGUNETT: All right.

MS. EWING: Hi, I'm Sharon Ewing. I'm with the Virginia Department of Conservation and Recreation with state parks, and we would also like to see that area included in the study.

MS. SANGUNETT: All right.

MR. GRIST: I'm Joseph Grist with the Department of Environmental Quality of Virginia. Same.

MR. HILL: I'm Rex Hill with the Carroll County Board of Supervisors. Does AEP own the lands like they do above dams that's got so much property above them? Do you own that?

MS. SANGUNETT: Yes. I'm not sure if - this might be the existing project boundary. What's currently licensed. So, it may not have been, like, an active decision by AEP to leave that out. We would have to research how the project boundary was chosen in the last license.

MR. KITTRELL: Bill Kittrell again, I think the fact that many times in the document, the PAD, and the scoping document, says the projects are run in sync. They're very in tune with one another, and because they do operate so closely together that, you know, I think there's a certainly a linkage there between the two projects, that small section between the projects. I think there's justification to include it in the project numbers.

MS. SANGUNETT: Yes.

MR. KITTRELL: Even without ownership of the land, there are certainly impacts to the river, the corridor, the riparian corridor, to --

MS. SANGUNETT: Ownership is not a requirement for inclusion in the project boundaries.

MR. COPELAND: John Copeland, Virginia Department of Game and Inland Fisheries. We need to know the difference between the project area and the area of project influence. So, if anyone from FERC can speak to that, that would be helpful.

MS. SANGUNETT: We struggle with that as well. But typically the project boundary provides a good guide for both of those. Not always, though.

Anybody else want to have a, add to that?

MR. CALLIHAN: I can speak to that a little bit. I mean, Jody Callihan with FERC. Technically the project boundary includes the project works that are necessary to operate the project. Then in our environmental assessment, our assessment of effects is not confined to the project boundary. It is and often extends beyond those red boundaries you see in that map. The project boundary. So, it in no way confines our analysis of project effects, which this, only includes the facilities and the waters that are necessary to operate the project. It's the idea of the project.

MR. COPELAND: So, this is John Copeland again. You know, the point you really have to look at is, ecologically where do you go to look at downstream project influence. Where do you go upstream to locate a reference point of what the river should look like without the influence of these dams. So, those are the kind of things that, we need to be thinking around.

MS. SANGUNETT: Yes. It's really important to identify that before the studies are conducted so everyone can agree on studies and be sure that everything was looked at.

Any more comments on geology and soils?

Moving on to aquatic resources. We have about six, seven different areas that we've identified that we want to tailor more closely in our Environmental Assessment. One is water quality including dissolved oxygen and water temperature, both upstream and downstream of each development including the Buck bypass reach. We want to look at the adequacy of existing minimum flows for each development. And currently that's 360 CFS. CFS being cubic feet per second.

MS. NORMAN: Or less.

MS. SANGUNETT: I'm sorry?

MS. NORMAN: Or inflow, right? The adequacy - so maybe that should be restated, if you're going to revise the scope. It's not clear for other -

MS. SANGUNETT: Good point.

MS. NORMAN: - other viewers. 360 CFS or less depending on inflow.

MS. SANGUNETT: All right. Good point. Sometimes I abbreviate the bullet; that does not look like that's the case.

MS. NORMAN: And saying where that current minimum flow is for. That it's only for, below, currently below - which section are you referring to? If it's only currently below the powerhouse, right? And it's not in the bypassed reach, or is this referring to the bypassed reach. We don't just say downstream of the development.

PARTICIPANT: Well, the license currently -- I'm sorry, go ahead. That is downstream of the --

MS. NORMAN: Of the powerhouse, right. But the summary doesn't indicate that and so someone who is getting a quick perusal of this, they could say, oh, they wouldn't know the distinction between the powerhouse and the bypassed reach. So, we should clarify.

MS. SANGUNETT: I should point out too, Jody is in charge of this resource area.

We will move on to the next one. We're going to look at whether there's a need for a minimum flow in the Buck bypass reach. We'll also look at the effects of continued project maintenance which includes periodic draw downs to replace flashboards and periodic dredgings of the sediments from the impoundment. We'll look at that -- especially fresh water mussels and spawning habitats of the fish. We will look at the effects of project operations on entrainment and impingement mortality of resident fish. Species of special concern, we'll look at those, impact on them, such as the Eastern Hellbender. And finally we will look at the existing ramping rate to prevent fish jamming.

All right. Again, I want to point out there are several proposed studies listed on page 16 and 17 that relate to aquatic resources. So, there's a water quality study proposed. A bypass reach aquatic habit and flow assessment study. Inflatable Obermeyer crest gate operational effectiveness evaluation. Those all relate to aquatic resources.

MR. COPELAND: This is John Copeland. Game and Inland Fisheries. Do you want us to talk about existing bullet points or do you want us to also talk about the studies?

MS. SANGUNETT: Aquatic resources.

MR. COPELAND: Okay, I'll start with this, and that is, I saw maximum depth for the reservoirs in the PAD but I didn't see average depth, so I wondered when was the last mapping of these reservoirs and what was that data based on?

MS. SANGUNETT: Mapping of the site?

MR. COPELAND: Yes.

MS. SANGUNETT: Okay.

MR. KITTRELL: Bill Kittrell with the Game Department. On the bypass reach, aquatic habitat and flow assessment, the language in there is talking about a desktop survey that really it's just assessing the current status it appears at the habitat, there's no biological impact, the bypass reach as it's really proposed to be done. I'm just wondering if that's something that was considered or something that should be evaluated to some degree.

MR. MAGALSKI: This is Jon Magalski. I welcome your comments, I'm delighted to look at it. I think we took the approach of, we can take a stab at it now or wait until we get your comments so we can start building that study plan.

MS. NORMAN: Janet Norman. U.S. Fish and Wildlife Service. I would agree that, that we definitely need to sit down and build that study plan and have an understanding of minimum flow options, because a lot of times we don't know some of the operational constraints that you have that would help us tailor a better situation.

I would also say, this is my first project where I started in at the PAD, and other projects I've been thrown in at the end result, and it hasn't been, it's not effective for us to be, you know, just throwing comment letters back and forth to each other where something is ruled out on a technicality or it wasn't mentioned earlier, I would much prefer if we could - this is especially at minimum flow from other projects. If we could work together early on to determine what operationally can be done, what ecologically needs to be done, in advanced instead of just trading letters back and forth.

MS. SANGUNETT: Sounds great. That's definitely FERC's goal.

MR. COPELAND: John Copeland. Game and Inland Fisheries. That brings up a question regarding how, procedures here; and that is if we're going to go through comment periods, we're going to have proposed study plans to go through. A meeting around proposed study plans?

MS. SANGUNETT: Yes.

MR. COPELAND: Then there will be an opportunity to comment?

MS. SANGUNETT: Yes.

MR. COPELAND: So my question would be whether there is going to be an collaborative process in those study plan meetings.

MS. SANGUNETT: Yes, there will.

MR. COPELAND: Can we accomplish that in one day as proposed in the document?

MS. SANGUNETT: I doubt that, and we certainly are not restricting anybody to one day. So we want you to have lots of conversations.

MS. CONNER: This is Allyson Conner with FERC. Oftentimes working groups can be formed, and so there can be more in-person groups or conference calls to accomplish this kind of thing for something that's a little bit more difficult to deal with that might not be solved in one day. So, that's definitely part of the process, again. AEP would take the lead on creating those, and then the agencies can also, you know, do as they do, in getting together; but the working group is really the most effective way especially if you feel like within that one study plan meeting day, you know, you didn't quite get where you needed to go.

MR. COPELAND: Right. This is John Copeland again. The question with regard to the ramping grates in the bypass reach, has there ever been any evaluation on what kind of flows those create in CFS, or do we have any idea?

MR. COLBURN: This is Fred Colburn, AEP. So, we have telemetry and when we open a gate, we know how many feet it's open and we have tables that correspond to CFS.

MR. COPELAND: All right.

MR. COLBURN: And it's either, you know, with the 360 minimum flow, it's either, we look at it as the project that --[noise interference] So, downstream of the project we're always past the minimum flow.

MR. COPELAND: So, can you restate that? Because I couldn't hear all of it, Fred, I'm sorry.

MR. COLBURN: When we open a Tainter gate, we have, we know how much we open up, it's one foot, 1.25 feet. We get feedback and we have tables that's built into our system so we know how much CFS goes with that gate opening.

MR. COPELAND: And so, this is John Copeland again -- the question would be: are you looking at total flow downstream of the project, then? In the turbine outlet as well as that?

MR. COLBURN: Yes.

MR. COPELAND: Okay. Relative to your minimum flow requirement?

MR. COLBURN: Correct. It's a combination through, you pass all the flows to the hydro plant. If the plant fails, it trips offline, we immediately open up the Tainter gates to meet that 360 CFS minimum flow.

MR. COPELAND: So, you're just operating those in concert with each other? John Copeland again, I guess the follow up question would be, how do we find out what those flow rates look like at different Tainter gates, Tainter gate openings? Because I didn't see any of that in the PAD.

MS. SANGUNETT: If you would like to see the table, it says, what does that coordinate with this --

MR. COPELAND: Yes. That information would be really helpful.

MR. COLBURN: And we have that information.

MR. COPELAND: All right.

MS. CONNER: Yes. So, if you want to provide that to FERC, we can add it to our eLibrary system and then it would be available to everybody. That would be one way to disseminate that information.

MR. CALLIHAN: Jody Callihan with FERC. So, for example, for the ramping rate, I guess it would be useful to know within that range from 0 to 2 feet open what the CFS release into the bypass reach would be. And then if you had some kind of bypass reach study, it could then link that flow to what does the bypass reach look like in terms of depth, velocity, coverage. How much is flooded, things like that as well.

MR. COPELAND: Yes.

MR. KITTRELL: This is Bill Kittrell with the Game Department. Also, I think, because of the complexity of that bypass channel, particularly below Buck, you almost would, I would think, would need to have some type of a demonstration flow at each, at, you know, various levels of Tainter gate openings to see what impact, because it's just such a complex channel and there's so -- best way I can say it, I guess -- you really need to visualize what's happening in that downstream channel. Because certainly a thousand

and five foot long spillway and the Tainter gates, you know, five to six Tainter gates, 33 feet wide, there's a lot of bypass channel that may be watered during certain periods obviously, and so it would be nice to see what kind of escape routes may be formed during different flows at different levels. Just something that we'll probably recommend when the study is being developed.

MS. NORMAN: U.S. Fish and Wildlife. We definitely agree with that, that seeing where the water is flowing over that complex downstream is important.

MR. CALLIHAN: Jody Callihan with FERC. In thinking about the bypassed reach and studies, I think we need to think about the overall goal, what we want that bypassed reach to look like and how we want it to function. Because right now, except during the spring it's largely the water. And whether stranding is the main issue, or we want that to be whether the agencies want that to be some kind of permanent habitat for aquatic species, I think that's important to keep in mind.

MS. NORMAN: U.S. Fish and Wildlife Service. And quantifying the loss of that existing habitat is important to us. If you can make sure that is in the document and how that can be mitigated and replaced in the balancing of power, of ecological function.

MS. SANGUNETT: Okay. Any other aquatics

comments or questions?

MS. NORMAN: Probably.

MS. SANGUNETT: All right.

MS. NORMAN: Let me look through 10 pages of notes here. All right.

So, Janet Norman, U.S. Fish and Wildlife, talking about the bypass reaches, insufficient water, inadequate pool connectivity as Bill Kittrell has mentioned. The reaches are sediment starved, lacking suitable spawning habitat, or habitat for Eastern Hellbender or endemic Candy Darter within the bypass reach, if that is important to us.

MS. SANGUNETT: Is that [] that you're referring to?

MS. NORMAN: This is our own -- we have been informed by Don's letter informed by the Candy Darter recovery outline, as formed by DGIF's surveys. This is just my own notes of what not to forget.

MS. SANGUNETT: Okay.

MS. CONNER: I just wanted to refer everyone to that assessment you were looking at.

MS. NORMAN: Yes. Right, so Don Orth of Virginia Tech, emeritus professor, it's a very important consideration that he had laid out, that we will refer to.

MR. CALLIHAN: Jody Callihan with FERC. Do we have, it would be useful if there's some new information on

Candy Darter distribution and plans, recovery plans are in any kind of comprehensive plan? If those could be filed on the record that could be useful for us to have.

MS. SANGUNETT: Sure.

MR. CALLIHAN: Sometimes we don't have access to all aquatic struggles at FERC.

MS. SANGUNETT: All right.

MR. KITTRELL: This is Bill Kittrell. There is numerous ongoing projects that we're funding right now through state wildlife grants and other sources of funding that are ongoing. So, that may be useful information.

MS. SANGUNETT: Yes. Absolutely.

MR. KITTRELL: Since the, obviously, the New is, you know, is the only watershed where it does occur in the Upper New, in Virginia.

MR. COPELAND: This is John Copeland again. Game and Inland Fisheries. Regarding the water quality studies. I think it's important that we look at these projects in the context of their temperature influences on the overall temperature regime of the New River, and because there's a number of endemic cold water species that inhabit the New River that could be displaced by temperature effects alone. And then in addition, I think, the water quality study as proposed is inadequate in terms of not examining things like turbidity or chlorophyll A levels.

MS. SANGUNETT: All right. Just to clarify, you're saying that you feel that water quality is a cumulatively affected resource?

MR. COPELAND: Yes.

MS. NORMAN: Yes. We would agree that there's a whole number of cumulatively affected resources that are not included in -

MS. SANGUNETT: That haven't been identified by FERC staff?

MS. NORMAN: That haven't been identified by FERC staff as cumulative resources. To also beyond the water quality -- Hellbender, crayfish, and dragonfly, odinate habitat production and transport of organic materials, increased water temperature and reduced dissolved oxygen as John has said. So, a whole number that we will be listing.

MS. SANGUNETT: So, water quality in general, and then aquatic habitat is another cumulatively affected resource?

MS. NORMAN: Yes.

MS. SANGUNETT: All right.

MR. CALLIHAN: Jody Callihan with FERC. Janet, can you explain, so, Byllesby-Buck is one project. I guess, can you explain why you think there are cumulative effects on other resources and what other activities in combination with the project may lead to those?

MS. NORMAN: On the downstream, upstream functioning of the New River is what is the cumulative effect that we see of this, widespread impacts of the project.

MR. CALLIHAN: I just didn't know what other effects other than the project that you were thinking about that could add to the project itself.

MS. NORMAN: Okay. I also wanted to mention in the aquatic resource section -- and John and Bill from DGIF had mentioned somewhat that the accumulation of fine sediments in the impoundment that smothers benthic habitat and created unsuitable conditions for most fresh water mussels and an accumulation of PCB's in the sediments.

MR. KITTRELL: This is Bill Kittrell. I know there was, at the previous relicensing there was an aquatic resource survey, a general survey that was done throughout, I think, upstream, maybe between, and downstream. There's no proposal, to my knowledge, I'll go back and revisit that and actually do another comprehensive resource survey, and I think it would be useful since you had that baseline data from the relicensing done before and with, you know, all the effects of the project of the last 30 years, go back and look at that, you know, do a comprehensive aquatic resource survey which would include fish and crayfish, hellbenders, et cetera, throughout -- mollusk, throughout the area of this project influence. I think it would be useful to have that information to see. I know there was some work done in '97. Was that done, I think, as a result of maybe dredging, some dredging work?

MR. CALLIHAN: The '97 was the ramping rate.

MR. KITTRELL: Ramping rates.

MR. CALLIHAN: The sample would be Buck bypass reach following three different spill events in the spring, I believe like, March through May of '97. Like, as soon as the snow was over, they went out and electroshocked in the Buck bypass reach, three different occasions.

MR. KITTRELL: That would also help inform if we're doing a study on the bypass reach, knowing what's there and, you know, a comprehensive list of what's being impacted or what maybe has been impacted in the past by those operations, I think it would be useful to have that.

MS. NORMAN: Fish and Wildlife Service would agree with that. Using a variety of methods across all seasons or at least during the spring and fall.

MS. SANGUNETT: Using what methods, I'm sorry?

MS. NORMAN: A variety.

MS. SANGUNETT: A variety.

MS. NORMAN: Across all seasons, or at the very minimum, spring and fall.

MS. SANGUNETT: And by methods, you mean electrofishing, or?

MS. NORMAN: Yes. Depending on access ability --

MS. SANGUNETT: Right, because it's kind of --

MS. NORMAN: -- difficult to use a boat where you can't get a boat in there. So that, those fish surveys and multi surveys are going to be useful for informing, are going to be needed for informing the entrainment study and other things.

MS. SANGUNETT: I just want to, this is Brandi with FERC. Obviously you know my voice by now. I just wanted to revisit the sediment issue. Obviously this is having an effect on aquatic habitat and wildlife quality. But the New River is known to have a heavy sediment load in general, so what are your thoughts about isolating, sort of, background noise, from specific project's effects on adding to sediment issues? It seems as though they are mostly just dealing with the sedimentation that comes their way, from dredging. I'd like to have a bit of a discussion about that and see what you guys think about what's going on in the river in terms of sedimentation.

MR. COPELAND: This is John Copeland. I'm not sure I can address that question adequately, but I can say that there's a great deal of sediment liberation by operations that impacts aquatic habitat downstream. It can be observed on a regular basis as a result of these project operations.

MS. SANGUNETT: So, it looks like sedimentation might need to be addressed as a cumulative effect. As cumulatively affected. Soils and geology might need to be cumulatively, addressed as a cumulatively affected resource. I'm not sure how you say that.

MS. NORMAN: We would agree.

MS. SANGUNETT: Does everyone agree with that?

MS. NORMAN: Yes.

MR. COPELAND: So, this is John Copeland.

MS. SANGUNETT: So that's pretty challenging. Sorry. To isolate project effects from what's already going on with the river.

MR. CALLIHAN: Jody from FERC. In relation to that, started thinking because it's run-of-river that they're just simply passing whatever sediment is in the river downstream.

MS. SANGUNETT: But it can accumulate behind the dredge periodically, but yes. Something to think about. It is a challenging issue.

MR. CALLIHAN: I guess the sedimentation behind the dam leads to the installation of the dam itself a hundred years ago.

MS. SANGUNETT: Right. Exactly. So, isolating the baseline from the effects of the project's operations. It's really important.

MR. MAGALSKI: Jon Magalski with AEP. Just to clarify on the dredging. We don't perform maintenance dredging. We've only performed dredging when there's been an issue in the intake. Once in '97. I don't know the background of why that dredging was done.

MS. SANGUNETT: Typically an emergency response?

MR. MAGALSKI: In '97? I'm not sure of the history of the '97 dredge, but the 2014 dredging was done because of a large deposit of sand in the intake because of extremely high water. So, just to clarify, we don't have a routine maintenance dredging program.

MR. THRASHER: Jim Thrasher for AEP. The '97 dredging was done because the intake structure of Byllesby had filled up because of lack of a proper trash raking system. So, we hydraulically dredged 20,000 cubic yards of material out of in front and pumped it upstream to create the current wetlands that are above Byllesby. It was, that's what it was for, and that was the only two dredging operations that occurred there.

MS. SANGUNETT: All right. Maybe you could clarify a little bit; on our site visit, we saw that the trash racks were used for sediment control also, is that dealing with sediment accumulation? Can someone from

MR. THRASHER: The trash rake?

MS. SANGUNETT: Yes. The Yes. Can we maybe talk about that a little bit more so we can get some clarification on that for everybody, how that works?

MR. THRASHER: Jim Thrasher, AEP. Most trash gates will operate directly in front of the intake screens. Go straight to the bottom, bring the material up and deal with it. Either put it in the dumpster or pass it downstream. On this particular project, that was creating only a ditch and it was so much sediment coming downstream to us, being fed to us, that it was sedimenting in and we were having water cascade into the ditch, and the effect on production was negative, very negative.

MS. SANGUNETT: And this is in the Byllesby Project?

MR. THRASHER: Byllesby Project. So, we researched the market of trash raking systems and found one that's called a drag rake which goes out into the forebay any distance you want, drops to the bottom, to the forebay bed, drags along that, and then comes up to the intake screen. So yes, it's getting debris and whatever else is mixed with the debris and it's bringing it in to the trash trough. If it's too, if it's small enough to go through the intake screens, which are about, it's in the PAD, probably two-and-a-half to three inch center-to-center opening. Then it will pass through the units.

MS. SANGUNETT: So, you're able to pass some sediment downstream then, in that manner?

MR. THRASHER: Yes.

MS. SANGUNETT: Okay. And you do not have a similar system at Buck?

MR. THRASHER: We do but we don't have a sediment problem at Buck. It's just, it's also a great trash raking system, so to match the systems to both plants, that's what we elected to do.

MS. SANGUNETT: All right. And so by using the system you're able to deal with the sediment on a regular basis rather than having to do dredging.

MR. THRASHER: Sediment in equals sediment out; that's what we're trying to do.

MS. SANGUNETT: All right.

MS. NORMAN: Except for the larger sized materials. Is that correct?

MR. THRASHER: That's correct.

MS. NORMAN: So, anything -

MR. THRASHER: So, anything that will not pass through the intake bars

MS. NORMAN: So, anything larger than two-and-a-half inches -

MR. THRASHER: Or whatever that spacing is, I don't remember the spacing.

MS. SANGUNETT: That would go through the sluice gate, right?

MR. THRASHER: That would get into the sluice way and then be passed on downstream as you saw yesterday.

MS. SANGUNETT: So, everything is going downstream.

MR. THRASHER: Yes. Except manmade material we try to extract.

MS. SANGUNETT: All right.

MR. THRASHER: Tires. Particularly tires.

MS. SANGUNETT: Plastic bottles.

PARTICIPANT: Brandi, are you, I have a question.

MS. SANGUNETT: Sure.

PARTICIPANT: I didn't want to get off of geology and soils until we were square.

MS. SANGUNETT: All right. I'm good.

MR. KITTRELL: I will say, this is Bill Kittrell, in terms of sedimentation, although dredging has only been done a couple of times, that was done during the - those two times were done during the 30 year license, and look at the wetlands that was developed as a result of that. So, operationally, handling sediment is going to be an ongoing problem.

MS. SANGUNETT: Yes.

MR. KITTRELL: Whether they are receiving it from upstream, or, you know, which I would gather most of it is coming from upstream. Operationally, they got to handle the sediments and what to do with it in creation of wetlands or passing it, or hauling it offsite. One of those options is about the only thing they can do with it, so, you know, it does need to be considered, I think, in the study.

MS. SANGUNETT: So, you know their current method of their trash rake system is not fully addressing the problem, or?

MR. KITTRELL: Well, it's currently addressing the problem but it didn't address, I mean, you know, I don't think that - of course, that was not implemented until after -

PARTICIPANT: After the hydraulic --

MR. KITTRELL: -- 2014, right?

MS. SANGUNETT: All right.

PARTICIPANT: In '97 when we did the hydraulic dredge we also installed the new trash -- well, the trash raking you currently see. That was new in '97.

MS. SANGUNETT: Good to know. So, that was installed in what year, again?

PARTICIPANT: '97.

MS. SANGUNETT: '97.

MR. KITTRELL: But they still had to do a hydraulic dredging project in '14.

MS. SANGUNETT: Right.

MR. KITTRELL: That was, the one in '14, the trash was a result of the flood of '13. We lost the plant, the trip -- I forgot, I think it was a 45,000 CFS flood and we, it flooded the powerhouse, so all that sediment went into our turbine pits and it encapsulated all the moving equipment. We couldn't, the trash rake would do no good. We couldn't, we had no movement of water, so we couldn't pass water through the turbines; so we had to extract that material, and we went and Jon could comment on that, we put it into bags that would leech out the liquid portion, capture the solid portion then we disposed of the solid portion on our own land. But it was a, you know, a perfect storm, I guess. Will that reoccur? We don't know.

MS. SANGUNETT: -- in a 50 year period.

MS. NORMAN: In a 50 year period it's likely that that will reoccur.

MS. SANGUNETT: And this is part of a wetland mitigation project as well. When you use that dredging material to create a -

PARTICIPANT: We did not create a wetlands.

MS. SANGUNETT: Not for that one.

MR. CALLIHAN: That was hauled. That was hauled offsite.

PARTICIPANT: Well, higher elevation on our own property near the site. Within a mile.

MS. SANGUNETT: All right.

MR. KITTRELL: And I believe the '97, Bill Kittrell, again. I believe the '97 project was not necessarily mitigation, it was disposal, just a disposal, it wasn't something you were required to do.

PARTICIPANT: No. We did it. We asked permission. MR. KITTRELL: That was allowed to be done with the spoil from the dredging project.

PARTICIPANT: It was a collaborative effort.

MR. KITTRELL: So, you know, to call it mitigation is probably not exactly correct.

MS. SANGUNETT: So, it's not technically the wetland mitigation program.

MR. KITTRELL: Right. Right.

MS. SANGUNETT: I got you. All right. And you worked with Virginia DGIF on that? Or DEC or who was involved in that?

PARTICIPANT: One other bit of information, the reservoir was last surveyed in '89.

MS. SANGUNETT: All right.

PARTICIPANT: That was the last.

We've done some others just to find out so we can get barges in and out of there. We didn't do the entire forebay. We only did directly in front of the spillway gates for the Obermeyer work. We wanted to know the depth so we could determine what size footprint a barge can we put on the pond?

MS. SANGUNETT: So, that information would be really useful to everyone. Any studies that you've done, surveys or any studies that you did on the feasibility of the trash rake system. If you have anything like that that you can share with everyone that would probably be very useful. So, if you could submit that onto eLibrary, as well, so then everyone will have that information.

MR. CALLIHAN: Jody Callihan with FERC. I have a question. So, for dredging, you would have to go through a DEQ and a Corps permit to conduct that dredging; so presumably any materials would be tested and whatever you removed would be tested for PCB's, let's say?

MR. MAGALSKI: Yes, this is Jon Magalski, again. It would all be permitted through the Corps and/or DEQ, and in the 2014 dredging we did test the materials --

MR. CALLIHAN: So, there would be a mechanism in place to test for any kind of toxicity in the materials that you removed and potentially modified?

MR. MAGALSKI: Correct. That's usually a permit requirement, to test that, to determine how we're going to use it, whether it's beneficial reused or disposal offsite.

MR. SANGUNETT: And, again, if you could share that information online that would be very helpful so everyone is on the same page.

MR. COPELAND: This is John Copeland, and I wanted to back up to these aquatic resource surveys and just mention that there's research by Hill and Webster on the New River about how important aquatic vegetation is to the productivity of the system. When you do these fall surveys, I think it needs to include information, basic information about aquatic vegetation beds. There's particularly a lot of interest around things like river weed as an important component of that productivity.

And Hill and Webster's research showed that the decomposition of this aquatic vegetation in the New River every Fall provides a very important pulse of nutrients to the system to supplement what periphyton does through the spring and summer. So, I wanted to make sure that was mentioned and considered as well.

MS. NORMAN: U.S. Fish and Wildlife Service would agree with the importance of that survey and study to plan for restoration of the aquatic river weed.

MS. SANGUNETT: So, one particular species?

MS. NORMAN: The most common species, but the other aquatic vegetation as well.

MS. SANGUNETT: All right.

MR. COPELAND: This is John Copeland again. Sorry to interject, Janet.

MS. NORMAN: Yes. Please, do.

MR. COPELAND: Water willow, for example, Justicia Americana; very important in crayfish production to fish habitat and is quite easily propagated and planted as well. We just need to know whether the operation of these projects are impacting that particular habitat. Because it exists upstream and downstream of the project. And also I can point you to a published paper in the Southeastern Naturalist Journal that I was an author on, where we looked at aquatic vegetation from Buck Dam down to Alistonia, in that reach. So, that's a good baseline, a piece of information.

MS. SANGUNETT: Yes, please share that.

MR. CALLIHAN: Are those plants, do they need permanent inundation to thrive? Do they need to be permanently inundated?

MS. SANGUNETT: Willow does not.

MR. COPELAND: Water willow is quite resistant to drying. So, they can take inundation and then desiccation regularly. And you see it's cycle, water willow cycles through the fall and it starts to die back and it comes back the next spring. It grows particularly well on its own.

So, there's a lot of spread of it and the root systems are very important for things like crayfish.

MR. KITTRELL: They also, this is Bill Kittrell, it also, those beds tend to hold those stream banks more intact which is critical, in particularly Carroll County we have such sandy, erodible soil.

MS. SANGUNETT: All right.

MR. CALLIHAN: Jody Callihan from FERC. I have a question in line with the aquatic resources surveys and what the agencies are thinking. I mean, there was some pretty frequent, some pretty intensive sampling for the last relicensing. Six samplings per month from, you know, May through October, and I think we just need to keep in mind what we may expect. What may have changed since that time reasonably. Since there is a pretty good base already of information of the species that are out in the vicinity of the project.

MS. NORMAN: I would definitely say that we want to see the changes over the past 30 years. So, that that informs us to the current situation.

MR. KITTRELL: I don't know if they actually did Hellbender and mussel surveys 30 years ago or not.

PARTICIPANT: Mainly fish.

MR. KITTRELL: Mainly fish. And that's why I'm thinking a comprehensive survey would be very useful to provide a little more information.

MR. COPELAND: This is John Copeland. Ecologically speaking, of course, we've got to look at reference -

MS. NORMAN: Reference sites, yes.

MR. COPELAND: And there is some information further downstream and there's some information upstream. These were surveys that were done around the Fries project. So, there is some ancillary information that could be brought to bear in that regard.

MR. KITTRELL: And that was very recent information in Fries so that's very, I think that would be very useful to have as reference.

MR. COPELAND: A biological survey report from the Fries project could give us that information.

MS. SANGUNETT: Also, one of you guys installed your Obermeyer gates, I think you mentioned that there were some mussels that you salvaged? I don't know if you identified species or anything like that when we did that.

MR. MAGALSKI: Yes, this is Jon Magalski with AEP. As part of the drawdown we did mussel salvage, recovery efforts. And in the Byllesby pool we found four live mussels and in the Buck pool we found two live mussels.

MS. SANGUNETT: So much.

MR. MAGALSKI: In Game and Fish we're actually on site, I think, to observe that recovery. I think as far as mussels go, I think we have a pretty good wealth of information on mussels upstream and downstream of the project based on surveys that we've conducted for Claytor, and these are ongoing surveys. There's a site downstream from Buck that we periodically surveyed over the last several years. And then with the Fries information on mussels I think we have a pretty good handle on mussels up that way.

MS. SANGUNETT: All right.

MR. MAGALSKI: And even downstream of the Claytor project. In general though, the New River has a pretty low mussel abundment. And then also part of that drawdown we did habitat surveys for Virginia spire and also follow up actual surveys for Virginia spire when we did not find any during that survey.

MS. NORMAN: Virginia Spire straddles the aquatic resources and the endangered species things.

MS. SANGUNETT: Can we hold off for a minute?

MS. NORMAN: You want me to hold off on that? Okay.

MS. SANGUNETT: We'll talk about that in the T and E species.

MS. NORMAN: Got it.

MS. SANGUNETT: Just so we don't confuse anybody about -

MS. NORMAN: Yes.

MS. SANGUNETT: Our geology and soils got, kind of, thrown in the mix there but it seems to be pretty tied in with aquatics. Any other comments on aquatics before we move on?

MR. CALLIHAN: I have some questions along that line.

MS. SANGUNETT: All right.

MR. CALLIHAN: And maybe fortify on the record-- Jody Callihan with FERC -- and some questions on stocking practices. The Walleye management plan, the Walleye management plan for the New River. That would be very useful if we had that filed, on the record, because that's one thing we definitely need to take into account for comprehensive planning purposes is any kind of management plan for the waterway so that would definitely be useful to have.

In terms of fish stocking, muskies and walleye. It talks about the muskie stocking has been discontinued downstream of Claytor; but is there any, what current stocking of any species occurs in the vicinity of the project?

MR. KITTRELL: There have been various stocking efforts over the years, whether it be a walleye, muskie, even channel catfish I think have been stocked; crappie which in some portions of the country that would be called croppie. That would be the only species, Jon might jump in but stocking efforts at Byllesby and Buck probably would be walleye, muskie, I know catfish and probably crappie stocked in the past. Right now there's, to my knowledge, there's no stocking taking place right now.

MR. COPELAND: Actively.

MR. KITTRELL: Actively.

MR. COPELAND: This is John Copeland. The last stocking was a walleye stocking we did collagically in Byllesby Reservoir. That would have been probably 2017.

MR. CALLIHAN: I know I looked at the website. I think 2014 was the last thing listed. I guess it will just be useful to know what, over the term of a license that we would expect some stocking in this area, presumably.

MR. KITTRELL: I will say this. Bill Kittrell again, Buck is extremely important to our statewide stocking efforts and the operation at Buck. It helps facilitate brood stock collection downstream of the reservoir. So, we actually use the operations at Buck as an integral part of our brood stock collections for statewide muskie production.

MR. CALLIHAN: Walleye, muskie or?

MR. KITTRELL: Walleye.

Walleye production, I'm sorry.

MR. COPELAND: Yes, this is John Copeland. It's hard to underestimate the value of the New River walleye fishery just for its significance on a genetic basis alone but also in terms of statewide production of walleye for other rivers and reservoirs. It's a key component and the fact remains that these reservoirs probably cover up what would have been historic spawning habitat. And that has to be looked at.

MR. CALLIHAN: So, the brood stock, by and large, walleye brood stock are collected in the tailrace of Buck for production purposes?

MR. COPELAND: Yes.

MR. KITTRELL: That's one of the primary areas.

MR. COPELAND: One of the primary areas, so there's two principle spawning areas for New River Walleye that were identifying in George Palmer's research. And those were the Poncher Falls area below 77 and also in the Buck Dam vicinity. And typically, as close as we can get is the pool at Ivanhoe; unless we have the right flow conditions, we can't get up into the tail race area to collect brood stock, but when we do, they are quite concentrated.

MR. CALLIHAN: Over the term of a license there will probably be some walleye fingerlings and muskies, like 9, 10 inch sized muskies stocked in the area of the project.

MR. COPELAND: Yes. And another important point about Byllesby is that Byllesby to Fries Dam creates an important local fishery for people in Galax and the Carroll County area and Fries, as well as a little broader reach. They concentrate on that fishery and unless we have adequate production we can't consistently stock that segment.

MR. CALLIHAN: You mean for walleye?

MR. COPELAND: Yes, for walleye. Yes.

MS. SANGUNETT: Any other aquatic resource discussion points?

MR. COPELAND: I hate to be a -

MS. SANGUNETT: No, go ahead, that's why we're here.

MR. COPELAND: This is John Copeland again. One thing that I saw that looked to be a missing element from your SD1 that was covered in the PAD is a wetlands and riparian habitat characterization. In the PAD it's suggested as a study but I didn't see it in SD1. And particularly -

MS. SANGUNETT: That would be an oversight on my part if that's the case.

MR. COPELAND: I think it's particularly important when we look at wetlands and riparian habitats that we look at ways that these areas could be enhanced for wildlife use and particularly waterfowl use and people that would want to hunt the waterfowl. So, these are things that we would definitely want to look at as an agency.

MS. SANGUNETT: All right.

MR. CALLIHAN: John, when you were out of the room, I had mentioned about, we could have the walleye management plan on file for the project, that would be useful.

MR. COPELAND: Yes.

MS. NORMAN: I'll upload it as a comprehensive plan.

MR. COPELAND: This is John Copeland again. That brings up a couple of procedural questions on my part that weren't particularly clear; but if the management plan is in the PAD it does not get carried over into the FERC documents, is that -

MS. SANGUNETT: Not necessarily.

MR. CALLIHAN: Well, if it's, just that it's in the record? Are you talking comprehensive plans, or just the fact that it's in the record?

MR. COPELAND: So, like for example, a wildlife management plan. It's in the PAD, it's in the list of resources for the PAD, so how do we make that part of the process beyond that?

MR. CALLIHAN: Yes. Like, if it was an actual, the actual document was included in the PAD then it would already be part of the record; but since, right now, it's only a reference in there, so if we could, like, attach the actual document as an eFiling to say, comment, you could call it comments on the PAD, even, or additional information for the PAD and you could just file it under our eFiling as an attachment and say, 'Please consider this walleye management plan as part of the record.'

MS. CONNER: This is Allyson Conner. I sent out an email to Janet explaining how to file a comprehensive plan and it's through the eFiling, and it's a report on the project and then it gets a different docket number; so it would be it's own plan and then we have one of our staff members review them and decide, like, if it's accepted as a comprehensive plan. And if it's not, then it becomes topic specific plans. It becomes, if it is accepted then it goes on our list and then it is always maintained within our database of comprehensive plans.

MR. CALLIHAN: For the state of Virginia, right?

MS. CONNER: Yes.

MR. KITTRELL: If you could send that to DGIF as well.

MS. CONNER: Okay.

MR. COPELAND: This John Copeland. So, with regard to relevant literature then, is that filed the same way?

MS. SANGUNETT: Yes.

MR. CALLIHAN: Yes, you can file that the same way, just as a comment or additional information.

MR. COPELAND: For example, any of the walleye literature that we published for --

MR. CALLIHAN: Definitely.

MR. COPELAND: -- the aquatic vegetation paper, things like that.

MR. CALLIHAN: All that.

MS. SANGUNETT: Yes.

MR. CALLIHAN: We don't often have ready access to those.

MS. NORMAN: And those would be filed in the same way as our regular comments?

MR. CALLIHAN: Yes, regular comments.

MS. SANGUNETT: And that way everyone has access.

MR. CALLIHAN: As part of the record; that way anybody can see them. Part of the public record for the project.

Mr. COPELAND: This is John again. We kind of diverted this over to more procedural things, let me ask a couple other procedural things. We have this distribution list in the PAD and then we have this mailing list in the scoping document.

MS. SANGUNETT: Yes.

MR. COPELAND: I'm still trying to sort out --

MS. SANGUNETT: Bane of my existence.

MR. COPELAND: I'm still trying to sort out --

MS. SANGUNETT: You and me both.

MR. COPELAND: I didn't even see, maybe a quick review, but I didn't see Department of Game and Inland Fisheries in the one in the scoping document. The mailing list.

MS. SANGUNETT: So, how it works is we have a, what's the word I'm trying to get, a leftover mailing list that is considered the official FERC mailing list, and it comes from previous proceedings; and you can search that yourself on our, what was that, E?

MR. CALLIHAN: eService.

MS. SANGUNETT: eService. Yes. So, there's a service list and a mailing list, and they're used differently and they have different people on them and it's the mailing list that you want to focus on.

MR. COPELAND: All right.

MS. SANGUNETT: If you're on the mailing list then you will get hard copies of everything. But we recommend everyone eSubscribe because then you will get emails notifying you instantly of any, or nearly instantly, of any filings added to the document.

MR. CALLIHAN: Which we do; we're all getting the eSubscribe.

MS. SANGUNETT: I know it's confusing.

MR. COPELAND: It's just the documents, you know, there was a volume of literature still on my shelf from the Claytor project. And then I have a box for each one of the others.

MS. SANGUNETT: Yes.

MR. COPELAND: You know?

MS. SANGUNETT: So, if you see a problem with something on the mailing list and you want changes made, I have a slide about that but there's an email that you send the message to, I can't remember off the top of my head, I'll show you. And you have to provide the project number and ask to be removed or added or having a name added or removed. So, what I did for the scoping document is I looked at our mailing list and I looked at the applicant's distribution list, and if there's anybody on the distribution list that was not on the main list, I created a supplemental mailing list. But that's only a one-time deal, so for any future documents you'll need to make changes to the mailing list.

MR. COPELAND: All right. So, that means hard copies.

MS. SANGUNETT: If you want a hard copy. Otherwise you can eSubscribe and get electronic copies.

MR. COPELAND: That makes sense because I get a hard copy of SD1 by mail. And then one other thing is whether these Powerpoint presentations are available.

MS. SANGUNETT: I can certainly share it with you or I can even add it to the eLibrary on the docket for this project, if that would be helpful.

MR. COPELAND: Wherever; it would just be helpful to have those to refer to. Pretty immediately.

MS. SANGUNETT: Again, most of this information is in the scoping document but some of the procedural things, I think, are presented maybe in a more condensed manner on the slide so I'm happy to share that with everybody.

MS. NORMAN: Janet Norman, U.S. Fish and Wildlife. I have a question for our FERC lawyer. So, my understanding is that the service list becomes important down the road into dispute resolution or other -

MS. WARDEN: Hearings.

MS. SANGUNETT: Intervenors.

MS. WARDEN: Intervenors. Yes.

MS. NORMAN: Intervenors, so that we have to send our notice of intervention to that service list. So, making sure that's important. That's up-to-date and accurate comes into play later on?

MS. WARDEN: Yes.

MS. NORMAN: So, John, we want to check that all the important Virginia folks are included in the service list.

MS. WARDEN: Right. Intervenors are allowed to, at the end, once the license order is issued, if there's something of a dispute, if you have intervenor status, then you can bring that up for rehearing. That's what the service list and intervention, in a nutshell, is.

MS. SANGUNETT: Very good questions, everybody.

MR. COPELAND: So, this is John Copeland. I had one other question.

MS. SANGUNETT: Okay.

MR. COPELAND: Sometimes the questions come from the PAD, sometimes they come from scoping.

MS. SANGUNETT: Okay.

MR. COPELAND: But I see them as one thing. All right?

MS. SANGUNETT: Yes.

MR. COPELAND: So, Article, let me see which one. It's Article -

MS. SANGUNETT: So you're looking at the list of current license requirements in the PAD?

MR. COPELAND: Right. I'm looking at section 4.5 in the PAD. And I'm wondering where the ramping rate assessment plan that was approved by the FERC order in 1995 is located.

MS. SANGUNETT: Well, it's in eLibrary somewhere, but it's probably on microfilm.

MR. CALLIHAN: I had some of those requested to get it converted to microfilm and I believe, now, that that plan is on eLibrary -

MS. SANGUNETT: As a PDF?

MR. CALLIHAN: As a PDF. As a text document, at least. And the actual ramping rate assessment, the study that was done in 1997, the results of that study are also on there. But if you send me an email, I can provide you with, kind of a quick link to those.

MR. COPELAND: All right.

MR. CALLIHAN: That will keep you from searching because it does take some digging.

MS. NORMAN: Is it a different docket number?

MR. CALLIHAN: No, it's the same main docket, so it's still 2514, but it may have a different sub.

MS. NORMAN: May have a different sub.

MR. CALLIHAN: So when I search on eLibrary I usually just use the main project number without the sub, because I want the whole shebang.

MS. SANGUNETT: The subdocket number is important for when you're filing something, comments or -

MS. NORMAN: Right.

MS. SANGUNETT: That way it gets assigned to the proper proceeding.

MS. NORMAN: Okay. I've done searches on just the main docket number and sometimes it says 'no results' which is extremely frustrating.

MS. SANGUNETT: Yes.

MR. CALLIHAN: Yes.

MS. NORMAN: Do you have to put a dash and then -

MS. SANGUNETT: You have to have P dash. You must have P dash, then the number.

MS. NORMAN: Right. But then do you have to do an asterisk?

MS. SANGUNETT: No.

MR. CALLIHAN: No.

MS. NORMAN: Or spaces or -

MS. SANGUNETT: It does a text search. If you don't put anything in the text search, it doesn't work.

MS. NORMAN: Sometimes even when I've done P dash.

MR. CALLIHAN: There's a base range. Like, if you put in the P 2514 and then have, like, a 30 year date range for this project you should get, like, hundreds of hits.

MS. NORMAN: All right. I usually put it all.

MS. SANGUNETT: And if you do have any trouble using our electronic document system there's a helpline, there's people standing by ready to help you. And that's in this brochure, FERC Online Support. There's an email address and there's lots of phone numbers, so that's on the back of this brochure and they're very helpful. We do the best we can to help out but that's all they focus on so they're better at it than we are.

Do you have any other procedural questions, anybody, that we can clear up before we move on? Do you want to stay with aquatic resources?

MS. NORMAN: I have a procedural question on submitting study requests. One of your slides goes through all the elements that are needed in the study requests and how the agencies are supposed to come up with estimated costs is unclear to me.

MS. SANGUNETT: All right. We do actually have some guidance on cost assessment. Is that public or is that just for us?

MR. CALLIHAN: I think it's internal.

MS. SANGUNETT: It's internal, all right. That's real helpful.

MR. CALLIHAN: I would say, I mean, I realize that it's tough to come up with a cost estimate. And if you just address it and give a ballpark or to make sure you address the cost. The cost will be dependent on the level of sampling. Just include a sentence about cost at a minimum, and then, yeah, just don't completely ignore it.

MS. SANGUNETT: It's hard for us, too, and that's why we are asking for help on that because sometimes we have no idea. You guys are much more familiar with that than we are. You're out there in the field doing the studies.

Yes? Is your question on procedures or aquatics?

MR. KITTRELL: I always have a question. Mostly aquatics. Let's leave aquatics.

MS. SANGUNETT: Okay. We have some more slides that deal with procedures, but can we hold off on more procedure questions until we get through the resources?

MR. KITTRELL: Yes.

MS. SANGUNETT: We'll definitely get to your questions, though.

MS. NORMAN: So, before we leave aquatics completely, I just wanted to make sure we are on record requesting a fish protection and downstream passage study.

MS. SANGUNETT: Okay.

MS. NORMAN: Which has to do with trash rack spacing, which has to do with the study of the powerhouse, killing what percentage of fish attempting to move downstream. Knowing what the present day situation impacts are and the cumulative impacts.

MS. SANGUNETT: All right.

MS. NORMAN: Which would include a desktop study with in-field clarification and proposed deterrent.

MS. NORMAN: All right. Anybody else with aquatics? All right. Let's move on to terrestrial resources.

So, what I've identified-- that's me up there, this is my resource area -- what I've identified to look at is the effects of impoundment fluctuations on wetlands and riparian habitat. Also, the current project operation and maintenance on, or continued operations on upland wildlife habitat and especially bald eagles. And as pointed out, I left out a proposed study in the scoping document and that's a wetland assessment. So, my apologies about that. That will fall under the purview of terrestrial resources. But it is very much linked to aquatics. We recognize that, so Jody and I will work very closely on that resource area.

MR. KITTRELL: This is Bill Kittrell, and as was mentioned in the public meeting last night, we do just need to make sure we understand what the results of the feasibility study for lowering the impoundment a foot during the winter might have on wetland habitat and species and potentially even recreational use.

MS. SANGUNETT: Again, we want to make sure that everyone knows what we're talking about, so there is a need for potential for -- where is that so that I get the wording right -- I think we have that in the scoping document, right? MR. KITTRELL: 3.2.1.

MS. SANGUNETT: All right. Oh, yes. Proposed operations. So, the applicant is presently evaluating the feasibility and benefits of operating the developments within one foot lower impoundment level during winter months, the purpose of which is to reduce the risk of overtopping project structures due to ice jams in the New River.

So, as Jody talked about yesterday, it would be really useful if that could be incorporated into your proposed study plan, your feasibility assessment for that so that it can be evaluated with everything else. If it comes in after the fact, that can often complicate matters and delay procedures. If we can look at it altogether, that would be really helpful. All right.

So, specifically with that feasibility you are also interested in the effects on that, with that reservoir --

MR. KITTRELL: If there may be connectivity between the impoundment and the wetlands which you would expect there would be any significant, you know, drying out of those wetland areas during the wintertime.

MS. SANGUNETT: Last night you mentioned recreational impacts as well.

MR. KITTRELL: Right, because there potentially is the waterfowl hunting that takes place over those wetlands in the vicinity of the wetlands, so that might be an issue as well.

MS. SANGUNETT: All right.

MR. CALLIHAN: In terms of access.

MR. KITTRELL: Access. yes.

MS. NORMAN: Janet Norman, Fish and Wildlife Service. I would add the impacts of impoundment water level fluctuations on the macrophyte river weed, water willow and American water celery.

MS. SANGUNETT: All right. So, when we look at wetland habitat we also look at submerged aquatic vegetation, and emergent vegetation, so we would -

MS. NORMAN: Cover those?

MS. SANGUNETT: Yes, we would cover those under wetlands. Yes. But thanks for pointing out the specifics.

MR. COPELAND: This is John Copeland again. In that regard with aquatic vegetation associated with wetlands, I think these impoundments could add significant areas of like elodea, the native plant, it's probably a great reservoir nutrient input.

MS. SANGUNETT: So, it could be there, is what you're saying?

MR. COPELAND: That's what I'm thinking, yes.

MS. SANGUNETT: As a valuable --

MS. NORMAN: As a valuable habitat component.

MR. COPELAND: Yes, and a nutrient source. So, typically in these smaller pool areas in the New River you find a lot of elodea. That's a prominent feature.

MS. SANGUNETT: So the wetland assessment proposed study would identify if any of those were present?

MR. COPELAND: Yes, or other aquatic vegetation types as well.

MR. CALLIHAN: So, Brandi, would that be in relation to if there was a change from the current condition to the current impoundment levels during the winter, right? Because otherwise, I mean, they're operating within a one foot band. I guess there would only be an effect if that band would shift or change, right?

MS. SANGUNETT: Yes. Thank you for pointing that out. Any other wetlands or terrestrial resource issues?

Just to refresh my memory, there are no known bald eagle nests in the project area, correct?

MR. MAGALSKI: Yes, Jon Magalski with AEP, there are no known bald eagle nests in the project area.

MS. SANGUNETT: All right.

MR. MAGALSKI: When our consultant was out doing the spire surveys they did make observations for nests and eagles.

MS. SANGUNETT: All right. What year was that again?

MR. MAGALSKI: 2017.

MS. SANGUNETT: 2017. All right.

MR. COPELAND: The closest nest is going to be at Foster Falls.

MS. SANGUNETT: There's a known nest at Foster Falls?

MS. NORMAN: There's a known nest at Foster Falls.

MS. SANGUNETT: All right. And how far away is that from the project boundary?

MR. CALLIHAN: Better pull out a map, but it's probably 10 miles.

MR. COPELAND: Seven to ten miles, that range.

MS. SANGUNETT: All right. We would assume that bald eagles are using the habitat.

MR. COPELAND: Yes.

MS. SANGUNETT: All right.
MR. COPELAND: John Copeland, I think there is plenty of bald eagle nesting habitat along, for the reservoir area. Because the terrain in the area and the -- available nest.
MS. SANGUNETT: Okay.
MR. COPELAND: So, in that regard, you know, we did a whole bald eagle assessment on the Claytor project that should be looked at on this one as well.
MS. NORMAN: It is reasonable foreseeable that bald eagles could and will use the area within the next 30 to 50 years of the project life.
MS. SANGUNETT: Sure. All right.
So, ready to move on to T & E species. I know we're going to have some questions and comments about that. So, we've identified the Indiana Bat, the Northern Long-eared Bat, and the Virginia Spire, and we've also been told that we need to possibly look at the Darter.
MS. NORMAN: Endangered Candy Darter.
MS. SANGUNETT: Candy Darter.
MS. NORMAN: That's a federally listed, endangered Candy Darter.
MS. SANGUNETT: Now, we don't have any information about the range of the Candy Darter. Known locations. So, please share that with us. Like we said,

there's a new study being done. We need that information on the docket.

MS. NORMAN: So, would you like me to submit that as comprehensive, a species status assessment that the Service, the U.S. Fish and Wildlife Service does during the listing process?

MS. CONNER: All right. If it's not available on IPaC, then yes. We would appreciate you sharing that with us. Just through the same eComments, I mean, eFiling process. Is it a specific, a comprehensive plan? Or is it for the informational article, like, kind of talking about the --

MS. NORMAN: It's comprehensive about the species throughout its whole range. A status assessment of the species throughout its whole range.

MS. CONNER: You can submit it as a comprehensive plan and we would review it, and it has to meet certain criteria, and it may be determined that it's really just informational about the species as opposed to a truly plan of, you know, from beginning to end, of how they're -- not cared for, but how they're -

MS. NORMAN: Handled.

MS. CONNER: Right. Right. So, you can always submit as a comprehensive plan and it does get reviewed, and if it's not that then it would become information for this project specifically.

MS. CONNER: Especially if it was new information about known locations or things like that.

MR. CALLIHAN: For most immediate use would probably be beneficial to just file it as a comment for--

MS. SANGUNETT: For this particular project.

MS. NORMAN: Sure, get it in there quickest.

MS. SANGUNETT: Yes.

MS. CONNER: True, because it can take a while.

MR. CALLIHAN: I'm not sure how long that process is.

MS. CONNER: I mean, a month or two, particularly.

MS. NORMAN: I'll file it as a comment.

MS. SANGUNETT: But again, if it's on IPaC, we look at that as well.

MS. NORMAN: Okay.

MS. SANGUNETT: It sounds like it's not.

MS. CONNER: It's on ECOS.

MS. NORMAN: I haven't been in IPaC --

MS. SANGUNETT: It's integrated into IPaC, yes. You can feel free to include it.

MS. NORMAN: But then other people might not be stumbling through that, if I can eFile it then they'll have it. All right.

Just a general comment about getting the endangered species information. That several of the databases are sometimes giving omissions or conflicting information, not full listings; so if we have the Fish and Wildlife Services IPaC, we have Virginia CPI National Heritage Data.

MS. SANGUNETT: Yes. And we look at that, too.

MS. NORMAN: Right. And Virginia Fish and Wildlife Information System. They don't all have the comprehensive list of these species, so some species are left off of a certain list so I would just encourage you to use all three and then double-check with the biologist to make sure everything is good.

MS. SANGUNETT: And the applicant is designated as a federal representative on this as well. That is typically the case. So, they can request lists and species lists and talk to you guys about --

MS. NORMAN: And just for everyone's knowledge that during the listing process for certain endangered or threatened species that there is a designation of critical habitat areas, and so Cripple Creek has been included in the designated critical habitat --

MS. SANGUNETT: For the Candy Darter?

MS. NORMAN: -- for the Candy Darter.

MS. SANGUNETT: Okay.

MS. NORMAN: Which is not -- you want to make sure that's the legalistic critical habitat under the Endangered Species Act as opposed to ecological terms that we throw around. This is important habitat. This is critical habitat. So it's an official designation.

MS. SANGUNETT: Okay.

MR. CALLIHAN: And that they're likely to be found there? And were --

MS. NORMAN: They are found there.

MR. CALLIHAN: Okay.

MS. NORMAN: There's population there.

MR. CALLIHAN: All right.

MR. KITTRELL: Yes. This is Bill Kittrell, and Cripple Creek has one of the remaining populations.

MR. COPELAND: This is John Copeland. My understanding is, too, that those Candy Darters use the mainstem areas in proximity to Cripple Creek as well based on recent survey data.

MR. KITTRELL: Chestnut Creek and Crooked Creek are just downstream, not too far.

MS. SANGUNETT: Again, anybody file a report, some studies.

MR. KITTRELL: We can share those. I will mention, are there any more federally endangereds?

MS. SANGUNETT: These are the ones that we've identified.

MR. KITTRELL: I know there -- I just will mention that there are two state endangered mussels and a federally, oh, excuse me, a state endangered, state threatened mussels and two state threatened and one state endangered mussel that are known from the vicinity of the project.

MS. SANGUNETT: So, this is just a list of federal species, and we address them separately from state listed species. State listed species are tossed into a category called species of special concern so the Hellbender, for example, is under that category. And we do divide those species between terrestrial and aquatic resource areas so, Jody will assign the T & E species to aquatic species.

But again, because of, for consultation purposes we separate out the federal species and any discussion of them so that that can act as our CA if we need to or if we can refer the Fish and Wildlife Service-specific parts of our EA.

MS. CONNER: My name is Allyson with FERC. Just as confirmation, the scoping notice doesn't make Appalachian the Commission's non-federal representative for carrying out the informal consultations for endangered species and for cultural resources. Just putting that on the record.

MS. NORMAN: Great, and so, Janet Norman, Fish and Wildlife Service. I had a question how that, how that consultation happens. I actually recently attended Endangered Species Act Section 7 Consultation training for a week and the end of it, and I asked, well how does this, 'How does FERC handle ESA consultations?' and they said, "Oh, God, we don't know."

(Laughter)

MS. SANGUNETT: Was this at NPTT?

MS. NORMAN: This is at NPTT. A teleworker.

MS. SANGUNETT: We've been to those trainings as well.

MS. NORMAN: Oh, it's a whole different world, isn't it? So, I still don't have a clear answer to the process on how the -

MS. SANGUNETT: We follow the same process everyone else does; it's just that we have certain limitations to our jurisdiction and our regulations but --

MS. NORMAN: But when in the process will it occur, when this informal consultation --

MS. SANGUNETT: So, before we do our EA we will do an IPaC search and we will make sure that it will be a formal submission of that; not just for our own information.

MS. NORMAN: Yes.

MS. SANGUNETT: So, we use the IPaC system to alert Fish and Wildlife Service that we are - and this is what we've been instructed to do, so if there's something different that you're aware of, please let us know. We've been instructed to go through the IPaC system. We'll look for, we'll request a list of current listed species. We'll look for critical habitat, migratory birds of concern. There's one other thing.

MS. NORMAN: And then will you send us a letter requesting concurrent consultation?

MS. SANGUNETT: So, no, not yet. We do eventually. But at that point --

MS. NORMAN: At what point in the process?

MS. SANGUNETT: So we gather the information about what species to look at before we do our EA, and then in the EA we evaluate, we give background information about each species and we evaluate any impacts that might occur due to the project, and then we make our determinations of that in the EA. And then when we issue the EA, we will send out a concurrent letter requesting you to let us know if you agree with our determination or not. And then if there's a disagreement then we try to work on that then, or do formal consultation if necessary.

MS. NORMAN: I would encourage that you would reach out and we do consultation prior to that, as opposed to -

MS. SANGUNETT: Well, we don't make our determination until we have evaluated --. We start the formal process through the IPaC search.

MS. NORMAN: All right. But I would also say along with the IPaC search that you engage in discussions with the Fish and Wildlife Service.

MS. SANGUNETT: So, we can send you an email and say, did you see that this went through the IPaC system? What do you think?

MS. NORMAN: Right. Because I don't handle the IPaC system. I don't see the letters --

MS. SANGUNETT: Really?

MS. NORMAN: No. We have separate -- and mostly we try and automate that and then -- they're separate things. So I don't see that you've done an IPaC search so

MS. SANGUNETT: We have not; the applicant has.

MS. NORMAN: Right.

MS. SANGUNETT: We do that right before our EA. Up until that point the applicant acts on our behalf.

MS. NORMAN: Right. But, but, so IPaC is not always updated. Properly, maybe there's new -- that the Service office is responsible for the consultation.

MS. SANGUNETT: See, that's interesting, because some other field offices --

MS. NORMAN: It is handled differently by every single field office. Which we understand --

MS. SANGUNETT: We're really happy to engage with you earlier and everything, but we've been told there's not enough staff, we don't have time, we need to use the automated system.

MS. NORMAN: Yes, and the automated system is our go-to system that you're supposed to use; but I apologize for the frustration that each individual Fish and Wildlife Service field office sometimes handles procedures differently on species.

MS. SANGUNETT: Okay.

MS. NORMAN: On something big like a project like this, you're not just doing, you know, ten feet of reg or something.

MS. SANGUNETT: And at any time if you want to provide information about endangered species, you know, you don't have to wait for us to ask for it, you can provide it.

MS. NORMAN: But I'm trying to foresee when it's going to be, when our consultation with you will occur. And I would recommend -

MS. SANGUNETT: It's occurring now.

MS. TANYA: Yes, so this Tanya __ with HDR. This might clarify a little bit. In preparation of the PAD, we did the IPaC search, and then we always send the IPaC results with a letter packaged to Fish & Wildlife, then we reach out to the national heritage program in other state level agencies as well; so you would actually see that documentation in the -

MS. SANGUNETT: It's included in the PAD.

MS. TANYA: --correspondence log, and it has all the correspondence in a table format as well as what we sent and what you responded with.

MS. SANGUNETT: Right.

MS. NORMAN: I'll make sure I get on your mailing list for that, because otherwise it goes to a separate, you know, generic pile.

MS. SANGUNETT: So, now, you're in a regional office?

MS. TANYA: No, I'm in a field office.

MS. SANGUNETT: You're in a field office.

MS. TANYA: The Chesapeake Bay field office located in Annapolis. It covers Maryland, Virginia, parts of Delaware.

MS. SANGUNETT: All right.

MR. MAGALSKI: This is Jon Magalski with AEP. Just since we're on the subject and consultation, I would just like to make the request for all the resource agencies to provide any location data on the Candy Darter, if that's possible. Especially in particular to the New River mainstem.

MS. SANGUNETT: That can be filed as privileged information if you don't want that known by the general public. And you can label it as such when you file, when you eFile. So, there's three categories of information.

MS. NORMAN: CEII.

MS. SANGUNETT: Yes. There's public. There's privileged. And there's CEII. C E I I stands for Critical Energy Infrastructure Information.

MR. MAGALSKI: Infrastructure information.

MS. SANGUNETT: Yes. Information. Thank you. So, that would be like internal dam structure. Things like that would be CEII. Privileged information would be sensitive information about cultural resources or native species or other resources where you don't want the public going and ransacking the area.

MS. NORMAN: So, can we as the agencies see -

MS. SANGUNETT: I don't think so.

MS. NORMAN: I don't think we can see privileged information.

MS. CONNER: Typically not.

MS. NORMAN: It has to be

MS. SANGUNETT: It's really just for our

purposes.

MS. CONNER: Right. Because it's often cultural sites like where they are located so that information is very tightly kept. And so you would have to go directly to that -- the state SHPO, the state information office and they can give you that information.

PARTICIPANT: And the applicant.

MS. CONNER: Right.

PARTICIPANT: The individual who is listed as the contact for the project is able to access that. So, it's very limited access.

MS. NORMAN: Get it from DHR.

MS. SANGUNETT: Yes, you guys can --.

Any other procedural questions about consultation?

MS. NORMAN: So, we would expect that the applicant's consultant would be directly contacting us.

MS. SANGUNETT: Yes. You're the person to contact, right?

MS. NORMAN: Yes.

MS. SANGUNETT: So, now that we know that we will focus on making sure you are in the loop on everything in terms of endangered species, yes.

MS. NORMAN: All right.

MS. SANGUNETT: All right. Next. Recreation and land use and we have a picture of Allyson, recreating. Doing her favorite thing. So, we'll be looking at project operation and maintenance on recreation land use and aesthetics within the project area. That is not necessarily the project boundary, correct?

MS. CONNER: Correct.

MS. NORMAN: Before we move on, I'm sorry. I have another endangered species thing. Just for your knowledge for the Virginia Spire. So, the survey results are considered to be valid for two years. So, we might be requesting a new survey for July of '19 -- and suitable habitat identified? It was documented in 1992.

MR. MAGALSKI: This is Jon Magalski with AEP. That documented occurrence, do you have any information on that? Because I think when we were looking at doing that it was just pretty much a point and there's no information, no verification of that finding. Is there any additional information that you could provide on that sighting?

MS. NORMAN: I do not know, but I would defer to contacting our colleagues, my colleagues in the Virginia U.S. Fish and Wildlife Service office, and our state college, if there's any additional information on that.

MR. MAGALSKI: And this is Jon, just a follow up. I guess just for consideration for the request of the further Spire surveys, I guess, you'd think about how that data would be used beyond this present. Because it's quite costly to do those surveys.

MS. SANGUNETT: And the licensing process is a five year process. So, we want to try to have everyone on the same schedule as much as possible.

All right. Moving on to recreation again.

MR. KITTRELL: Brandi?

MS. SANGUNETT: Yes.

MR. KITTRELL: This is Bill Kittrell. I just want to make one correction to the PAD, there's a listing here for the Byllesby boat launch, and that is actually a DGIF lease from Appalachian Power. We leased it in 1995 for 20 years, and there's an annual renewal; we're in the renewal phase, but instead of Doctor it needs to be DGIF just for that boat launch in the Byllesby pool.

MS. NORMAN: You are correct. Thank you.

MS. SANGUNETT: So, it's on AEP land -

MR. KITTRELL: Correct.

MS. SANGUNETT: - leased to DGIF?

MR. KITTRELL: Correct.

MS. SANGUNETT: The other area we'll look at is the adequacy of existing recreation facilities and public acces to the project to meet current and future recreational demand. Yes?

MR. HILL: I'm Rex Hill with Carroll County. I was looking at the property between the dams, it is owned by AEP on the east side of the national forest, on the west side on the map.

MS. SANGUNETT: I'll hold that map up for you.

MR. HILL: So, that helps out a lot. And I think

MS. NORMAN: It's owned by -

MR. HILL: AEP on the east side and national forest on the west side.

MS. SANGUNETT: Do you want this one or the one on the recreation site, would that be?

MR. HILL: Recreation sites. Any expansion of recreation facilities by the DEQ, I mean, the DCR on the east side, that's heavily used by folks and it gets trashed quite a bit. On the upper end of Buck, they can drive back through and create a lot of potholes and things like that, so it might be something to be considered.

MS. EWING: This is Sharon Ewing with DCR. It's my understanding that the area that is not outlined in red as the gentleman is referring to is heavily used. But there's not any public access points in that area, and so we would concur that that's an area we would like AEP to look at in their study for recreational use.

MR. HILL: Just this little creek right here. I mean, it's like, tons and tons of trash in that creek. I don't know whether anything could be done about that or not. I mean, it's like an old dog site that's been used for years. MS. SANGUNETT: Do you know the name of that creek?

MR. HILL: It borders the -- that road runs right along, I guess from the road, the side is all AEP property. I think it's heavily used all the way down through there and some of the locals, I think, pick up the trash. Somebody does occasionally; and I don't know, some kind of mechanism where we can have a mutual agreement between the agencies.

MS. SANGUNETT: Okay.

MR. COPELAND: This is John Copeland. I know in our historic New River float guide that that ferry is listed as a potential access point, and that's probably one of the reasons it gets used like that. Locals know about it as well.

MS. SANGUNETT: Do you have access to that, Allyson?

MS. CONNER: To, what's the --?

MR. COPELAND: We have a New River float guide, an existing one, the new one's not out yet; but the older one is still up on our website under maps and access. Is that something you need a link to?

MS. CONNER: Yes. That would be great. I'm going to send you an email and you send me one back.

MR. COPELAND: You've got it. There used to be a ferry so you could drive almost like to the river; it's about a two foot drop there. That might be where you could put in a boat ramp, I mean, a canoe launch; it's not conducive to motorized boats through there, but -- some folks do that. I'd like to see on the Buck Dam, I'd like to see a boat ramp for small motorized boats, not just canoes. Most of our population is getting older and they don't use canoes, I don't anymore. And maybe the possibility of handicapped fishing piers, upstream or downstream in any of those areas there; Buck-Byllesby, maybe at the boat ramp at Byllesby.

MS. SANGUNETT: All right.

MS. EWING: This is Sharon Ewing with DCR State Parks. We've also like in the recreational plan to look at fishing pods and ADA accessibility in that area. Also, I know the portage around the dams is challenging. And certainly in the recreational study if we could look at ways of potentially improving those, you know, at a minimal, better signage directing boaters, you know, where to get in, where to go to, because it's very confusing for them.

Also, I believe during the Lower Byllesby, during the work, that the portage in that area was used as part of the dam work and between that and recent flooding, things like that, damaged. I think that's correct, and I'd like to see that put back, and, you know, restored and fixed.

The other question I had is I understand that Byllesby is in the process of updating some mechanical lift gates, is that correct? Do I understand that correct?

MS. SANGUNETT: Obermeyer gates and dam topping gates.

MS. EWING: Yes. And those will be operated out of Ohio at that point? All right. I guess our question is, is just for reference, I think that what is the current notification process on the operation of those during flooding, is that going to change in the future with these new operational processes? And how will we be notified as agencies having things downstream that are very, you know, prone to flooding from this operation?

MS. SANGUNETT: Recreational?

MS. EWING: Recreational facilities are particularly why I'm bringing it up in this area; we obviously have recreational facilities that are impacted.

MS. SANGUNETT: You want to address this?

MR. COLBURN: Sure. Fred Colburn at AEP. It will be followed by the same protocols we do. Anytime we open up the gate, we blow our fisherman's warning siren. It will be on the same structure, and what you'll actually see is a more controlled river. We'll have more ability to control the river instead of having it get to the point where you have to release the flash boards which are at play. So, I think that's a benefit that we're looking to see, or one of the many benefits.

MS. NORMAN: What's the advanced notice on the siren?

MR. COLBURN: Two minutes.

MS. NORMAN: Two minutes. All right.

MS. SANGUNETT: Currently they are manually operated? Or on site?

MR. COLBURN: For the Obermeyers it's locally operated.

MS. CONNER: And then you said yesterday --

MR. COLBURN: Right. We're looking to get a schedule to be complete, complete the work of bringing it into the -- by May, or by the end of May.

MS. SANGUNETT: All right.

MR. COPELAND: This is John Copeland. That brings up a broader recreational concern and that is just notification and information around navigating these projects and how that's accessible, whether it's available on a website. Something that people can consult on a real-time basis. And know something about project flows and things like that that might impact their recreation.

MR. CALLIHAN: Probably, the, you know, the USGS river gauges would be the best indication because they can tell if you've got high flows, they're not going to be on the river anyways, they're going to be operating those gates.

MR. COLBURN: Right. But I'm talking a little more broadly in terms of similar information to what we have with the Claytor project. But, had some productivity, some predictions about flows down at downstream points.

MS. SANGUNETT: Why don't you describe how that works?

MR. COLBURN: That website, a downstream user can go to it and know what the flow is at Claytor Dam. They can know when projected flow rates look like downstream, certain distances, for recreational purposes.

MS. SANGUNETT: One thing to point out though is Claytor does not operate run-of-river.

MR. COLBURN: Right.

MS. SANGUNETT: But this one is run-of-river.

MR. COLBURN: I know. This is basically run-of-river; what's coming in is going out. We're, there's really minimal ponding ability.

PARTICIPANT: Understood.

MS. SANGUNETT: So you feel that you wouldn't be able to provide much more information than the USGS gauge?

MR. COLBURN: That would be the best indication.

MR. CALLIHAN: I have a question. On the

applicant's website, I notice you guys do have real-time information on that as well, right?

That's downstream. It doesn't separate it, I don't think, on what's coming out of the tailrace versus a spillway, but overall downstream what's coming out of the project as a whole, I believe that's on there.

MR. COLBURN: For which facility?

MR. CALLIHAN: For both Buck and Byllesby. I was checking it the other day. It has a tailrace discharge in CFS.

MR. KITTRELL: This is Bill Kittrell. Question on the recreational needs assessment study. It says Appalachian proposes to conduct a recreational assessment of the project to assess existing opportunities. I think it would be useful to, I don't know how much, what level, or what extent, or what monitoring is going on right now, I don't know if that's just like a Form 80, or -- which is a very cursory overview but, you know, I think it would be useful to have some type of recreational assessment of the usage, not just, you know, it's hard to know what the needs are if you don't understand what the actual usage is, and I would even think that it would be, not only on the project boundary as defined here but the project lands associated with the projects, the project itself which includes the area of influence.

What that entails, you know, will probably take some thought, but I think there's a lot of usage going on, not only within that project boundary as defined in the PAD but also on the project lands associated with the project. And we discussed this at our field site the other day about the area downstream of Buck, which is project lands that is pretty heavily used by recreational users.

MS. SANGUNETT: So you're saying that in the proposed study description, you don't see anything about assessing current usage?

MR. KITTRELL: It says the existing monitoring will be included in the study, but existing monitoring may not be adequate to fully describe the recreational use. If you're only doing a Form 80 which is a very cursory survey method, I think, in my opinion, that may not fully describe how much recreational use is taking place. Because all of DCR's assets adjacent to the project and then a lot of other usage that's going on, would, you know, the DGIF ramp and the fishing and hunting and boating and so forth, and the hiking and biking there's a lot of usage that's taking place that may not be fully described under current monitoring methods.

MR. COPELAND: This is John Copeland. That brings up a related question. I noticed in the PAD under the review on 4-25, Article 4.12 says that this article regarding monitoring the recreation use was deleted by FERC July 30th of 2002. So, how do we, where's the more current information regarding recreation use? And it also mentions a recreation plan in Article 4.11. And I don't know where that recreation plan is available.

MS. SANGUNETT: Again, that would be on eLibrary. It might be something that is microfilm that needs to be converted to text or PDF. Allyson?

MS. CONNER: I'm looking to see if that particular part --.

PARTICIPANT: It was filed in 2016, the recent one.

MS. SANGUNETT: Oh, the Form 80 is 2016?

MS. EWING: Sharon Ewing with Doctor, State Parks. Following up on Bill's comments about doing a good assessment of the recreation rather than just a cursory check, because we do know from use of facilities that that area is very loved and very well-used.

MS. SANGUNETT: Okay.

MS. NORMAN: Important to the local economy and the culture and -

MS. EWING: Not just important to the local economy, it's important to the economy of the Commonwealth. State parks and again economic impact. For our local communities --

MR. HILL: Rex Hill from Carroll County. You have so many different types; you've got horseback riders, you've got bikers, you've got walkers, you've got boaters, you've got fishermen. I mean, this is probably the most widely, varying folks that use this than any place that I know of. Kind of remote. It's an excellent place.

MR. KITTRELL: Makes it attractive.

MR. HILL: It does. And back years ago, national forest had a campground there. I don't know -- and I know at one time DCR at one time leased that, but it's gone back to the national forest. If there's any way that maybe as a group we could get that opened back up some way, I don't know, that is something we should really look at. That would really improve access there, too. Bring more people into the area that it used to be with --.

PARTICIPANT: And that's in that Bucks Dam picnic area, right?

MR. HILL: Yes. Yes.

MR. KITTRELL: The Department of Game and Inland Fisheries would really support that effort as well, to look at reopening those day use areas and potentially overnight camping along that corridor. I think the Forest Service does own the land.

MS. EWING: I could see that happening in the scope, time span of this particular project.

MR. HILL: Anything, any help you need, let me know.

MS. SANGUNETT: Anything else about recreation?

MR. COPELAND: John Copeland. Allyson, should I ask you for that report, that most recent recreational report? Would that be the best way to get it?

MS. CONNER: That Form 80 report?

MR. COPELAND: It was a 2015 report mentioned in the PAD?

MS. CONNER: I can get it to you.

MS. SANGUNETT: Again, that should already be in eLibrary. Might be tough to find, but it should be there.

Any other recreation issues?

MS. EWING: I apologize, I'll have to get to Salem for another meeting. [Leaving]

MS. SANGUNETT: All right. Thanks for coming. All right.

Moving on. Cultural resources. This is also Allyson's purview. We'll be looking at effects to listed places, listed or potentially eligible resources, and any previously unidentified resources. Any comments or questions I know what I was going to say - as we mentioned before, the applicant is our non-federal rep for Section 106 cultural resources.

Any comments or questions about that?

The last one is developmental resources. So, we look at the economics of the projects and any effects of any recommended environmental measures on the project's economics. And that's Lucy, another team member who couldn't be with us today, is working on that.

MR. CALLIHAN: I have a question unrelated to developmental, just more FERC for APCO. Can you explain the battery storage that's onsite a little bit and how it integrates with the hydro project. Whether it's connected to the hydro and what part of the project.

MR. COLBURN: Yes. So, the idea that came from trying to co-load a battery with another type of power generation. So, we started vetting out different types of generation and we ran some studies and we decided that to try to collocate it with the hydro plant.

So, basically, we got a little bit of storage, so you wouldn't be giving up any energy going to the dam, you're just kind of shifting the time a little bit. So -- this is Fred Colburn, by the way, Anticipate -- In PJM, we operate in the PJM regional transmission organization, and one of the ancillary services that we can offer into the market is a regulation product. And if you site a battery out on its own, it's not sustainable; it needs the ability to maintain its charge, either a positive or a negative charge. So, it can operate 24/7.

So, we ran studies to determine the size of the batteries we could collocate; you know, what type of facility you need to keep the battery healthy. So in that regard all we're doing is using the hydro portion of that generation to manage the state of charge of the battery so the battery by regulation, says we did not increase the capacity of the project; we can use the existing intersection rights; and you know, run tests and certify it in the market.

PARTICIPANT: And so that's in the capacity of the plant, it is not changing; it's more like a redistribution.

MR. COPELAND: Right.

MS. SANGUNETT: Any other questions or comments about developmental resources?

All right. Let's go over some more information about study requests, submitting a study requests. It is very important that any study request follow these seven criteria. This is an abbreviated version, you can find the full, word for word, how it is in the regs, on Appendix A of the scoping document. Yes.

Be sure to describe the goals and objectives of the study. Explain the relevant resource management goals. Explain any relevant public interest considerations. Describe existing information. Describe the nexus between project operations and effects. So, how is the project directly affecting the resource. Explain proposed study methodology. And describe the level of effort and costs. And again, with the costs, we talked about how that can be very difficult but please just take a stab at it if you, if it's not something you know for sure. Do your best. But each of the seven criteria has to be addressed for it to be evaluated.

So, an important date to remember: May 7th. You can provide oral comments today or you can provide written comments and study requests by May 7th. It is very important to include the project number and sub-docket in all of your filings. You can either file by mail or electronically, which we discussed quite a bit. We prefer electronic filings. And again, this guide, this brochure tells you everything you need to know about electronic filing and provides a help line, online support, by email and phone number, if you need additional information.

It's, we also mentioned this before but eSubscription is the best way to stay informed and that is, you will get email notifications of any new filings or issuances. You can also search any current or existing documents on our database called eLibrary that are specific to this project. And again, you'll need to use P-2514. You don't need the sub-docket for that necessarily, but if you want to look at things very specific to this current proceeding, then you'll use the sub-docket, 186. Again, the brochure gives you more information about that.

We talked quite a bit about the mailing list so I'm going to skip over that but again, if you want to check to see if you're on the mailing list, I included it on page 26 of the scoping document. You can also look under eService, and if you want to be added, please send an email to efiling@ferc.gov. Include the project number and information that you want added or removed. All right.

And this is what our FERC online website looks like. The first thing you'll need to do is eRegister if you haven't done so already. If you are eRegistered then you simply have to log in and then you can do a search on the library for documents or you may file your comments to eComment which is a text version that has a 6,000 character limit or if you have a document that you want to upload or a longer set of comments, then you can use a Word file or a PDF and file that through eComment, and you can see that on the sidebar at the top of the list here. Ecomment, eRegister, eFiling, eSubscription, that's for getting the email notifications. eService, that's the mailing list. eLibrary, that's for searching for documents.

All right. Any questions? Well, that's it. Any concluding remarks or final questions, procedural or otherwise?

MS. WARDEN: Rachael Warden, FERC. Just e-mail on the procedural -- To add contacts on the intervention piece, that is correct that intervenors are required to serve any of their filings on all parties. We are in pre-filing now so there will not be any intervenors for a really long time because right now there's no proceeding to intervene in, so that will be after the license application is accepted. I was just trying to get it correct, when the service becomes important.

MS. SANGUNETT: You will know when the application is accepted when we issue a notice stating so and then that's the signal that you can intervene. I think it actually says that.

MS. WARDEN: There is a paragraph that talks about intervenors.

MS. SANGUNETT: Anything else?

All right. Shall we conclude? Here's my contact information if you have any further questions I have some business cards in the back.

And with that, thank you very much for coming, we are adjourned.

[Whereupon at 11:22 a.m., the verbal comment session concluded.]

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceeding before the FEDERAL ENERGY REGULATORY COMMISSION in the Matter of:

Name of Proceeding:

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Docket No.: No. 2514-186

Place: Galax, Virginia

Date: Thursday, April 11, 2019

were held as herein appears, and that this is the original transcript thereof for the file of the Federal Energy Regulatory Commission, and is a full correct transcription of the proceedings.

Dan Hawkins

Official Reporter

UNITED STATES OF AMERICA

FEDERAL ENERGY REGULATORY COMMISSION

OFFICE OF ENERGY PROJECTS

- - - - - - - - - - - - - - - - - - x

Appalachian Power Company : Project No. 2514-186

- - - - - - - - - - - - - - - - - - x Virginia

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Hampton Inn-Galax

205 Cranberry Road

Galax, Virginia 24333

Thursday, April 11, 2019

The public scoping meeting, pursuant to notice, convened at 9:00 a.m.

P R O C E E D I N G S

MS. SANGUNETT: All right. I think we can get started. In case you are lost, you're in the Byllesby-Buck scoping meeting for the Federal Energy Regulatory Commission, and my name is Brandi Sangunett. I'm the project coordinator and I'm working on terrestrial and threatened and endangered species. And I'll have my team members introduce themselves starting with Rachael Warden.

MS. WARDEN: Hi, everyone. I'm Rachael Warden. I'm the FERC attorney on the project.

MS. CONNER: I am Allyson Conner. I am doing recreation, land use, aesthetics and cultural resources for this project.

MR. CALLIHAN: Jody Callihan. I'm a fish biologist with FERC working on water quality and fisheries on this project.

MS. SANGUNETT: All right. Make sure everybody has signed in. Has anybody not signed in? I'll pass around the sign in sheet. All right. And that will help the court reporter who is going to be providing a transcript of the meeting today. It will be available in a couple of weeks. So, when you speak please clearly state your name and affiliation so that we will know who you are in the transcript.

Also, we have some handouts. Anybody need a copy of the scoping document? I have plenty of copies. Does anybody need one? Then we have the Guide for Electronic Information at FERC. And then we have our Hydropower Licensing Guide. All right.

The agenda for today's meeting is just to go over some information about who FERC is, why we're here for scoping, what the licensing process is about, and then we'll get an overview of the project from the applicant. And we'll go over the purpose of scoping. We'll discuss the specific resource issues that we are considering for our environmental assessment, and I'll tell you how to stay involved and informed, and how to submit your comments. And we'll go over some important dates for those comments, and then any questions about comments that you might have at the end.

FERC stands for the Federal Energy Regulatory Commission. It is an independent federal agency that regulates the interstate transmission of natural gas, oil, and electricity. FERC also regulates natural gas and hydropower projects, but only non-federal projects. So, for example, the Bonneville Dam, out west, is owned by the Corps and they regulate themselves. We are led by five commissioners that are appointed by the president and they are supported by 12 offices and a staff of about 1,500 employees.

And specifically, our team works out of the Office of Energy Projects in the Division of Hydropower Licensing. We also work very closely with the Division of Hydropower Administration and Compliance. They usually deal with the project after it's been licensed. And throughout the whole process, the Division of Dam Safety and Inspections is involved. And there, there's quite a few regional offices where the inspectors and engineers are usually located.

We derive our authority from the Federal Power Act, and we are directed to balance all of the uses of the resource. Licenses are usually issued for a term of 30 to 50 years and we are in charge of about 2,500 licensed or exempted projects throughout the country.

The purpose of scoping is to gather all available information for the relicensing of the Byllesby-Buck Project. It is required by NEPA, the National Environmental Policy Act. This particular project had a 30 year license which was issued in 1994, it expires on February 29th, 2024. The licensing process takes about five years so that's why we're getting an early start.

This particular project is going to be following the Integrated Licensing Process. This process has three founding principles, the first of which is early identification and resolution of studies. We also want to integrate all agency and tribal permitting processing needs including NEPA and the applicant's pre-filing consultation and federal and state permitting needs. We want everybody to get on the same page, on the same schedule, so we can proceed all together.

And the final principle is to establish time frames to complete the process steps so we can move along and everybody knows exactly when everything is required to be finished. This is what the full process looks like. The first, the top of the-- here it shows the pre-filing, just a general overview of that. And that begins when the applicant files their NOI and PAD. N O I stands for Notice of Intent and P A D is Pre-Application Document. The next step, which is what we are completing today is this scoping meeting and we collect comments from the public about the PAD and any additional study requests.

Then the applicant will develop a study plan and then that full process there takes about a year. And then once everybody agrees on the study plan, the applicant will conduct the studies and prepare the application, and that can take one to two years. Once the application files their license application with the Commission, that starts the post-filing process. Then FERC staff will review the application and make certain it meets all of the minimum requirements of our regs, our regulations. And we will seek further public comment on that.

Once we feel like we have all the information we need, we will begin our environmental assessment and once that gets issued we, again, ask for public comment. And the final step in the process is a license order from FERC. And for this particular project, a very detailed process plan is included in the scoping document, only for pre-filing, though. And that is in Appendix B.

Any questions on that before I move on? All right.

Some of the steps that we've already completed in this process are filing the NOI and PAD, the applicant did that on January 7th. FERC staff issued Scoping Document 1 which hopefully you have all seen. That was on March 8th. We're holding the scoping meetings now. And your comments on scoping are due May 7th. Very important date to remember. And then, next we'll have our proposed study plan be filed and if we need to we will issue, staff will issue scoping Document 2. There will be meetings to discuss the proposed study plan and you will be able to comment on those, and then the final determination for the study plan, by FERC, will be November 18th.

So, what is scoping? The purpose of scoping is to identify environmental issues or concerns. To look at any potential effects of the project on aquatic, terrestrial, and the human environment. The kinds of information we're looking for are existing information, such as resource reports or survey data. We also want any new information which can include comments from stakeholders or agencies.

It also involves determining what resources might be cumulatively affected. So, for example, if you have a river that has multiple dams on it and the fish is going through all of those dams, that would be a cumulative effect. All of the impacts from each of those dams. We also want to look for any reasonable alternatives to the applicant's proposal. That's a very important part of the NEPA process, is alternatives.

And finally we want to look at what resources we don't really need to spend a lot of time analyzing; they just aren't relevant to the project. So, think about these topics as we go through each resource area. We're going to go through each one in detail and discuss what we're thinking about putting in our environmental assessment. And we need your feedback on that.

These are the resource areas that we're going to focus on. Geology and soils, aquatics, terrestrial, T & E species, wetland use, aesthetics, cultural resources and developmental resources. And I think I'll turn it over to

Liz so she can give you an overview of the project and its developments. There we go.

MS. PARCELL: Good morning, everyone. Welcome back. I'm Liz Parcell and with me is Jon Magalski. We are the co-leaders, managers of this relicensing process. And we have several APCO people here as well as HDR who are here to assist us. I'll go over, if you have any questions, feel free to jump in and ask. And certainly if I can't answer them the people who are with me can.

We're going to run through the civil works, the recreation facilities, and operations. The licensee for this project is Appalachian Power Company. We are a unit of American Electric Power. Our currently Federal Energy Regulatory Commission license expires February 29th, 2024. And as Brandi mentioned, we filed our Notice of Intent and pre-application document on January 7th, 2019. We are using the Integrated Licensing Process. And we are FERC project number 2514. And be sure when you make any filings whatsoever to add the sub-docket number which is dash 186.

This project has two developments and it's located on the Upper New River in Carroll County, Virginia. The Byllesby development is located a nine miles north of the City of Galax, and the Buck development is located approximately 3 river miles downstream of Byllesby. And

43.5 river miles upstream of Claytor Dam, which is another one of the Appalachian Power Company's projects.

The Byllesby development operates in a run-of-river mode. It has an installed capacity of 21.6 megawatts. And the primary features include a concrete dam that's 528 feet long and 64 feet high. It has four sections of nine foot high flashboards. Five sections of nine foot high inflatable Obermeyer crest gates, and six bays of 10 foot Tainter gates. It has a 239-acre reservoir with 2,000 acre-feet of storage at normal maximum surface elevation, 2,079.2. It also has an auxiliary spillway which includes six sections of nine foot high flashboards. The powerhouse contains four vertical Francis turbine generator units. Here's a picture.

The Buck development operates in a run-of-river mode as well. It has an installed capacity of 8.5 megawatts, and the primary features include a concrete dam that's 353 feet long and 42 feet high. It also has a 1,005 foot long spillway section with a height of 19 feet topped with 20 sections of flashboards with a height of nine feet. Four sections of nine feet high inflatable Obermeyer crest gates, and six bays of 10 feet high Tainter gates. It also has a 66 acre reservoir with 661-acre feet of storage capacity at normal maximum surface elevation, 2,003.4. And this powerhouse contains three vertical Francis turbine generator units. There's also a 4,100 foot long bypass reach.

Here's a map of that area. There's six recreational amenities associated with this project, two of which Appalachian Power Company owns and operates and four which the Virginia Department of Conservation and Recreation manages. VDCR manages the Byllesby boat launch and then Appalachian Power Company maintains both the Byllesby canoe portage and Buck Dam canoe portage. The other three Virginia Department of Conservation and Recreation facilities include the New River Canoe launch, the New River trail picnic area, and the Buck Dam picnic area, which if you were able to go on the site visit yesterday, we saw someone at the New River Trail picnic area.

Here is a map of all of those facilities. The New River Trail parallels the river.

MS. CONNER: This is Allyson Conner with FERC. I want to just ask one quick question. Are the two canoe portages are the only facilities that are on APCO owned land, correct? Is that?

MS. PARCELL: Ownership, I'll have to verify.

MS. CONNER: Okay.

MS. PARCELL: But that's my understanding.

MS. CONNER: All right.

MS. PARCELL: We may know more. Or even Frank.

MR. SIMMS: That's my understanding.

MS. CONNER: Okay. That's one thing that would be great -- especially for the license application.

MR. SIMMS: Yes, that's one thing I wasn't sure about.

MS. CONNER: Right. Just making that clarification for future --. Thank you.

MS. PARCELL: With regards to operations. License article 401 requires that the project be operated in a run-of-river mode and have a one foot pool that we operate within. At Byllesby that's 2,078.2 and 2079.2 and then at Buck it's 2002.4 and 2003.4. License article 403 requires a minimum release of 360 CFS or inflows, whichever is less, downstream of the powerhouses. And the Buck development is approximately three miles downstream from the Byllesby development, therefore it is dependent upon flows from Byllesby; and so the operation of the two developments is closely coordinated. Tainter gate operation generation at both developments are remotely controlled from an AEP center located in Columbus, Ohio. And the operators are stationed at the control center 24 hours a day, 7 days a week. We also have plant personnel present at the Byllesby project four days a week, ten hours a day to perform routine maintenance. Gate openings are planned and based on monitoring of upstream USGS gauges. The gauge at Galax and the Byllesby and Buck forebay elevations. When inflow to either project exceeds the discharge capacity of the powerhouse, the Tainter gates are open to pass the excess flow. When inflows exceed the capacity of the Tainter gates, the inflatable Obermeyer crest gates are then operated followed by a manual tripping of the wooden flashboards.

The Byllesby emergency spillway is operated after releasing all available inflatable crest gates and wooden flashboard sections. Typically it flows in excess of 46,690 CFS. When a spillway gate at Buck development has been opened two feet or more, Appalachian is required to discharge flows through a two foot wide gate opening for at least three hours. And then Appalachian is required to reduce the opening to one foot for at least an additional three hours, after which Appalachian must close the gate.

If you have any questions, feel free to give me a call or email me, and I'll work closely with you. Thank you.

MS. SANGUNETT: So, if you want to follow along, we'll be going through section 4.2 of the scoping document, and that starts on page 13. I will go specifically through each resource area and what FERC staff has identified as issues to be examine, in an assessment with the NEPA document. So while we go through this list please keep in mind any additional issues or concerns and any identified issues that you might disagree with, and why.

MS. NORMAN: Brandi, would you like us to -- this is Janet Norman, Fish and Wildlife Service. U.S. Fish and Wildlife Service. Would you like us to interject while you are on that -

MS. SANGUNETT: Absolutely. Yes.

MS. NORMAN: - that little segment of the thing?

MS. SANGUNETT: Feel free to jump in any time and, yes, especially after I finish going through the bullets, that's a fine time to ask your --

MS. NORMAN: Do you want to go through all the bullets or each like, aquatic resources, you go through the bullets and then we can talk about it?

MS. SANGUNETT: Whatever you would like to do. However it helps you remember to ask your questions.

Yes. I'm very flexible about that. All right. So, let's start with geology and soils. FERC staff has identified that we would like to look at the effects of continued project operation and maintenance on shoreline erosion at the impoundments at each development.

MR. COPELAND: This is John Copeland at Department of Game and Inland Fisheries in Virginia. One question that we have is if you're going to study shoreline erosion, why are you not looking at sedimentation as well? We think sedimentation in these reservoirs in this particular region of the New River is important to examine.

MS. SANGUNETT: Okay.

MS. NORMAN: And U.S. Fish and Wildlife would agree with that comment, priority.

MS. SANGUNETT: All right.

MS. NORMAN: U.S. Fish and Wildlife Service also agrees there is a need for the shoreline stability assessment. MS. SANGUNETT: Oh, yes. We will also talk about additional study requests; and I'll just point out, too, that the applicant has proposed some studies which is one that Janet mentioned. And those are on page 16, and the shoreline stability assessment is one of the proposed studies that the applicant proposed. And it gives a bit of a description on that paper, as well.

MR. KITTRELL: This is Bill Kittrell with the Department of Game and Inland Fisheries. That brings up another point about the proposed study. In looking at the project boundary there is a gap between Byllesby and Buck in the boundary. And I think, I know our department is very concerned that that gap is there because I think there's project effects, including sedimentation and deposition of sediment between the projects. It's occurring but certainly maybe impacted by the project; I think that project boundary should include that middle section.

MS. SANGUNETT: I'm trying to pull that map up.

MS. NORMAN: U.S. Fish and Wildlife Service would agree with that project boundary extension to include those.

MS. SANGUNETT: So, you're specifically talking about this section right here?

MR. KITTRELL: Yes. You know, and on our field trip that we took you could see point, a large point bar; there's lots of sediments deposition, and so forth, in that area but there's certainly -- that would also impacts aquatic resources, and when you get to the recreation study I think there's also potential, there's a nexus there between the project and that area as far as recreation as well, so, I think our department certainly is going to make formal comments to recommend that that be included in part in the relicensing.

MS. SANGUNETT: All right. Liz, did you want to address why you guys decided not to include that in the project boundary?

MS. PARCELL: I would have to research it.

MS. SANGUNETT: All right.

MS. EWING: Hi, I'm Sharon Ewing. I'm with the Virginia Department of Conservation and Recreation with state parks, and we would also like to see that area included in the study.

MS. SANGUNETT: All right.

MR. GRIST: I'm Joseph Grist with the Department of Environmental Quality of Virginia. Same.

MR. HILL: I'm Rex Hill with the Carroll County Board of Supervisors. Does AEP own the lands like they do above dams that's got so much property above them? Do you own that?

MS. SANGUNETT: Yes. I'm not sure if - this might be the existing project boundary. What's currently licensed. So, it may not have been, like, an active decision by AEP to leave that out. We would have to research how the project boundary was chosen in the last license.

MR. KITTRELL: Bill Kittrell again, I think the fact that many times in the document, the PAD, and the scoping document, says the projects are run in sync. They're very in tune with one another, and because they do operate so closely together that, you know, I think there's a certainly a linkage there between the two projects, that small section between the projects. I think there's justification to include it in the project numbers.

MS. SANGUNETT: Yes.

MR. KITTRELL: Even without ownership of the land, there are certainly impacts to the river, the corridor, the riparian corridor, to --

MS. SANGUNETT: Ownership is not a requirement for inclusion in the project boundaries.

MR. COPELAND: John Copeland, Virginia Department of Game and Inland Fisheries. We need to know the difference between the project area and the area of project influence. So, if anyone from FERC can speak to that, that would be helpful.

MS. SANGUNETT: We struggle with that as well. But typically the project boundary provides a good guide for both of those. Not always, though.

Anybody else want to have a, add to that?

MR. CALLIHAN: I can speak to that a little bit. I mean, Jody Callihan with FERC. Technically the project boundary includes the project works that are necessary to operate the project. Then in our environmental assessment, our assessment of effects is not confined to the project boundary. It is and often extends beyond those red boundaries you see in that map. The project boundary. So, it in no way confines our analysis of project effects, which this, only includes the facilities and the waters that are necessary to operate the project. It's the idea of the project.

MR. COPELAND: So, this is John Copeland again. You know, the point you really have to look at is, ecologically where do you go to look at downstream project influence. Where do you go upstream to locate a reference point of what the river should look like without the influence of these dams. So, those are the kind of things that, we need to be thinking around.

MS. SANGUNETT: Yes. It's really important to identify that before the studies are conducted so everyone can agree on studies and be sure that everything was looked at.

Any more comments on geology and soils?

Moving on to aquatic resources. We have about six, seven different areas that we've identified that we want to tailor more closely in our Environmental Assessment. One is water quality including dissolved oxygen and water temperature, both upstream and downstream of each development including the Buck bypass reach. We want to look at the adequacy of existing minimum flows for each development. And currently that's 360 CFS. CFS being cubic feet per second.

MS. NORMAN: Or less.

MS. SANGUNETT: I'm sorry?

MS. NORMAN: Or inflow, right? The adequacy - so maybe that should be restated, if you're going to revise the scope. It's not clear for other -

MS. SANGUNETT: Good point.

MS. NORMAN: - other viewers. 360 CFS or less depending on inflow.

MS. SANGUNETT: All right. Good point. Sometimes I abbreviate the bullet; that does not look like that's the case.

MS. NORMAN: And saying where that current minimum flow is for. That it's only for, below, currently below - which section are you referring to? If it's only currently below the powerhouse, right? And it's not in the bypassed reach, or is this referring to the bypassed reach. We don't just say downstream of the development.

PARTICIPANT: Well, the license currently -- I'm sorry, go ahead. That is downstream of the --

MS. NORMAN: Of the powerhouse, right. But the summary doesn't indicate that and so someone who is getting a quick perusal of this, they could say, oh, they wouldn't know the distinction between the powerhouse and the bypassed reach. So, we should clarify.

MS. SANGUNETT: I should point out too, Jody is in charge of this resource area.

We will move on to the next one. We're going to look at whether there's a need for a minimum flow in the Buck bypass reach. We'll also look at the effects of continued project maintenance which includes periodic draw downs to replace flashboards and periodic dredgings of the sediments from the impoundment. We'll look at that -- especially fresh water mussels and spawning habitats of the fish. We will look at the effects of project operations on entrainment and impingement mortality of resident fish. Species of special concern, we'll look at those, impact on them, such as the Eastern Hellbender. And finally we will look at the existing ramping rate to prevent fish jamming.

All right. Again, I want to point out there are several proposed studies listed on page 16 and 17 that relate to aquatic resources. So, there's a water quality study proposed. A bypass reach aquatic habit and flow assessment study. Inflatable Obermeyer crest gate operational effectiveness evaluation. Those all relate to aquatic resources.

MR. COPELAND: This is John Copeland. Game and Inland Fisheries. Do you want us to talk about existing bullet points or do you want us to also talk about the studies?

MS. SANGUNETT: Aquatic resources.

MR. COPELAND: Okay, I'll start with this, and that is, I saw maximum depth for the reservoirs in the PAD but I didn't see average depth, so I wondered when was the last mapping of these reservoirs and what was that data based on?

MS. SANGUNETT: Mapping of the site?

MR. COPELAND: Yes.

MS. SANGUNETT: Okay.

MR. KITTRELL: Bill Kittrell with the Game Department. On the bypass reach, aquatic habitat and flow assessment, the language in there is talking about a desktop survey that really it's just assessing the current status it appears at the habitat, there's no biological impact, the bypass reach as it's really proposed to be done. I'm just wondering if that's something that was considered or something that should be evaluated to some degree.

MR. MAGALSKI: This is Jon Magalski. I welcome your comments, I'm delighted to look at it. I think we took the approach of, we can take a stab at it now or wait until we get your comments so we can start building that study plan.

MS. NORMAN: Janet Norman. U.S. Fish and Wildlife Service. I would agree that, that we definitely need to sit down and build that study plan and have an understanding of minimum flow options, because a lot of times we don't know some of the operational constraints that you have that would help us tailor a better situation.

I would also say, this is my first project where I started in at the PAD, and other projects I've been thrown in at the end result, and it hasn't been, it's not effective for us to be, you know, just throwing comment letters back and forth to each other where something is ruled out on a technicality or it wasn't mentioned earlier, I would much prefer if we could - this is especially at minimum flow from other projects. If we could work together early on to determine what operationally can be done, what ecologically needs to be done, in advanced instead of just trading letters back and forth.

MS. SANGUNETT: Sounds great. That's definitely FERC's goal.

MR. COPELAND: John Copeland. Game and Inland Fisheries. That brings up a question regarding how, procedures here; and that is if we're going to go through comment periods, we're going to have proposed study plans to go through. A meeting around proposed study plans?

MS. SANGUNETT: Yes.

MR. COPELAND: Then there will be an opportunity to comment?

MS. SANGUNETT: Yes.

MR. COPELAND: So my question would be whether there is going to be an collaborative process in those study plan meetings.

MS. SANGUNETT: Yes, there will.

MR. COPELAND: Can we accomplish that in one day as proposed in the document?

MS. SANGUNETT: I doubt that, and we certainly are not restricting anybody to one day. So we want you to have lots of conversations.

MS. CONNER: This is Allyson Conner with FERC. Oftentimes working groups can be formed, and so there can be more in-person groups or conference calls to accomplish this kind of thing for something that's a little bit more difficult to deal with that might not be solved in one day. So, that's definitely part of the process, again. AEP would take the lead on creating those, and then the agencies can also, you know, do as they do, in getting together; but the working group is really the most effective way especially if you feel like within that one study plan meeting day, you know, you didn't quite get where you needed to go.

MR. COPELAND: Right. This is John Copeland again. The question with regard to the ramping grates in the bypass reach, has there ever been any evaluation on what kind of flows those create in CFS, or do we have any idea?

MR. COLBURN: This is Fred Colburn, AEP. So, we have telemetry and when we open a gate, we know how many feet it's open and we have tables that correspond to CFS.

MR. COPELAND: All right.

MR. COLBURN: And it's either, you know, with the 360 minimum flow, it's either, we look at it as the project that --[noise interference] So, downstream of the project we're always past the minimum flow.

MR. COPELAND: So, can you restate that? Because I couldn't hear all of it, Fred, I'm sorry.

MR. COLBURN: When we open a Tainter gate, we have, we know how much we open up, it's one foot, 1.25 feet. We get feedback and we have tables that's built into our system so we know how much CFS goes with that gate opening.

MR. COPELAND: And so, this is John Copeland again -- the question would be: are you looking at total flow downstream of the project, then? In the turbine outlet as well as that?

MR. COLBURN: Yes.

MR. COPELAND: Okay. Relative to your minimum flow requirement?

MR. COLBURN: Correct. It's a combination through, you pass all the flows to the hydro plant. If the plant fails, it trips offline, we immediately open up the Tainter gates to meet that 360 CFS minimum flow.

MR. COPELAND: So, you're just operating those in concert with each other? John Copeland again, I guess the follow up question would be, how do we find out what those flow rates look like at different Tainter gates, Tainter gate openings? Because I didn't see any of that in the PAD.

MS. SANGUNETT: If you would like to see the table, it says, what does that coordinate with this --

MR. COPELAND: Yes. That information would be really helpful.

MR. COLBURN: And we have that information.

MR. COPELAND: All right.

MS. CONNER: Yes. So, if you want to provide that to FERC, we can add it to our eLibrary system and then it would be available to everybody. That would be one way to disseminate that information.

MR. CALLIHAN: Jody Callihan with FERC. So, for example, for the ramping rate, I guess it would be useful to know within that range from 0 to 2 feet open what the CFS release into the bypass reach would be. And then if you had some kind of bypass reach study, it could then link that flow to what does the bypass reach look like in terms of depth, velocity, coverage. How much is flooded, things like that as well.

MR. COPELAND: Yes.

MR. KITTRELL: This is Bill Kittrell with the Game Department. Also, I think, because of the complexity of that bypass channel, particularly below Buck, you almost would, I would think, would need to have some type of a demonstration flow at each, at, you know, various levels of Tainter gate openings to see what impact, because it's just such a complex channel and there's so -- best way I can say it, I guess -- you really need to visualize what's happening in that downstream channel. Because certainly a thousand

and five foot long spillway and the Tainter gates, you know, five to six Tainter gates, 33 feet wide, there's a lot of bypass channel that may be watered during certain periods obviously, and so it would be nice to see what kind of escape routes may be formed during different flows at different levels. Just something that we'll probably recommend when the study is being developed.

MS. NORMAN: U.S. Fish and Wildlife. We definitely agree with that, that seeing where the water is flowing over that complex downstream is important.

MR. CALLIHAN: Jody Callihan with FERC. In thinking about the bypassed reach and studies, I think we need to think about the overall goal, what we want that bypassed reach to look like and how we want it to function. Because right now, except during the spring it's largely the water. And whether stranding is the main issue, or we want that to be whether the agencies want that to be some kind of permanent habitat for aquatic species, I think that's important to keep in mind.

MS. NORMAN: U.S. Fish and Wildlife Service. And quantifying the loss of that existing habitat is important to us. If you can make sure that is in the document and how that can be mitigated and replaced in the balancing of power, of ecological function.

MS. SANGUNETT: Okay. Any other aquatics

comments or questions?

MS. NORMAN: Probably.

MS. SANGUNETT: All right.

MS. NORMAN: Let me look through 10 pages of notes here. All right.

So, Janet Norman, U.S. Fish and Wildlife, talking about the bypass reaches, insufficient water, inadequate pool connectivity as Bill Kittrell has mentioned. The reaches are sediment starved, lacking suitable spawning habitat, or habitat for Eastern Hellbender or endemic Candy Darter within the bypass reach, if that is important to us.

MS. SANGUNETT: Is that [] that you're referring to?

MS. NORMAN: This is our own -- we have been informed by Don's letter informed by the Candy Darter recovery outline, as formed by DGIF's surveys. This is just my own notes of what not to forget.

MS. SANGUNETT: Okay.

MS. CONNER: I just wanted to refer everyone to that assessment you were looking at.

MS. NORMAN: Yes. Right, so Don Orth of Virginia Tech, emeritus professor, it's a very important consideration that he had laid out, that we will refer to.

MR. CALLIHAN: Jody Callihan with FERC. Do we have, it would be useful if there's some new information on

Candy Darter distribution and plans, recovery plans are in any kind of comprehensive plan? If those could be filed on the record that could be useful for us to have.

MS. SANGUNETT: Sure.

MR. CALLIHAN: Sometimes we don't have access to all aquatic struggles at FERC.

MS. SANGUNETT: All right.

MR. KITTRELL: This is Bill Kittrell. There is numerous ongoing projects that we're funding right now through state wildlife grants and other sources of funding that are ongoing. So, that may be useful information.

MS. SANGUNETT: Yes. Absolutely.

MR. KITTRELL: Since the, obviously, the New is, you know, is the only watershed where it does occur in the Upper New, in Virginia.

MR. COPELAND: This is John Copeland again. Game and Inland Fisheries. Regarding the water quality studies. I think it's important that we look at these projects in the context of their temperature influences on the overall temperature regime of the New River, and because there's a number of endemic cold water species that inhabit the New River that could be displaced by temperature effects alone. And then in addition, I think, the water quality study as proposed is inadequate in terms of not examining things like turbidity or chlorophyll A levels.

MS. SANGUNETT: All right. Just to clarify, you're saying that you feel that water quality is a cumulatively affected resource?

MR. COPELAND: Yes.

MS. NORMAN: Yes. We would agree that there's a whole number of cumulatively affected resources that are not included in -

MS. SANGUNETT: That haven't been identified by FERC staff?

MS. NORMAN: That haven't been identified by FERC staff as cumulative resources. To also beyond the water quality -- Hellbender, crayfish, and dragonfly, odinate habitat production and transport of organic materials, increased water temperature and reduced dissolved oxygen as John has said. So, a whole number that we will be listing.

MS. SANGUNETT: So, water quality in general, and then aquatic habitat is another cumulatively affected resource?

MS. NORMAN: Yes.

MS. SANGUNETT: All right.

MR. CALLIHAN: Jody Callihan with FERC. Janet, can you explain, so, Byllesby-Buck is one project. I guess, can you explain why you think there are cumulative effects on other resources and what other activities in combination with the project may lead to those?

MS. NORMAN: On the downstream, upstream functioning of the New River is what is the cumulative effect that we see of this, widespread impacts of the project.

MR. CALLIHAN: I just didn't know what other effects other than the project that you were thinking about that could add to the project itself.

MS. NORMAN: Okay. I also wanted to mention in the aquatic resource section -- and John and Bill from DGIF had mentioned somewhat that the accumulation of fine sediments in the impoundment that smothers benthic habitat and created unsuitable conditions for most fresh water mussels and an accumulation of PCB's in the sediments.

MR. KITTRELL: This is Bill Kittrell. I know there was, at the previous relicensing there was an aquatic resource survey, a general survey that was done throughout, I think, upstream, maybe between, and downstream. There's no proposal, to my knowledge, I'll go back and revisit that and actually do another comprehensive resource survey, and I think it would be useful since you had that baseline data from the relicensing done before and with, you know, all the effects of the project of the last 30 years, go back and look at that, you know, do a comprehensive aquatic resource survey which would include fish and crayfish, hellbenders, et cetera, throughout -- mollusk, throughout the area of this project influence. I think it would be useful to have that information to see. I know there was some work done in '97. Was that done, I think, as a result of maybe dredging, some dredging work?

MR. CALLIHAN: The '97 was the ramping rate.

MR. KITTRELL: Ramping rates.

MR. CALLIHAN: The sample would be Buck bypass reach following three different spill events in the spring, I believe like, March through May of '97. Like, as soon as the snow was over, they went out and electroshocked in the Buck bypass reach, three different occasions.

MR. KITTRELL: That would also help inform if we're doing a study on the bypass reach, knowing what's there and, you know, a comprehensive list of what's being impacted or what maybe has been impacted in the past by those operations, I think it would be useful to have that.

MS. NORMAN: Fish and Wildlife Service would agree with that. Using a variety of methods across all seasons or at least during the spring and fall.

MS. SANGUNETT: Using what methods, I'm sorry?

MS. NORMAN: A variety.

MS. SANGUNETT: A variety.

MS. NORMAN: Across all seasons, or at the very minimum, spring and fall.

MS. SANGUNETT: And by methods, you mean electrofishing, or?

MS. NORMAN: Yes. Depending on access ability --

MS. SANGUNETT: Right, because it's kind of --

MS. NORMAN: -- difficult to use a boat where you can't get a boat in there. So that, those fish surveys and multi surveys are going to be useful for informing, are going to be needed for informing the entrainment study and other things.

MS. SANGUNETT: I just want to, this is Brandi with FERC. Obviously you know my voice by now. I just wanted to revisit the sediment issue. Obviously this is having an effect on aquatic habitat and wildlife quality. But the New River is known to have a heavy sediment load in general, so what are your thoughts about isolating, sort of, background noise, from specific project's effects on adding to sediment issues? It seems as though they are mostly just dealing with the sedimentation that comes their way, from dredging. I'd like to have a bit of a discussion about that and see what you guys think about what's going on in the river in terms of sedimentation.

MR. COPELAND: This is John Copeland. I'm not sure I can address that question adequately, but I can say that there's a great deal of sediment liberation by operations that impacts aquatic habitat downstream. It can be observed on a regular basis as a result of these project operations.

MS. SANGUNETT: So, it looks like sedimentation might need to be addressed as a cumulative effect. As cumulatively affected. Soils and geology might need to be cumulatively, addressed as a cumulatively affected resource. I'm not sure how you say that.

MS. NORMAN: We would agree.

MS. SANGUNETT: Does everyone agree with that?

MS. NORMAN: Yes.

MR. COPELAND: So, this is John Copeland.

MS. SANGUNETT: So that's pretty challenging. Sorry. To isolate project effects from what's already going on with the river.

MR. CALLIHAN: Jody from FERC. In relation to that, started thinking because it's run-of-river that they're just simply passing whatever sediment is in the river downstream.

MS. SANGUNETT: But it can accumulate behind the dredge periodically, but yes. Something to think about. It is a challenging issue.

MR. CALLIHAN: I guess the sedimentation behind the dam leads to the installation of the dam itself a hundred years ago.

MS. SANGUNETT: Right. Exactly. So, isolating the baseline from the effects of the project's operations. It's really important.

MR. MAGALSKI: Jon Magalski with AEP. Just to clarify on the dredging. We don't perform maintenance dredging. We've only performed dredging when there's been an issue in the intake. Once in '97. I don't know the background of why that dredging was done.

MS. SANGUNETT: Typically an emergency response?

MR. MAGALSKI: In '97? I'm not sure of the history of the '97 dredge, but the 2014 dredging was done because of a large deposit of sand in the intake because of extremely high water. So, just to clarify, we don't have a routine maintenance dredging program.

MR. THRASHER: Jim Thrasher for AEP. The '97 dredging was done because the intake structure of Byllesby had filled up because of lack of a proper trash raking system. So, we hydraulically dredged 20,000 cubic yards of material out of in front and pumped it upstream to create the current wetlands that are above Byllesby. It was, that's what it was for, and that was the only two dredging operations that occurred there.

MS. SANGUNETT: All right. Maybe you could clarify a little bit; on our site visit, we saw that the trash racks were used for sediment control also, is that dealing with sediment accumulation? Can someone from

MR. THRASHER: The trash rake?

MS. SANGUNETT: Yes. The Yes. Can we maybe talk about that a little bit more so we can get some clarification on that for everybody, how that works?

MR. THRASHER: Jim Thrasher, AEP. Most trash gates will operate directly in front of the intake screens. Go straight to the bottom, bring the material up and deal with it. Either put it in the dumpster or pass it downstream. On this particular project, that was creating only a ditch and it was so much sediment coming downstream to us, being fed to us, that it was sedimenting in and we were having water cascade into the ditch, and the effect on production was negative, very negative.

MS. SANGUNETT: And this is in the Byllesby Project?

MR. THRASHER: Byllesby Project. So, we researched the market of trash raking systems and found one that's called a drag rake which goes out into the forebay any distance you want, drops to the bottom, to the forebay bed, drags along that, and then comes up to the intake screen. So yes, it's getting debris and whatever else is mixed with the debris and it's bringing it in to the trash trough. If it's too, if it's small enough to go through the intake screens, which are about, it's in the PAD, probably two-and-a-half to three inch center-to-center opening. Then it will pass through the units.

MS. SANGUNETT: So, you're able to pass some sediment downstream then, in that manner?

MR. THRASHER: Yes.

MS. SANGUNETT: Okay. And you do not have a similar system at Buck?

MR. THRASHER: We do but we don't have a sediment problem at Buck. It's just, it's also a great trash raking system, so to match the systems to both plants, that's what we elected to do.

MS. SANGUNETT: All right. And so by using the system you're able to deal with the sediment on a regular basis rather than having to do dredging.

MR. THRASHER: Sediment in equals sediment out; that's what we're trying to do.

MS. SANGUNETT: All right.

MS. NORMAN: Except for the larger sized materials. Is that correct?

MR. THRASHER: That's correct.

MS. NORMAN: So, anything -

MR. THRASHER: So, anything that will not pass through the intake bars

MS. NORMAN: So, anything larger than two-and-a-half inches -

MR. THRASHER: Or whatever that spacing is, I don't remember the spacing.

MS. SANGUNETT: That would go through the sluice gate, right?

MR. THRASHER: That would get into the sluice way and then be passed on downstream as you saw yesterday.

MS. SANGUNETT: So, everything is going downstream.

MR. THRASHER: Yes. Except manmade material we try to extract.

MS. SANGUNETT: All right.

MR. THRASHER: Tires. Particularly tires.

MS. SANGUNETT: Plastic bottles.

PARTICIPANT: Brandi, are you, I have a question.

MS. SANGUNETT: Sure.

PARTICIPANT: I didn't want to get off of geology and soils until we were square.

MS. SANGUNETT: All right. I'm good.

MR. KITTRELL: I will say, this is Bill Kittrell, in terms of sedimentation, although dredging has only been done a couple of times, that was done during the - those two times were done during the 30 year license, and look at the wetlands that was developed as a result of that. So, operationally, handling sediment is going to be an ongoing problem.

MS. SANGUNETT: Yes.

MR. KITTRELL: Whether they are receiving it from upstream, or, you know, which I would gather most of it is coming from upstream. Operationally, they got to handle the sediments and what to do with it in creation of wetlands or passing it, or hauling it offsite. One of those options is about the only thing they can do with it, so, you know, it does need to be considered, I think, in the study.

MS. SANGUNETT: So, you know their current method of their trash rake system is not fully addressing the problem, or?

MR. KITTRELL: Well, it's currently addressing the problem but it didn't address, I mean, you know, I don't think that - of course, that was not implemented until after -

PARTICIPANT: After the hydraulic --

MR. KITTRELL: -- 2014, right?

MS. SANGUNETT: All right.

PARTICIPANT: In '97 when we did the hydraulic dredge we also installed the new trash -- well, the trash raking you currently see. That was new in '97.

MS. SANGUNETT: Good to know. So, that was installed in what year, again?

PARTICIPANT: '97.

MS. SANGUNETT: '97.

MR. KITTRELL: But they still had to do a hydraulic dredging project in '14.

MS. SANGUNETT: Right.

MR. KITTRELL: That was, the one in '14, the trash was a result of the flood of '13. We lost the plant, the trip -- I forgot, I think it was a 45,000 CFS flood and we, it flooded the powerhouse, so all that sediment went into our turbine pits and it encapsulated all the moving equipment. We couldn't, the trash rake would do no good. We couldn't, we had no movement of water, so we couldn't pass water through the turbines; so we had to extract that material, and we went and Jon could comment on that, we put it into bags that would leech out the liquid portion, capture the solid portion then we disposed of the solid portion on our own land. But it was a, you know, a perfect storm, I guess. Will that reoccur? We don't know.

MS. SANGUNETT: -- in a 50 year period.

MS. NORMAN: In a 50 year period it's likely that that will reoccur.

MS. SANGUNETT: And this is part of a wetland mitigation project as well. When you use that dredging material to create a -

PARTICIPANT: We did not create a wetlands.

MS. SANGUNETT: Not for that one.

MR. CALLIHAN: That was hauled. That was hauled offsite.

PARTICIPANT: Well, higher elevation on our own property near the site. Within a mile.

MS. SANGUNETT: All right.

MR. KITTRELL: And I believe the '97, Bill Kittrell, again. I believe the '97 project was not necessarily mitigation, it was disposal, just a disposal, it wasn't something you were required to do.

PARTICIPANT: No. We did it. We asked permission. MR. KITTRELL: That was allowed to be done with the spoil from the dredging project.

PARTICIPANT: It was a collaborative effort.

MR. KITTRELL: So, you know, to call it mitigation is probably not exactly correct.

MS. SANGUNETT: So, it's not technically the wetland mitigation program.

MR. KITTRELL: Right. Right.

MS. SANGUNETT: I got you. All right. And you worked with Virginia DGIF on that? Or DEC or who was involved in that?

PARTICIPANT: One other bit of information, the reservoir was last surveyed in '89.

MS. SANGUNETT: All right.

PARTICIPANT: That was the last.

We've done some others just to find out so we can get barges in and out of there. We didn't do the entire forebay. We only did directly in front of the spillway gates for the Obermeyer work. We wanted to know the depth so we could determine what size footprint a barge can we put on the pond?

MS. SANGUNETT: So, that information would be really useful to everyone. Any studies that you've done, surveys or any studies that you did on the feasibility of the trash rake system. If you have anything like that that you can share with everyone that would probably be very useful. So, if you could submit that onto eLibrary, as well, so then everyone will have that information.

MR. CALLIHAN: Jody Callihan with FERC. I have a question. So, for dredging, you would have to go through a DEQ and a Corps permit to conduct that dredging; so presumably any materials would be tested and whatever you removed would be tested for PCB's, let's say?

MR. MAGALSKI: Yes, this is Jon Magalski, again. It would all be permitted through the Corps and/or DEQ, and in the 2014 dredging we did test the materials --

MR. CALLIHAN: So, there would be a mechanism in place to test for any kind of toxicity in the materials that you removed and potentially modified?

MR. MAGALSKI: Correct. That's usually a permit requirement, to test that, to determine how we're going to use it, whether it's beneficial reused or disposal offsite.

MR. SANGUNETT: And, again, if you could share that information online that would be very helpful so everyone is on the same page.

MR. COPELAND: This is John Copeland, and I wanted to back up to these aquatic resource surveys and just mention that there's research by Hill and Webster on the New River about how important aquatic vegetation is to the productivity of the system. When you do these fall surveys, I think it needs to include information, basic information about aquatic vegetation beds. There's particularly a lot of interest around things like river weed as an important component of that productivity.

And Hill and Webster's research showed that the decomposition of this aquatic vegetation in the New River every Fall provides a very important pulse of nutrients to the system to supplement what periphyton does through the spring and summer. So, I wanted to make sure that was mentioned and considered as well.

MS. NORMAN: U.S. Fish and Wildlife Service would agree with the importance of that survey and study to plan for restoration of the aquatic river weed.

MS. SANGUNETT: So, one particular species?

MS. NORMAN: The most common species, but the other aquatic vegetation as well.

MS. SANGUNETT: All right.

MR. COPELAND: This is John Copeland again. Sorry to interject, Janet.

MS. NORMAN: Yes. Please, do.

MR. COPELAND: Water willow, for example, Justicia Americana; very important in crayfish production to fish habitat and is quite easily propagated and planted as well. We just need to know whether the operation of these projects are impacting that particular habitat. Because it exists upstream and downstream of the project. And also I can point you to a published paper in the Southeastern Naturalist Journal that I was an author on, where we looked at aquatic vegetation from Buck Dam down to Alistonia, in that reach. So, that's a good baseline, a piece of information.

MS. SANGUNETT: Yes, please share that.

MR. CALLIHAN: Are those plants, do they need permanent inundation to thrive? Do they need to be permanently inundated?

MS. SANGUNETT: Willow does not.

MR. COPELAND: Water willow is quite resistant to drying. So, they can take inundation and then desiccation regularly. And you see it's cycle, water willow cycles through the fall and it starts to die back and it comes back the next spring. It grows particularly well on its own.

So, there's a lot of spread of it and the root systems are very important for things like crayfish.

MR. KITTRELL: They also, this is Bill Kittrell, it also, those beds tend to hold those stream banks more intact which is critical, in particularly Carroll County we have such sandy, erodible soil.

MS. SANGUNETT: All right.

MR. CALLIHAN: Jody Callihan from FERC. I have a question in line with the aquatic resources surveys and what the agencies are thinking. I mean, there was some pretty frequent, some pretty intensive sampling for the last relicensing. Six samplings per month from, you know, May through October, and I think we just need to keep in mind what we may expect. What may have changed since that time reasonably. Since there is a pretty good base already of information of the species that are out in the vicinity of the project.

MS. NORMAN: I would definitely say that we want to see the changes over the past 30 years. So, that that informs us to the current situation.

MR. KITTRELL: I don't know if they actually did Hellbender and mussel surveys 30 years ago or not.

PARTICIPANT: Mainly fish.

MR. KITTRELL: Mainly fish. And that's why I'm thinking a comprehensive survey would be very useful to provide a little more information.

MR. COPELAND: This is John Copeland. Ecologically speaking, of course, we've got to look at reference -

MS. NORMAN: Reference sites, yes.

MR. COPELAND: And there is some information further downstream and there's some information upstream. These were surveys that were done around the Fries project. So, there is some ancillary information that could be brought to bear in that regard.

MR. KITTRELL: And that was very recent information in Fries so that's very, I think that would be very useful to have as reference.

MR. COPELAND: A biological survey report from the Fries project could give us that information.

MS. SANGUNETT: Also, one of you guys installed your Obermeyer gates, I think you mentioned that there were some mussels that you salvaged? I don't know if you identified species or anything like that when we did that.

MR. MAGALSKI: Yes, this is Jon Magalski with AEP. As part of the drawdown we did mussel salvage, recovery efforts. And in the Byllesby pool we found four live mussels and in the Buck pool we found two live mussels.

MS. SANGUNETT: So much.

MR. MAGALSKI: In Game and Fish we're actually on site, I think, to observe that recovery. I think as far as mussels go, I think we have a pretty good wealth of information on mussels upstream and downstream of the project based on surveys that we've conducted for Claytor, and these are ongoing surveys. There's a site downstream from Buck that we periodically surveyed over the last several years. And then with the Fries information on mussels I think we have a pretty good handle on mussels up that way.

MS. SANGUNETT: All right.

MR. MAGALSKI: And even downstream of the Claytor project. In general though, the New River has a pretty low mussel abundment. And then also part of that drawdown we did habitat surveys for Virginia spire and also follow up actual surveys for Virginia spire when we did not find any during that survey.

MS. NORMAN: Virginia Spire straddles the aquatic resources and the endangered species things.

MS. SANGUNETT: Can we hold off for a minute?

MS. NORMAN: You want me to hold off on that? Okay.

MS. SANGUNETT: We'll talk about that in the T and E species.

MS. NORMAN: Got it.

MS. SANGUNETT: Just so we don't confuse anybody about -

MS. NORMAN: Yes.

MS. SANGUNETT: Our geology and soils got, kind of, thrown in the mix there but it seems to be pretty tied in with aquatics. Any other comments on aquatics before we move on?

MR. CALLIHAN: I have some questions along that line.

MS. SANGUNETT: All right.

MR. CALLIHAN: And maybe fortify on the record-- Jody Callihan with FERC -- and some questions on stocking practices. The Walleye management plan, the Walleye management plan for the New River. That would be very useful if we had that filed, on the record, because that's one thing we definitely need to take into account for comprehensive planning purposes is any kind of management plan for the waterway so that would definitely be useful to have.

In terms of fish stocking, muskies and walleye. It talks about the muskie stocking has been discontinued downstream of Claytor; but is there any, what current stocking of any species occurs in the vicinity of the project?

MR. KITTRELL: There have been various stocking efforts over the years, whether it be a walleye, muskie, even channel catfish I think have been stocked; crappie which in some portions of the country that would be called croppie. That would be the only species, Jon might jump in but stocking efforts at Byllesby and Buck probably would be walleye, muskie, I know catfish and probably crappie stocked in the past. Right now there's, to my knowledge, there's no stocking taking place right now.

MR. COPELAND: Actively.

MR. KITTRELL: Actively.

MR. COPELAND: This is John Copeland. The last stocking was a walleye stocking we did collagically in Byllesby Reservoir. That would have been probably 2017.

MR. CALLIHAN: I know I looked at the website. I think 2014 was the last thing listed. I guess it will just be useful to know what, over the term of a license that we would expect some stocking in this area, presumably.

MR. KITTRELL: I will say this. Bill Kittrell again, Buck is extremely important to our statewide stocking efforts and the operation at Buck. It helps facilitate brood stock collection downstream of the reservoir. So, we actually use the operations at Buck as an integral part of our brood stock collections for statewide muskie production.

MR. CALLIHAN: Walleye, muskie or?

MR. KITTRELL: Walleye.

Walleye production, I'm sorry.

MR. COPELAND: Yes, this is John Copeland. It's hard to underestimate the value of the New River walleye fishery just for its significance on a genetic basis alone but also in terms of statewide production of walleye for other rivers and reservoirs. It's a key component and the fact remains that these reservoirs probably cover up what would have been historic spawning habitat. And that has to be looked at.

MR. CALLIHAN: So, the brood stock, by and large, walleye brood stock are collected in the tailrace of Buck for production purposes?

MR. COPELAND: Yes.

MR. KITTRELL: That's one of the primary areas.

MR. COPELAND: One of the primary areas, so there's two principle spawning areas for New River Walleye that were identifying in George Palmer's research. And those were the Poncher Falls area below 77 and also in the Buck Dam vicinity. And typically, as close as we can get is the pool at Ivanhoe; unless we have the right flow conditions, we can't get up into the tail race area to collect brood stock, but when we do, they are quite concentrated.

MR. CALLIHAN: Over the term of a license there will probably be some walleye fingerlings and muskies, like 9, 10 inch sized muskies stocked in the area of the project.

MR. COPELAND: Yes. And another important point about Byllesby is that Byllesby to Fries Dam creates an important local fishery for people in Galax and the Carroll County area and Fries, as well as a little broader reach. They concentrate on that fishery and unless we have adequate production we can't consistently stock that segment.

MR. CALLIHAN: You mean for walleye?

MR. COPELAND: Yes, for walleye. Yes.

MS. SANGUNETT: Any other aquatic resource discussion points?

MR. COPELAND: I hate to be a -

MS. SANGUNETT: No, go ahead, that's why we're here.

MR. COPELAND: This is John Copeland again. One thing that I saw that looked to be a missing element from your SD1 that was covered in the PAD is a wetlands and riparian habitat characterization. In the PAD it's suggested as a study but I didn't see it in SD1. And particularly -

MS. SANGUNETT: That would be an oversight on my part if that's the case.

MR. COPELAND: I think it's particularly

important when we look at wetlands and riparian habitats that we look at ways that these areas could be enhanced for wildlife use and particularly waterfowl use and people that would want to hunt the waterfowl. So, these are things that we would definitely want to look at as an agency.

MS. SANGUNETT: All right.

MR. CALLIHAN: John, when you were out of the room, I had mentioned about, we could have the walleye management plan on file for the project, that would be useful.

MR. COPELAND: Yes.

MS. NORMAN: I'll upload it as a comprehensive plan.

MR. COPELAND: This is John Copeland again. That brings up a couple of procedural questions on my part that weren't particularly clear; but if the management plan is in the PAD it does not get carried over into the FERC documents, is that -

MS. SANGUNETT: Not necessarily.

MR. CALLIHAN: Well, if it's, just that it's in the record? Are you talking comprehensive plans, or just the fact that it's in the record?

MR. COPELAND: So, like for example, a wildlife management plan. It's in the PAD, it's in the list of resources for the PAD, so how do we make that part of the process beyond that?

MR. CALLIHAN: Yes. Like, if it was an actual, the actual document was included in the PAD then it would already be part of the record; but since, right now, it's only a reference in there, so if we could, like, attach the actual document as an eFiling to say, comment, you could call it comments on the PAD, even, or additional information for the PAD and you could just file it under our eFiling as an attachment and say, 'Please consider this walleye management plan as part of the record.'

MS. CONNER: This is Allyson Conner. I sent out an email to Janet explaining how to file a comprehensive plan and it's through the eFiling, and it's a report on the project and then it gets a different docket number; so it would be it's own plan and then we have one of our staff members review them and decide, like, if it's accepted as a comprehensive plan. And if it's not, then it becomes topic specific plans. It becomes, if it is accepted then it goes on our list and then it is always maintained within our database of comprehensive plans.

MR. CALLIHAN: For the state of Virginia, right?

MS. CONNER: Yes.

MR. KITTRELL: If you could send that to DGIF as well.

MS. CONNER: Okay.

MR. COPELAND: This John Copeland. So, with regard to relevant literature then, is that filed the same way?

MS. SANGUNETT: Yes.

MR. CALLIHAN: Yes, you can file that the same way, just as a comment or additional information.

MR. COPELAND: For example, any of the walleye literature that we published for --

MR. CALLIHAN: Definitely.

MR. COPELAND: -- the aquatic vegetation paper, things like that.

MR. CALLIHAN: All that.

MS. SANGUNETT: Yes.

MR. CALLIHAN: We don't often have ready access to those.

MS. NORMAN: And those would be filed in the same way as our regular comments?

MR. CALLIHAN: Yes, regular comments.

MS. SANGUNETT: And that way everyone has access.

MR. CALLIHAN: As part of the record; that way anybody can see them. Part of the public record for the project.

Mr. COPELAND: This is John again. We kind of diverted this over to more procedural things, let me ask a couple other procedural things. We have this distribution list in the PAD and then we have this mailing list in the scoping document.

MS. SANGUNETT: Yes.

MR. COPELAND: I'm still trying to sort out --

MS. SANGUNETT: Bane of my existence.

MR. COPELAND: I'm still trying to sort out --

MS. SANGUNETT: You and me both.

MR. COPELAND: I didn't even see, maybe a quick review, but I didn't see Department of Game and Inland Fisheries in the one in the scoping document. The mailing list.

MS. SANGUNETT: So, how it works is we have a, what's the word I'm trying to get, a leftover mailing list that is considered the official FERC mailing list, and it comes from previous proceedings; and you can search that yourself on our, what was that, E?

MR. CALLIHAN: eService.

MS. SANGUNETT: eService. Yes. So, there's a service list and a mailing list, and they're used differently and they have different people on them and it's the mailing list that you want to focus on.

MR. COPELAND: All right.

MS. SANGUNETT: If you're on the mailing list then you will get hard copies of everything. But we recommend everyone eSubscribe because then you will get emails notifying you instantly of any, or nearly instantly, of any filings added to the document.

MR. CALLIHAN: Which we do; we're all getting the eSubscribe.

MS. SANGUNETT: I know it's confusing.

MR. COPELAND: It's just the documents, you know, there was a volume of literature still on my shelf from the Claytor project. And then I have a box for each one of the others.

MS. SANGUNETT: Yes.

MR. COPELAND: You know?

MS. SANGUNETT: So, if you see a problem with something on the mailing list and you want changes made, I have a slide about that but there's an email that you send the message to, I can't remember off the top of my head, I'll show you. And you have to provide the project number and ask to be removed or added or having a name added or removed. So, what I did for the scoping document is I looked at our mailing list and I looked at the applicant's distribution list, and if there's anybody on the distribution list that was not on the main list, I created a supplemental mailing list. But that's only a one-time deal, so for any future documents you'll need to make changes to the mailing list.

MR. COPELAND: All right. So, that means hard copies.

MS. SANGUNETT: If you want a hard copy. Otherwise you can eSubscribe and get electronic copies.

MR. COPELAND: That makes sense because I get a hard copy of SD1 by mail. And then one other thing is whether these Powerpoint presentations are available.

MS. SANGUNETT: I can certainly share it with you or I can even add it to the eLibrary on the docket for this project, if that would be helpful.

MR. COPELAND: Wherever; it would just be helpful to have those to refer to. Pretty immediately.

MS. SANGUNETT: Again, most of this information is in the scoping document but some of the procedural things, I think, are presented maybe in a more condensed manner on the slide so I'm happy to share that with everybody.

MS. NORMAN: Janet Norman, U.S. Fish and Wildlife. I have a question for our FERC lawyer. So, my understanding is that the service list becomes important down the road into dispute resolution or other -

MS. WARDEN: Hearings.

MS. SANGUNETT: Intervenors.

MS. WARDEN: Intervenors. Yes.

MS. NORMAN: Intervenors, so that we have to send our notice of intervention to that service list. So, making sure that's important. That's up-to-date and accurate comes into play later on?

MS. WARDEN: Yes.

MS. NORMAN: So, John, we want to check that all the important Virginia folks are included in the service list.

MS. WARDEN: Right. Intervenors are allowed to, at the end, once the license order is issued, if there's something of a dispute, if you have intervenor status, then you can bring that up for rehearing. That's what the service list and intervention, in a nutshell, is.

MS. SANGUNETT: Very good questions, everybody.

MR. COPELAND: So, this is John Copeland. I had one other question.

MS. SANGUNETT: Okay.

MR. COPELAND: Sometimes the questions come from the PAD, sometimes they come from scoping.

MS. SANGUNETT: Okay.

MR. COPELAND: But I see them as one thing. All right?

MS. SANGUNETT: Yes.

MR. COPELAND: So, Article, let me see which one. It's Article -

MS. SANGUNETT: So you're looking at the list of current license requirements in the PAD?

MR. COPELAND: Right. I'm looking at section 4.5 in the PAD. And I'm wondering where the ramping rate assessment plan that was approved by the FERC order in 1995 is located.

MS. SANGUNETT: Well, it's in eLibrary somewhere, but it's probably on microfilm.

MR. CALLIHAN: I had some of those requested to get it converted to microfilm and I believe, now, that that plan is on eLibrary -

MS. SANGUNETT: As a PDF?

MR. CALLIHAN: As a PDF. As a text document, at least. And the actual ramping rate assessment, the study that was done in 1997, the results of that study are also on there. But if you send me an email, I can provide you with, kind of a quick link to those.

MR. COPELAND: All right.

MR. CALLIHAN: That will keep you from searching because it does take some digging.

MS. NORMAN: Is it a different docket number?

MR. CALLIHAN: No, it's the same main docket, so it's still 2514, but it may have a different sub.

MS. NORMAN: May have a different sub.

MR. CALLIHAN: So when I search on eLibrary I usually just use the main project number without the sub, because I want the whole shebang.

MS. SANGUNETT: The subdocket number is important for when you're filing something, comments or -

MS. NORMAN: Right.

MS. SANGUNETT: That way it gets assigned to the proper proceeding.

MS. NORMAN: Okay. I've done searches on just the main docket number and sometimes it says 'no results' which is extremely frustrating.

MS. SANGUNETT: Yes.

MR. CALLIHAN: Yes.

MS. NORMAN: Do you have to put a dash and then -

MS. SANGUNETT: You have to have P dash. You must have P dash, then the number.

MS. NORMAN: Right. But then do you have to do an asterisk?

MS. SANGUNETT: No.

MR. CALLIHAN: No.

MS. NORMAN: Or spaces or -

MS. SANGUNETT: It does a text search. If you don't put anything in the text search, it doesn't work.

MS. NORMAN: Sometimes even when I've done P dash.

MR. CALLIHAN: There's a base range. Like, if you put in the P 2514 and then have, like, a 30 year date range for this project you should get, like, hundreds of hits.

MS. NORMAN: All right. I usually put it all.

MS. SANGUNETT: And if you do have any trouble using our electronic document system there's a helpline, there's people standing by ready to help you. And that's in this brochure, FERC Online Support. There's an email address and there's lots of phone numbers, so that's on the back of this brochure and they're very helpful. We do the best we can to help out but that's all they focus on so they're better at it than we are.

Do you have any other procedural questions, anybody, that we can clear up before we move on? Do you want to stay with aquatic resources?

MS. NORMAN: I have a procedural question on submitting study requests. One of your slides goes through all the elements that are needed in the study requests and how the agencies are supposed to come up with estimated costs is unclear to me.

MS. SANGUNETT: All right. We do actually have some guidance on cost assessment. Is that public or is that just for us?

MR. CALLIHAN: I think it's internal.

MS. SANGUNETT: It's internal, all right. That's real helpful.

MR. CALLIHAN: I would say, I mean, I realize that it's tough to come up with a cost estimate. And if you just address it and give a ballpark or to make sure you address the cost. The cost will be dependent on the level of sampling. Just include a sentence about cost at a minimum, and then, yeah, just don't completely ignore it.

MS. SANGUNETT: It's hard for us, too, and that's why we are asking for help on that because sometimes we have no idea. You guys are much more familiar with that than we are. You're out there in the field doing the studies.

Yes? Is your question on procedures or aquatics?

MR. KITTRELL: I always have a question. Mostly aquatics. Let's leave aquatics.

MS. SANGUNETT: Okay. We have some more slides that deal with procedures, but can we hold off on more procedure questions until we get through the resources?

MR. KITTRELL: Yes.

MS. SANGUNETT: We'll definitely get to your questions, though.

MS. NORMAN: So, before we leave aquatics completely, I just wanted to make sure we are on record requesting a fish protection and downstream passage study.

MS. SANGUNETT: Okay.

MS. NORMAN: Which has to do with trash rack spacing, which has to do with the study of the powerhouse, killing what percentage of fish attempting to move downstream. Knowing what the present day situation impacts are and the cumulative impacts.

MS. SANGUNETT: All right.

MS. NORMAN: Which would include a desktop study with in-field clarification and proposed deterrent.

MS. NORMAN: All right. Anybody else with aquatics? All right. Let's move on to terrestrial resources.

So, what I've identified-- that's me up there, this is my resource area -- what I've identified to look at is the effects of impoundment fluctuations on wetlands and riparian habitat. Also, the current project operation and maintenance on, or continued operations on upland wildlife habitat and especially bald eagles. And as pointed out, I left out a proposed study in the scoping document and that's a wetland assessment. So, my apologies about that. That will fall under the purview of terrestrial resources. But it is very much linked to aquatics. We recognize that, so Jody and I will work very closely on that resource area.

MR. KITTRELL: This is Bill Kittrell, and as was mentioned in the public meeting last night, we do just need to make sure we understand what the results of the feasibility study for lowering the impoundment a foot during the winter might have on wetland habitat and species and potentially even recreational use.

MS. SANGUNETT: Again, we want to make sure that everyone knows what we're talking about, so there is a need for potential for -- where is that so that I get the wording right -- I think we have that in the scoping document, right? MR. KITTRELL: 3.2.1.

MS. SANGUNETT: All right. Oh, yes. Proposed operations. So, the applicant is presently evaluating the feasibility and benefits of operating the developments within one foot lower impoundment level during winter months, the purpose of which is to reduce the risk of overtopping project structures due to ice jams in the New River.

So, as Jody talked about yesterday, it would be really useful if that could be incorporated into your proposed study plan, your feasibility assessment for that so that it can be evaluated with everything else. If it comes in after the fact, that can often complicate matters and delay procedures. If we can look at it altogether, that would be really helpful. All right.

So, specifically with that feasibility you are also interested in the effects on that, with that reservoir --

MR. KITTRELL: If there may be connectivity between the impoundment and the wetlands which you would expect there would be any significant, you know, drying out of those wetland areas during the wintertime.

MS. SANGUNETT: Last night you mentioned recreational impacts as well.

MR. KITTRELL: Right, because there potentially is the waterfowl hunting that takes place over those wetlands in the vicinity of the wetlands, so that might be an issue as well.

MS. SANGUNETT: All right.

MR. CALLIHAN: In terms of access.

MR. KITTRELL: Access. yes.

MS. NORMAN: Janet Norman, Fish and Wildlife Service. I would add the impacts of impoundment water level fluctuations on the macrophyte river weed, water willow and American water celery.

MS. SANGUNETT: All right. So, when we look at wetland habitat we also look at submerged aquatic vegetation, and emergent vegetation, so we would -

MS. NORMAN: Cover those?

MS. SANGUNETT: Yes, we would cover those under wetlands. Yes. But thanks for pointing out the specifics.

MR. COPELAND: This is John Copeland again. In that regard with aquatic vegetation associated with wetlands, I think these impoundments could add significant areas of like elodea, the native plant, it's probably a great reservoir nutrient input.

MS. SANGUNETT: So, it could be there, is what you're saying?

MR. COPELAND: That's what I'm thinking, yes.

MS. SANGUNETT: As a valuable --

MS. NORMAN: As a valuable habitat component.

MR. COPELAND: Yes, and a nutrient source. So, typically in these smaller pool areas in the New River you find a lot of elodea. That's a prominent feature.

MS. SANGUNETT: So the wetland assessment proposed study would identify if any of those were present?

MR. COPELAND: Yes, or other aquatic vegetation types as well.

MR. CALLIHAN: So, Brandi, would that be in relation to if there was a change from the current condition to the current impoundment levels during the winter, right? Because otherwise, I mean, they're operating within a one foot band. I guess there would only be an effect if that band would shift or change, right?

MS. SANGUNETT: Yes. Thank you for pointing that out. Any other wetlands or terrestrial resource issues?

Just to refresh my memory, there are no known

bald eagle nests in the project area, correct?
MR. MAGALSKI: Yes, Jon Magalski with AEP, there are no known bald eagle nests in the project area.
MS. SANGUNETT: All right.
MR. MAGALSKI: When our consultant was out doing the spire surveys they did make observations for nests and eagles.
MS. SANGUNETT: All right. What year was that again?
MR. MAGALSKI: 2017.
MS. SANGUNETT: 2017. All right.
MR. COPELAND: The closest nest is going to be at Foster Falls.
MS. SANGUNETT: There's a known nest at Foster Falls?
MS. NORMAN: There's a known nest at Foster Falls.
MS. SANGUNETT: All right. And how far away is that from the project boundary?
MR. CALLIHAN: Better pull out a map, but it's probably 10 miles.
MR. COPELAND: Seven to ten miles, that range.
MS. SANGUNETT: All right. We would assume that bald eagles are using the habitat.
MR. COPELAND: Yes.

MS. SANGUNETT: All right.

MR. COPELAND: John Copeland, I think there is plenty of bald eagle nesting habitat along, for the reservoir area. Because the terrain in the area and the -- available nest.

MS. SANGUNETT: Okay.

MR. COPELAND: So, in that regard, you know, we did a whole bald eagle assessment on the Claytor project that should be looked at on this one as well.

MS. NORMAN: It is reasonable foreseeable that bald eagles could and will use the area within the next 30 to 50 years of the project life.

MS. SANGUNETT: Sure. All right.

So, ready to move on to T & E species. I know we're going to have some questions and comments about that. So, we've identified the Indiana Bat, the Northern Long-eared Bat, and the Virginia Spire, and we've also been told that we need to possibly look at the Darter.

MS. NORMAN: Endangered Candy Darter.

MS. SANGUNETT: Candy Darter.

MS. NORMAN: That's a federally listed, endangered Candy Darter.

MS. SANGUNETT: Now, we don't have any information about the range of the Candy Darter. Known locations. So, please share that with us. Like we said, there's a new study being done. We need that information on the docket.

MS. NORMAN: So, would you like me to submit that as comprehensive, a species status assessment that the Service, the U.S. Fish and Wildlife Service does during the listing process?

MS. CONNER: All right. If it's not available on IPaC, then yes. We would appreciate you sharing that with us. Just through the same eComments, I mean, eFiling process. Is it a specific, a comprehensive plan? Or is it for the informational article, like, kind of talking about the --

MS. NORMAN: It's comprehensive about the species throughout its whole range. A status assessment of the species throughout its whole range.

MS. CONNER: You can submit it as a comprehensive plan and we would review it, and it has to meet certain criteria, and it may be determined that it's really just informational about the species as opposed to a truly plan of, you know, from beginning to end, of how they're -- not cared for, but how they're -

MS. NORMAN: Handled.

MS. CONNER: Right. Right. So, you can always

submit as a comprehensive plan and it does get reviewed, and
if it's not that then it would become information for this

project specifically.

MS. CONNER: Especially if it was new information about known locations or things like that.

MR. CALLIHAN: For most immediate use would probably be beneficial to just file it as a comment for--

MS. SANGUNETT: For this particular project.

MS. NORMAN: Sure, get it in there quickest.

MS. SANGUNETT: Yes.

MS. CONNER: True, because it can take a while.

MR. CALLIHAN: I'm not sure how long that process is.

MS. CONNER: I mean, a month or two, particularly.

MS. NORMAN: I'll file it as a comment.

MS. SANGUNETT: But again, if it's on IPaC, we look at that as well.

MS. NORMAN: Okay.

MS. SANGUNETT: It sounds like it's not.

MS. CONNER: It's on ECOS.

MS. NORMAN: I haven't been in IPaC --

MS. SANGUNETT: It's integrated into IPaC, yes. You can feel free to include it.

MS. NORMAN: But then other people might not be stumbling through that, if I can eFile it then they'll have it. All right.

Just a general comment about getting the endangered species information. That several of the databases are sometimes giving omissions or conflicting information, not full listings; so if we have the Fish and Wildlife Services IPaC, we have Virginia CPI National Heritage Data.

MS. SANGUNETT: Yes. And we look at that, too.

MS. NORMAN: Right. And Virginia Fish and Wildlife Information System. They don't all have the comprehensive list of these species, so some species are left off of a certain list so I would just encourage you to use all three and then double-check with the biologist to make sure everything is good.

MS. SANGUNETT: And the applicant is designated as a federal representative on this as well. That is typically the case. So, they can request lists and species lists and talk to you guys about --

MS. NORMAN: And just for everyone's knowledge that during the listing process for certain endangered or threatened species that there is a designation of critical habitat areas, and so Cripple Creek has been included in the designated critical habitat --

MS. SANGUNETT: For the Candy Darter?

MS. NORMAN: -- for the Candy Darter.

MS. SANGUNETT: Okay.

MS. NORMAN: Which is not -- you want to make sure that's the legalistic critical habitat under the Endangered Species Act as opposed to ecological terms that we throw around. This is important habitat. This is critical habitat. So it's an official designation.

MS. SANGUNETT: Okay.

MR. CALLIHAN: And that they're likely to be found there? And were --

MS. NORMAN: They are found there.

MR. CALLIHAN: Okay.

MS. NORMAN: There's population there.

MR. CALLIHAN: All right.

MR. KITTRELL: Yes. This is Bill Kittrell, and Cripple Creek has one of the remaining populations.

MR. COPELAND: This is John Copeland. My understanding is, too, that those Candy Darters use the mainstem areas in proximity to Cripple Creek as well based on recent survey data.

MR. KITTRELL: Chestnut Creek and Crooked Creek are just downstream, not too far.

MS. SANGUNETT: Again, anybody file a report, some studies.

MR. KITTRELL: We can share those. I will mention, are there any more federally endangereds?

MS. SANGUNETT: These are the ones that we've identified.

MR. KITTRELL: I know there -- I just will mention that there are two state endangered mussels and a federally, oh, excuse me, a state endangered, state threatened mussels and two state threatened and one state endangered mussel that are known from the vicinity of the project.

MS. SANGUNETT: So, this is just a list of federal species, and we address them separately from state listed species. State listed species are tossed into a category called species of special concern so the Hellbender, for example, is under that category. And we do divide those species between terrestrial and aquatic resource areas so, Jody will assign the T & E species to aquatic species.

But again, because of, for consultation purposes we separate out the federal species and any discussion of them so that that can act as our CA if we need to or if we can refer the Fish and Wildlife Service-specific parts of our EA.

MS. CONNER: My name is Allyson with FERC. Just as confirmation, the scoping notice doesn't make Appalachian the Commission's non-federal representative for carrying out the informal consultations for endangered species and for cultural resources. Just putting that on the record.

MS. NORMAN: Great, and so, Janet Norman, Fish and Wildlife Service. I had a question how that, how that consultation happens. I actually recently attended Endangered Species Act Section 7 Consultation training for a week and the end of it, and I asked, well how does this, 'How does FERC handle ESA consultations?' and they said, "Oh, God, we don't know."

(Laughter)

MS. SANGUNETT: Was this at NPTT?

MS. NORMAN: This is at NPTT. A teleworker.

MS. SANGUNETT: We've been to those trainings as well.

MS. NORMAN: Oh, it's a whole different world, isn't it? So, I still don't have a clear answer to the process on how the -

MS. SANGUNETT: We follow the same process everyone else does; it's just that we have certain limitations to our jurisdiction and our regulations but --

MS. NORMAN: But when in the process will it occur, when this informal consultation --

MS. SANGUNETT: So, before we do our EA we will do an IPaC search and we will make sure that it will be a formal submission of that; not just for our own information.

MS. NORMAN: Yes.

MS. SANGUNETT: So, we use the IPaC system to alert Fish and Wildlife Service that we are - and this is what we've been instructed to do, so if there's something different that you're aware of, please let us know. We've been instructed to go through the IPaC system. We'll look for, we'll request a list of current listed species. We'll look for critical habitat, migratory birds of concern. There's one other thing.

MS. NORMAN: And then will you send us a letter requesting concurrent consultation?

MS. SANGUNETT: So, no, not yet. We do eventually. But at that point --

MS. NORMAN: At what point in the process?

MS. SANGUNETT: So we gather the information about what species to look at before we do our EA, and then in the EA we evaluate, we give background information about each species and we evaluate any impacts that might occur due to the project, and then we make our determinations of that in the EA. And then when we issue the EA, we will send out a concurrent letter requesting you to let us know if you agree with our determination or not. And then if there's a disagreement then we try to work on that then, or do formal consultation if necessary.

MS. NORMAN: I would encourage that you would reach out and we do consultation prior to that, as opposed to -

MS. SANGUNETT: Well, we don't make our determination until we have evaluated --. We start the formal process through the IPaC search.

MS. NORMAN: All right. But I would also say along with the IPaC search that you engage in discussions with the Fish and Wildlife Service.

MS. SANGUNETT: So, we can send you an email and say, did you see that this went through the IPaC system? What do you think?

MS. NORMAN: Right. Because I don't handle the IPaC system. I don't see the letters --

MS. SANGUNETT: Really?

MS. NORMAN: No. We have separate -- and mostly we try and automate that and then -- they're separate things. So I don't see that you've done an IPaC search so

MS. SANGUNETT: We have not; the applicant has.

MS. NORMAN: Right.

MS. SANGUNETT: We do that right before our EA. Up until that point the applicant acts on our behalf.

MS. NORMAN: Right. But, but, so IPaC is not always updated. Properly, maybe there's new -- that the Service office is responsible for the consultation.

MS. SANGUNETT: See, that's interesting, because some other field offices --

MS. NORMAN: It is handled differently by every single field office. Which we understand --

MS. SANGUNETT: We're really happy to engage with you earlier and everything, but we've been told there's not enough staff, we don't have time, we need to use the automated system.

MS. NORMAN: Yes, and the automated system is our go-to system that you're supposed to use; but I apologize for the frustration that each individual Fish and Wildlife Service field office sometimes handles procedures differently on species.

MS. SANGUNETT: Okay.

MS. NORMAN: On something big like a project like this, you're not just doing, you know, ten feet of reg or something.

MS. SANGUNETT: And at any time if you want to provide information about endangered species, you know, you don't have to wait for us to ask for it, you can provide it.

MS. NORMAN: But I'm trying to foresee when it's going to be, when our consultation with you will occur. And I would recommend -

MS. SANGUNETT: It's occurring now.

MS. TANYA: Yes, so this Tanya __ with HDR. This might clarify a little bit. In preparation of the PAD, we did the IPaC search, and then we always send the IPaC results with a letter packaged to Fish & Wildlife, then we reach out to the national heritage program in other state level agencies as well; so you would actually see that documentation in the -

MS. SANGUNETT: It's included in the PAD.

MS. TANYA: --correspondence log, and it has all the correspondence in a table format as well as what we sent and what you responded with.

MS. SANGUNETT: Right.

MS. NORMAN: I'll make sure I get on your mailing list for that, because otherwise it goes to a separate, you know, generic pile.

MS. SANGUNETT: So, now, you're in a regional office?

MS. TANYA: No, I'm in a field office.

MS. SANGUNETT: You're in a field office.

MS. TANYA: The Chesapeake Bay field office located in Annapolis. It covers Maryland, Virginia, parts of Delaware.

MS. SANGUNETT: All right.

MR. MAGALSKI: This is Jon Magalski with AEP. Just since we're on the subject and consultation, I would just like to make the request for all the resource agencies to provide any location data on the Candy Darter, if that's possible. Especially in particular to the New River mainstem.

MS. SANGUNETT: That can be filed as privileged information if you don't want that known by the general public. And you can label it as such when you file, when you eFile. So, there's three categories of information.

MS. NORMAN: CEII.

MS. SANGUNETT: Yes. There's public. There's privileged. And there's CEII. C E I I stands for Critical Energy Infrastructure Information.

MR. MAGALSKI: Infrastructure information.

MS. SANGUNETT: Yes. Information. Thank you. So, that would be like internal dam structure. Things like that would be CEII. Privileged information would be sensitive information about cultural resources or native species or other resources where you don't want the public going and ransacking the area.

MS. NORMAN: So, can we as the agencies see -

MS. SANGUNETT: I don't think so.

MS. NORMAN: I don't think we can see privileged information.

MS. CONNER: Typically not.

MS. NORMAN: It has to be

MS. SANGUNETT: It's really just for our

purposes.

MS. CONNER: Right. Because it's often cultural sites like where they are located so that information is very tightly kept. And so you would have to go directly to that -- the state SHPO, the state information office and they can give you that information.

PARTICIPANT: And the applicant.

MS. CONNER: Right.

PARTICIPANT: The individual who is listed as the contact for the project is able to access that. So, it's very limited access.

MS. NORMAN: Get it from DHR.

MS. SANGUNETT: Yes, you guys can --.

Any other procedural questions about consultation?

MS. NORMAN: So, we would expect that the applicant's consultant would be directly contacting us.

MS. SANGUNETT: Yes. You're the person to contact, right?

MS. NORMAN: Yes.

MS. SANGUNETT: So, now that we know that we will focus on making sure you are in the loop on everything in terms of endangered species, yes.

MS. NORMAN: All right.

MS. SANGUNETT: All right. Next. Recreation and land use and we have a picture of Allyson, recreating. Doing her favorite thing. So, we'll be looking at project operation and maintenance on recreation land use and aesthetics within the project area. That is not necessarily the project boundary, correct?

MS. CONNER: Correct.

MS. NORMAN: Before we move on, I'm sorry. I have another endangered species thing. Just for your knowledge for the Virginia Spire. So, the survey results are considered to be valid for two years. So, we might be requesting a new survey for July of '19 -- and suitable habitat identified? It was documented in 1992.

MR. MAGALSKI: This is Jon Magalski with AEP. That documented occurrence, do you have any information on that? Because I think when we were looking at doing that it was just pretty much a point and there's no information, no verification of that finding. Is there any additional information that you could provide on that sighting?

MS. NORMAN: I do not know, but I would defer to contacting our colleagues, my colleagues in the Virginia U.S. Fish and Wildlife Service office, and our state college, if there's any additional information on that.

MR. MAGALSKI: And this is Jon, just a follow up. I guess just for consideration for the request of the further Spire surveys, I guess, you'd think about how that data would be used beyond this present. Because it's quite costly to do those surveys.

MS. SANGUNETT: And the licensing process is a five year process. So, we want to try to have everyone on the same schedule as much as possible.

All right. Moving on to recreation again.

MR. KITTRELL: Brandi?

MS. SANGUNETT: Yes.

MR. KITTRELL: This is Bill Kittrell. I just want to make one correction to the PAD, there's a listing here for the Byllesby boat launch, and that is actually a DGIF lease from Appalachian Power. We leased it in 1995 for 20 years, and there's an annual renewal; we're in the renewal phase, but instead of Doctor it needs to be DGIF just for that boat launch in the Byllesby pool.

MS. NORMAN: You are correct. Thank you.

MS. SANGUNETT: So, it's on AEP land -

MR. KITTRELL: Correct.

MS. SANGUNETT: - leased to DGIF?

MR. KITTRELL: Correct.

MS. SANGUNETT: The other area we'll look at is the adequacy of existing recreation facilities and public acces to the project to meet current and future recreational demand. Yes?

MR. HILL: I'm Rex Hill with Carroll County. I was looking at the property between the dams, it is owned by AEP on the east side of the national forest, on the west side on the map.

MS. SANGUNETT: I'll hold that map up for you.

MR. HILL: So, that helps out a lot. And I think

MS. NORMAN: It's owned by -

MR. HILL: AEP on the east side and national forest on the west side.

MS. SANGUNETT: Do you want this one or the one on the recreation site, would that be?

MR. HILL: Recreation sites. Any expansion of recreation facilities by the DEQ, I mean, the DCR on the east side, that's heavily used by folks and it gets trashed quite a bit. On the upper end of Buck, they can drive back through and create a lot of potholes and things like that, so it might be something to be considered.

MS. EWING: This is Sharon Ewing with DCR. It's my understanding that the area that is not outlined in red as the gentleman is referring to is heavily used. But there's not any public access points in that area, and so we would concur that that's an area we would like AEP to look at in their study for recreational use.

MR. HILL: Just this little creek right here. I mean, it's like, tons and tons of trash in that creek. I don't know whether anything could be done about that or not. I mean, it's like an old dog site that's been used for years. MS. SANGUNETT: Do you know the name of that creek?

MR. HILL: It borders the -- that road runs right along, I guess from the road, the side is all AEP property. I think it's heavily used all the way down through there and some of the locals, I think, pick up the trash. Somebody does occasionally; and I don't know, some kind of mechanism where we can have a mutual agreement between the agencies.

MS. SANGUNETT: Okay.

MR. COPELAND: This is John Copeland. I know in our historic New River float guide that that ferry is listed as a potential access point, and that's probably one of the reasons it gets used like that. Locals know about it as well.

MS. SANGUNETT: Do you have access to that, Allyson?

MS. CONNER: To, what's the --?

MR. COPELAND: We have a New River float guide, an existing one, the new one's not out yet; but the older one is still up on our website under maps and access. Is that something you need a link to?

MS. CONNER: Yes. That would be great. I'm going to send you an email and you send me one back.

MR. COPELAND: You've got it. There used to be a ferry so you could drive almost like to the river; it's about a two foot drop there. That might be where you could put in a boat ramp, I mean, a canoe launch; it's not conducive to motorized boats through there, but -- some folks do that. I'd like to see on the Buck Dam, I'd like to see a boat ramp for small motorized boats, not just canoes. Most of our population is getting older and they don't use canoes, I don't anymore. And maybe the possibility of handicapped fishing piers, upstream or downstream in any of those areas there; Buck-Byllesby, maybe at the boat ramp at Byllesby.

MS. SANGUNETT: All right.

MS. EWING: This is Sharon Ewing with DCR State Parks. We've also like in the recreational plan to look at fishing pods and ADA accessibility in that area. Also, I know the portage around the dams is challenging. And certainly in the recreational study if we could look at ways of potentially improving those, you know, at a minimal, better signage directing boaters, you know, where to get in, where to go to, because it's very confusing for them.

Also, I believe during the Lower Byllesby, during the work, that the portage in that area was used as part of the dam work and between that and recent flooding, things like that, damaged. I think that's correct, and I'd like to see that put back, and, you know, restored and fixed.

The other question I had is I understand that Byllesby is in the process of updating some mechanical lift gates, is that correct? Do I understand that correct?

MS. SANGUNETT: Obermeyer gates and dam topping gates.

MS. EWING: Yes. And those will be operated out of Ohio at that point? All right. I guess our question is, is just for reference, I think that what is the current notification process on the operation of those during flooding, is that going to change in the future with these new operational processes? And how will we be notified as agencies having things downstream that are very, you know, prone to flooding from this operation?

MS. SANGUNETT: Recreational?

MS. EWING: Recreational facilities are particularly why I'm bringing it up in this area; we obviously have recreational facilities that are impacted.

MS. SANGUNETT: You want to address this?

MR. COLBURN: Sure. Fred Colburn at AEP. It will be followed by the same protocols we do. Anytime we open up the gate, we blow our fisherman's warning siren. It will be on the same structure, and what you'll actually see is a more controlled river. We'll have more ability to control the river instead of having it get to the point where you have to release the flash boards which are at play. So, I think that's a benefit that we're looking to see, or one of the many benefits.

MS. NORMAN: What's the advanced notice on the siren?

MR. COLBURN: Two minutes.

MS. NORMAN: Two minutes. All right.

MS. SANGUNETT: Currently they are manually operated? Or on site?

MR. COLBURN: For the Obermeyers it's locally operated.

MS. CONNER: And then you said yesterday --

MR. COLBURN: Right. We're looking to get a schedule to be complete, complete the work of bringing it into the -- by May, or by the end of May.

MS. SANGUNETT: All right.

MR. COPELAND: This is John Copeland. That brings up a broader recreational concern and that is just notification and information around navigating these projects and how that's accessible, whether it's available on a website. Something that people can consult on a real-time basis. And know something about project flows and things like that that might impact their recreation.

MR. CALLIHAN: Probably, the, you know, the USGS river gauges would be the best indication because they can tell if you've got high flows, they're not going to be on the river anyways, they're going to be operating those gates.

MR. COLBURN: Right. But I'm talking a little more broadly in terms of similar information to what we have with the Claytor project. But, had some productivity, some predictions about flows down at downstream points.

MS. SANGUNETT: Why don't you describe how that works?

MR. COLBURN: That website, a downstream user can go to it and know what the flow is at Claytor Dam. They can know when projected flow rates look like downstream, certain distances, for recreational purposes.

MS. SANGUNETT: One thing to point out though is Claytor does not operate run-of-river.

MR. COLBURN: Right.

MS. SANGUNETT: But this one is run-of-river.

MR. COLBURN: I know. This is basically run-of-river; what's coming in is going out. We're, there's really minimal ponding ability.

PARTICIPANT: Understood.

MS. SANGUNETT: So you feel that you wouldn't be able to provide much more information than the USGS gauge?

MR. COLBURN: That would be the best indication.

MR. CALLIHAN: I have a question. On the

applicant's website, I notice you guys do have real-time information on that as well, right?

That's downstream. It doesn't separate it, I don't think, on what's coming out of the tailrace versus a spillway, but overall downstream what's coming out of the project as a whole, I believe that's on there.

MR. COLBURN: For which facility?

MR. CALLIHAN: For both Buck and Byllesby. I was checking it the other day. It has a tailrace discharge in CFS.

MR. KITTRELL: This is Bill Kittrell. Question on the recreational needs assessment study. It says Appalachian proposes to conduct a recreational assessment of the project to assess existing opportunities. I think it would be useful to, I don't know how much, what level, or what extent, or what monitoring is going on right now, I don't know if that's just like a Form 80, or -- which is a very cursory overview but, you know, I think it would be useful to have some type of recreational assessment of the usage, not just, you know, it's hard to know what the needs are if you don't understand what the actual usage is, and I would even think that it would be, not only on the project boundary as defined here but the project lands associated with the projects, the project itself which includes the area of influence.

What that entails, you know, will probably take some thought, but I think there's a lot of usage going on, not only within that project boundary as defined in the PAD but also on the project lands associated with the project. And we discussed this at our field site the other day about the area downstream of Buck, which is project lands that is pretty heavily used by recreational users.

MS. SANGUNETT: So you're saying that in the proposed study description, you don't see anything about assessing current usage?

MR. KITTRELL: It says the existing monitoring will be included in the study, but existing monitoring may not be adequate to fully describe the recreational use. If you're only doing a Form 80 which is a very cursory survey method, I think, in my opinion, that may not fully describe how much recreational use is taking place. Because all of DCR's assets adjacent to the project and then a lot of other usage that's going on, would, you know, the DGIF ramp and the fishing and hunting and boating and so forth, and the hiking and biking there's a lot of usage that's taking place that may not be fully described under current monitoring methods.

MR. COPELAND: This is John Copeland. That brings up a related question. I noticed in the PAD under the review on 4-25, Article 4.12 says that this article regarding monitoring the recreation use was deleted by FERC July 30th of 2002. So, how do we, where's the more current information regarding recreation use? And it also mentions a recreation plan in Article 4.11. And I don't know where that recreation plan is available.

MS. SANGUNETT: Again, that would be on eLibrary. It might be something that is microfilm that needs to be converted to text or PDF. Allyson?

MS. CONNER: I'm looking to see if that particular part --.

PARTICIPANT: It was filed in 2016, the recent one.

MS. SANGUNETT: Oh, the Form 80 is 2016?

MS. EWING: Sharon Ewing with Doctor, State Parks. Following up on Bill's comments about doing a good assessment of the recreation rather than just a cursory check, because we do know from use of facilities that that area is very loved and very well-used.

MS. SANGUNETT: Okay.

MS. NORMAN: Important to the local economy and the culture and -

MS. EWING: Not just important to the local economy, it's important to the economy of the Commonwealth. State parks and again economic impact. For our local communities --

MR. HILL: Rex Hill from Carroll County. You have so many different types; you've got horseback riders, you've got bikers, you've got walkers, you've got boaters, you've got fishermen. I mean, this is probably the most widely, varying folks that use this than any place that I know of. Kind of remote. It's an excellent place.

MR. KITTRELL: Makes it attractive.

MR. HILL: It does. And back years ago, national forest had a campground there. I don't know -- and I know at one time DCR at one time leased that, but it's gone back to the national forest. If there's any way that maybe as a group we could get that opened back up some way, I don't know, that is something we should really look at. That would really improve access there, too. Bring more people into the area that it used to be with --.

PARTICIPANT: And that's in that Bucks Dam picnic area, right?

MR. HILL: Yes. Yes.

MR. KITTRELL: The Department of Game and Inland Fisheries would really support that effort as well, to look at reopening those day use areas and potentially overnight camping along that corridor. I think the Forest Service does own the land.

MS. EWING: I could see that happening in the scope, time span of this particular project.

MR. HILL: Anything, any help you need, let me know.

MS. SANGUNETT: Anything else about recreation?

MR. COPELAND: John Copeland. Allyson, should I ask you for that report, that most recent recreational report? Would that be the best way to get it?

MS. CONNER: That Form 80 report?

MR. COPELAND: It was a 2015 report mentioned in the PAD?

MS. CONNER: I can get it to you.

MS. SANGUNETT: Again, that should already be in eLibrary. Might be tough to find, but it should be there.

Any other recreation issues?

MS. EWING: I apologize, I'll have to get to Salem for another meeting. [Leaving]

MS. SANGUNETT: All right. Thanks for coming. All right.

Moving on. Cultural resources. This is also Allyson's purview. We'll be looking at effects to listed places, listed or potentially eligible resources, and any previously unidentified resources. Any comments or questions I know what I was going to say - as we mentioned before, the applicant is our non-federal rep for Section 106 cultural resources.

Any comments or questions about that?

The last one is developmental resources. So, we look at the economics of the projects and any effects of any recommended environmental measures on the project's economics. And that's Lucy, another team member who couldn't be with us today, is working on that.

MR. CALLIHAN: I have a question unrelated to developmental, just more FERC for APCO. Can you explain the battery storage that's onsite a little bit and how it integrates with the hydro project. Whether it's connected to the hydro and what part of the project.

MR. COLBURN: Yes. So, the idea that came from trying to co-load a battery with another type of power generation. So, we started vetting out different types of generation and we ran some studies and we decided that to try to collocate it with the hydro plant.

So, basically, we got a little bit of storage, so you wouldn't be giving up any energy going to the dam, you're just kind of shifting the time a little bit. So -- this is Fred Colburn, by the way, Anticipate -- In PJM, we operate in the PJM regional transmission organization, and one of the ancillary services that we can offer into the market is a regulation product. And if you site a battery out on its own, it's not sustainable; it needs the ability to maintain its charge, either a positive or a negative charge. So, it can operate 24/7.

So, we ran studies to determine the size of the batteries we could collocate; you know, what type of facility you need to keep the battery healthy. So in that regard all we're doing is using the hydro portion of that generation to manage the state of charge of the battery so the battery by regulation, says we did not increase the capacity of the project; we can use the existing intersection rights; and you know, run tests and certify it in the market.

PARTICIPANT: And so that's in the capacity of the plant, it is not changing; it's more like a redistribution.

MR. COPELAND: Right.

MS. SANGUNETT: Any other questions or comments about developmental resources?

All right. Let's go over some more information about study requests, submitting a study requests. It is very important that any study request follow these seven criteria. This is an abbreviated version, you can find the full, word for word, how it is in the regs, on Appendix A of the scoping document. Yes.

Be sure to describe the goals and objectives of the study. Explain the relevant resource management goals. Explain any relevant public interest considerations. Describe existing information. Describe the nexus between project operations and effects. So, how is the project directly affecting the resource. Explain proposed study methodology. And describe the level of effort and costs. And again, with the costs, we talked about how that can be very difficult but please just take a stab at it if you, if it's not something you know for sure. Do your best. But each of the seven criteria has to be addressed for it to be evaluated.

So, an important date to remember: May 7th. You can provide oral comments today or you can provide written comments and study requests by May 7th. It is very important to include the project number and sub-docket in all of your filings. You can either file by mail or electronically, which we discussed quite a bit. We prefer electronic filings. And again, this guide, this brochure tells you everything you need to know about electronic filing and provides a help line, online support, by email and phone number, if you need additional information.

It's, we also mentioned this before but eSubscription is the best way to stay informed and that is, you will get email notifications of any new filings or issuances. You can also search any current or existing documents on our database called eLibrary that are specific to this project. And again, you'll need to use P-2514. You don't need the sub-docket for that necessarily, but if you want to look at things very specific to this current proceeding, then you'll use the sub-docket, 186. Again, the brochure gives you more information about that.

We talked quite a bit about the mailing list so I'm going to skip over that but again, if you want to check to see if you're on the mailing list, I included it on page 26 of the scoping document. You can also look under eService, and if you want to be added, please send an email to efiling@ferc.gov. Include the project number and information that you want added or removed. All right.

And this is what our FERC online website looks like. The first thing you'll need to do is eRegister if you haven't done so already. If you are eRegistered then you simply have to log in and then you can do a search on the library for documents or you may file your comments to eComment which is a text version that has a 6,000 character limit or if you have a document that you want to upload or a longer set of comments, then you can use a Word file or a PDF and file that through eComment, and you can see that on the sidebar at the top of the list here. Ecomment, eRegister, eFiling, eSubscription, that's for getting the email notifications. eService, that's the mailing list. eLibrary, that's for searching for documents.

All right. Any questions? Well, that's it. Any concluding remarks or final questions, procedural or otherwise?

MS. WARDEN: Rachael Warden, FERC. Just e-mail on the procedural -- To add contacts on the intervention piece, that is correct that intervenors are required to serve any of their filings on all parties. We are in pre-filing now so there will not be any intervenors for a really long time because right now there's no proceeding to intervene in, so that will be after the license application is accepted. I was just trying to get it correct, when the service becomes important.

MS. SANGUNETT: You will know when the application is accepted when we issue a notice stating so and then that's the signal that you can intervene. I think it actually says that.

MS. WARDEN: There is a paragraph that talks about intervenors.

MS. SANGUNETT: Anything else?

All right. Shall we conclude? Here's my contact information if you have any further questions I have some business cards in the back.

And with that, thank you very much for coming, we are adjourned.

[Whereupon at 11:22 a.m., the verbal comment session concluded.]

CERTIFICATE OF OFFICIAL REPORTER

This is to certify that the attached proceeding before the FEDERAL ENERGY REGULATORY COMMISSION in the Matter of:

Name of Proceeding:

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Docket No.: No. 2514-186

Place: Galax, Virginia

Date: Thursday, April 11, 2019

were held as herein appears, and that this is the original transcript thereof for the file of the Federal Energy Regulatory Commission, and is a full correct transcription of the proceedings.

Dan Hawkins

Official Reporter

ERRATA SHEET

DEPOSITION OF: BYLLESBY-BUCK HYDROELECTRIC PROJECT public scoping meeting

DATE OF DEPOSITION: 04-11-2019 PAGE 1 of 1 pages

Page	Line	Correction
7	23	species, recreational use, aesthetics, cultural resources and
19	10	PARTICIPANT=Jody Callahan
20	5	look at the existing ramping rate to prevent fish stranding.
26	15	Because right now, except during the spring it's largely de-
26	16	watered. And whether stranding is the main issue, or we want
28	6	all aquatic journals at FERC.
34	20	dam, but yes. Something to think about. It
39	3	AEP Personnel: not Mr. Kittrell
39	22	PARTICIPANT=Mr. Magalski, AEP
40	9	PARTICIPANT=Mr. Magalski, AEP
40	12	PARTICIPANT=Mr. Magalski, AEP
40	21	PARTICIPANT=Mr. Magalski, AEP
40	24	PARTICIPANT=Mr. Magalski, AEP
46	14	mussel abundance. And then also part of that drawdown we
48	12	stocking was a walleye stocking we did pelagically in
52	16	comprehensive plan. And if it's not, then it becomes project
55	3	of any filings added to the docket.
62	9	Ms. Sangunett
66	6	the spiraea surveys they did make observations for nests and
66	17	eared Bat, and the Virginia Spiraea, and we've also been told
68	7	Ms. Sangunett
72	22	as confirmation, the scoping notice does make Appalachian
73	10	MS. NORMAN: This is at NCTC. A coworker.
77	17	MS. Norman: No, I'm in a field office.
77	19	MS. Norman: The Chesapeake Bay field office
79	7	PARTICIPANT=Ms. Sangunett
79	9	PARTICIPANT=Ms. Sangunett
81	16	MS. Parcell, AEP
81	17	Ms. Conner
81	19	Ms. Conner
93	4	economics. And that's Woohee, another team member who

TELEPHONE MEMO

To: Public Files
From: Allyson Conner
Date: June 12, 2019
Docket: P-2514-000
Project: Byllesby-Buck Hydroelectric Project

Subject: Consultation with the Delaware Tribe of Indians for the Byllesby-Buck Hydroelectric Project No. 2514

On March 6, 2019, Allyson Conner, staff of the Division of Hydropower Licensing with the Federal Energy Regulatory Commission, issued a letter to the Delaware Tribe of Indians initiating tribal consultation for the relicensing process of the existing Byllesby-Buck Hydroelectric Project 2514-000.

On April 20, 2019, Ms. Conner left a message for Susan Bachor, Tribal Historic Preservation Officer. On May 7, 2019, Ms. Conner emailed the tribal consultation letter to Ms. Bachor. On May 21, 2019, Ms. Conner followed up with a second email to Ms. Bachor. No response has been received to date.

FEDERAL ENERGY REGULATORY COMMISSION
Washington, DC 20426
June 21, 2019

OFFICE OF ENERGY PROJECTS

Project No. P-2514-186 – Virginia
Byllesby-Buck Hydroelectric Project
Appalachian Power Company

Subject: Scoping Document 2 for the Byllesby-Buck Hydroelectric Project, P-2514-186

To the Party Addressed:

The Federal Energy Regulatory Commission (Commission) is currently reviewing the Pre-Application Document submitted by Appalachian Power Company (Appalachian) for relicensing the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Byllesby-Buck Project). The project consists of two developments, Byllesby and Buck, and is located on the New River in Carroll County, Virginia. The project does not occupy federal land.

Under the Integrated Licensing Process, Appalachian must file its preliminary licensing proposal or draft license application by October 1, 2021. The final license application must be filed with the Commission by February 28, 2022, two years before the license expires.

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, Commission staff intends to prepare an environmental assessment (EA), which will be used by the Commission to determine whether, and under what conditions, to issue a new license for the project. To support and assist our environmental review, we are beginning the public scoping process to ensure that all pertinent issues are identified and analyzed, and that the EA is thorough and balanced.

Our preliminary review of the scope of environmental issues associated with the proposed relicensing of the Byllesby-Buck Project was described in Scoping Document 1 (SD1), issued March 8, 2019. We requested comments on SD1, conducted an environmental site review, and held scoping meetings on April 10 and 11, 2019, to hear the views of all interested agencies and entities on the scope of issues that should be addressed in the EA. Based on the meetings and the submission of written comments received throughout the scoping process, we have updated SD1 to reflect our current view of issues and alternatives to be considered in the EA. ***Key changes from SD1 to SD2 are identified in bold, italicized type.***

SD2 is being distributed to the Commission's official mailing list (see section 9.0 of the attached SD2). If you wish to be added to, or removed from, the Commission's official mailing list, please send your request by email to ferconlinesupport@ferc.gov or by mail to: Secretary, Federal Energy Regulatory Commission, 888 First Street, N.E., Room 1A, Washington, DC, 20426. All written or emailed requests must specify your wish to be removed from or added to the mailing list and must clearly identify the following on the first page: **Byllesby-Buck Hydroelectric Project No. 2514-186**.

You may also register online at http://www.ferc.gov/docs-filing/esubscription.asp to be notified via email of new filings and issuances related to this or other pending projects. For assistance, please contact FERC Online Support at ferconlinesupport@ferc.gov.

The enclosed SD2 supersedes SD1. SD2 is issued for informational use by all interested parties; no response is required. If you have any questions about SD2, the scoping process, or how Commission staff will develop the EA for this project, please contact Allyson Conner at allyson.conner@ferc.gov or (202) 502-6082. Additional information about the Commission's licensing process and the Byllesby-Buck Project may be obtained from our website (www.ferc.gov) or Appalachian's licensing website, www.aephydro.com.

Enclosure: Scoping Document 2

SCOPING DOCUMENT 2

BYLLESBY-BUCK HYDROELECTRIC PROJECT

VIRGINIA

PROJECT NO. 2514-186

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, DC

JUNE 2019

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SCOPING DOCUMENT 2

Byllesby-Buck Hydroelectric Project, No. 2514-186

1.0 INTRODUCTION

The Federal Energy Regulatory Commission (Commission or FERC), under the authority of the Federal Power Act (FPA),[1] may issue licenses for terms ranging from 30 to 50 years for the construction, operation, and maintenance of non-federal hydroelectric projects. On January 7, 2019, Appalachian Power Company (Appalachian) filed a Pre-Application Document (PAD) and Notice of Intent to seek a new license for the Byllesby-Buck Hydroelectric Project, FERC Project No. 2514 (Byllesby-Buck Project or project).[2]

The Byllesby-Buck Project consists of two developments, Byllesby and Buck, and is located on the New River in Carroll County, Virginia. The average annual generation from 2012 to 2016 of the Byllesby Development was 36,906 megawatt-hours (MWh) and of the Buck Development was 30,874 MWh.

A detailed description of the project is provided in section 3.0. The location of the project is shown on figure 1. The Byllesby-Buck Project does not occupy federal land.

The National Environmental Policy Act (NEPA) of 1969,[3] the Commission's regulations, and other applicable laws require that we independently evaluate the environmental effects of relicensing the Byllesby-Buck Project as proposed, and also consider reasonable alternatives to the licensee's proposed action. At this time, we intend to prepare an environmental assessment (EA) that describes and evaluates the probable effects, including an assessment of the site-specific and cumulative effects, if any, of the proposed action and alternatives. The EA preparation will be supported by a scoping process to ensure identification and analysis of all pertinent issues. Although our current intent is to prepare an EA, there is a possibility that an environmental impact statement (EIS) will be required. The scoping process will satisfy the NEPA scoping requirements, irrespective of whether the Commission issues an EA or an EIS.

---

[1] 16 U.S.C. § 791(a)-825(r) (2012).

[2] The current license for the Byllesby-Buck Project was issued on March 28, 1994, and expires on February 29, 2024.

[3] National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-4370(f) (2012).

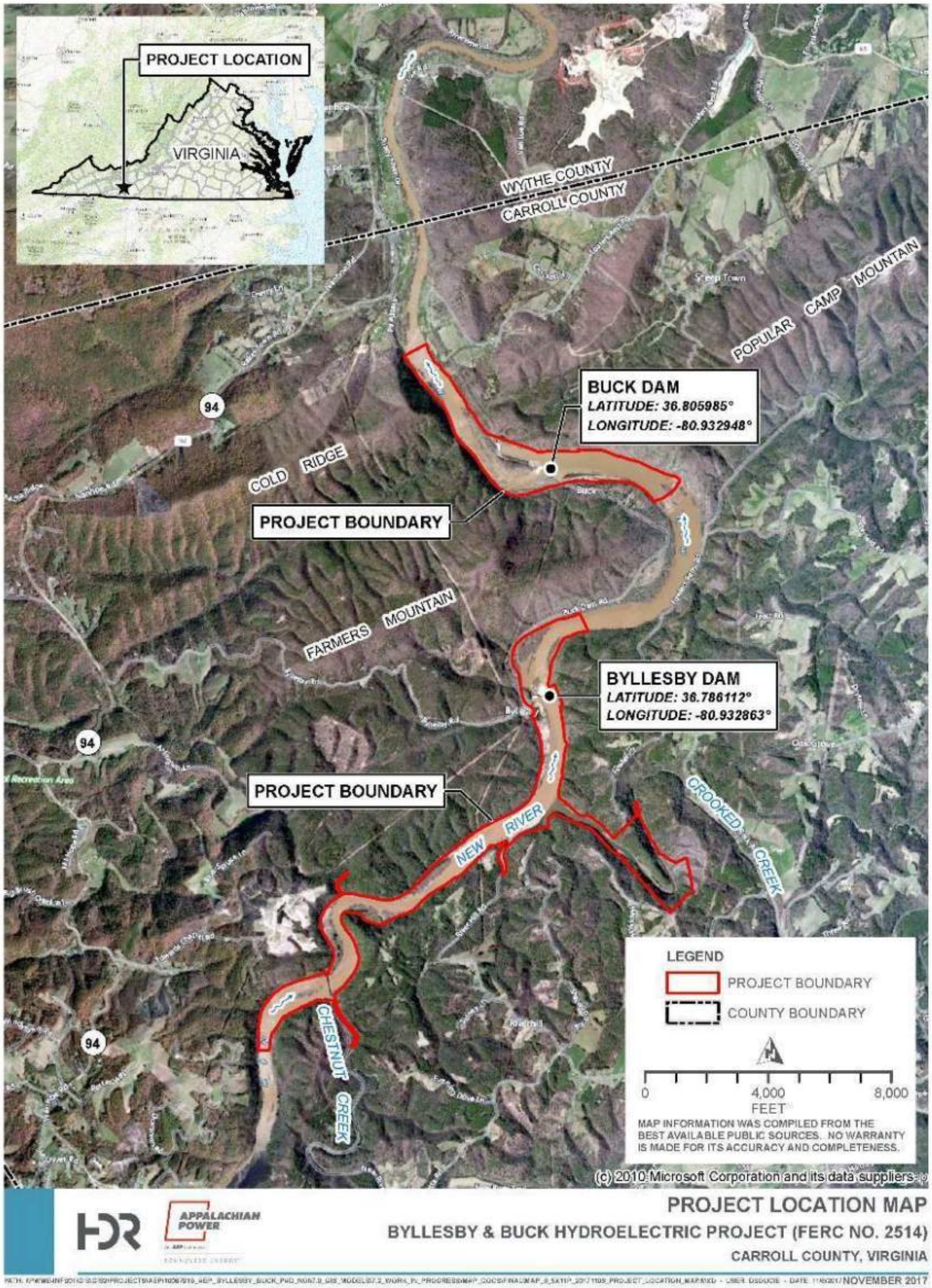


Figure 1. Location of the project. (Source: Appalachian).

2.0 SCOPING

This Scoping Document 2 (SD2) is intended to advise all participants as to the proposed scope of the EA and to seek additional information pertinent to this analysis. This document contains: (1) a description of the scoping process and schedule for the development of the EA; (2) a description of the proposed action and alternatives; (3) a preliminary identification of environmental issues and proposed studies; (4) a request for comments and information; (5) a proposed EA outline; and (6) a preliminary list of comprehensive plans that are applicable to the project.

2.1 PURPOSES OF SCOPING

Scoping is the process used to identify issues, concerns, and opportunities for enhancement or mitigation associated with a proposed action. In general, scoping should be conducted during the early planning stages of a project. The purposes of the scoping process are as follows:

- invite participation of federal, state, and local resource agencies, Indian tribes, non-governmental organizations (NGOs), and the public to identify significant environmental and socioeconomic issues related to the proposed project;

- determine the resource issues, depth of analysis, and significance of issues to be addressed in the EA;

- identify how the project would or would not contribute to cumulative effects in the project area;

- identify reasonable alternatives to the proposed action that should be evaluated in the EA;

- solicit, from participants, available information on the resources at issue, including existing information and study needs; and

- determine the resource areas and potential issues that do not require detailed analysis during review of the project.

2.2 COMMENTS, SCOPING MEETINGS, AND ENVIRONMENTAL SITE REVIEW

Commission staff issued Scoping Document 1 (SD1) on March 8, 2019, to enable resource agencies, Indian tribes, non-governmental organizations (NGO's), and the public to more effectively participate in and contribute to the scoping process. In SD1, we requested clarification of the preliminary issues concerning the project and identification of any new issues that needed to be addressed in the EA. We revised SD1 following the scoping meetings, environmental site review, and review of written comments filed during the scoping comment period, which ended May 8, 2019. This SD2 presents our current view of issues and alternatives to be considered in the EA. To facilitate review, key changes from SD1 to SD2 are identified in bold and italicized type.

We conducted scoping meetings in Galax, Virginia on April 10 and 11, 2019, and an environmental site review was conducted on April 10, 2019, to identify potential resource issues associated with the Byllesby-Buck Project. The scoping meetings and environmental site review were noticed in local newspapers and the Federal Register. A court reporter recorded and transcribed oral comments made during both scoping meetings.

In addition to oral comments received at the scoping meetings and written comments received from individuals, written comments were filed by the following entities:

COMMENTING ENTITY	***FILING DATE***
Don Orth, Virginia Tech	***March 15, 2019***
Bureau of Indian Affairs	***April 2, 2019***
Arlene Warren, Virginia Department of Health	***April 30, 2019***
National Park Service	***May 7, 2019***
U.S. Fish and Wildlife Service	***May 7, 2019***
Virginia Department of Game and Inland Fisheries	***May 7, 2019***
Virginia Department of Environmental Quality	***May 7, 2019***
Caitlin Carey, Virginia Tech	***May 8, 2019***
New River Conservancy	***May 8, 2019***
Virginia Department of Conservation and Recreation	***May 8, 2019***

All comments received are part of the Commission's official record for the project. Information in the official file is available for inspection and reproduction at the Commission's Public Reference Room, located at 888 First Street, NE, Room 2A, Washington, D.C., 20426, or by calling (202) 502-8371. Information also may be

accessed through the Commission's eLibrary system using the "Documents & Filings" link on the Commission's webpage at http://www.ferc.gov. Call (202) 502-6652 for assistance.

2.3 ISSUES RAISED DURING SCOPING

The issues raised by participants in the scoping process are summarized and addressed below. Note that the primary purpose of SD2 is to identify the issues to be analyzed in the EA. The summary does not include every oral and written comment made during the scoping process. We revised SD1 to address only those comments relating directly to the scope of environmental issues for the Byllesby-Buck Project. Comments on the PAD and study requests are not discussed here, but will be considered during study plan development and the ensuing study plan meetings. Further, we do not address comments that are recommendations for license conditions, such as protection, mitigation, and enhancement (PM&E) measures, as these comments will be addressed in the EA or any license order that is issued for this project. We will request final terms, conditions, recommendations, and comments when we issue our Ready for Environmental Analysis (REA) notice. Finally, we do not address comments or recommendations that are administrative in nature, such as requests for changes to the mailing list. Those items will be addressed separately.

General Comments

Comment: Virginia Department of Game and Inland Fisheries (Virginia DGIF), U.S. Fish and Wildlife Service (FWS), and the New River Conservancy (NRC) state that a potentially lower (e.g., 1 foot) winter pool elevation (to minimize ice damage to project facilities) could result in bank erosion at the project in areas where there is a limited riparian buffer and could inhibit recreational access to the impoundments. Virginia DGIF also comments that lower winter pool elevations could impact waterfowl hunting. In addition, FWS states that lower winter pool elevations could affect wetlands and bog turtle habitat.

Response: In the PAD, Appalachian states that it is evaluating the feasibility of operating the developments with 1-foot lower reservoir levels during the winter months of December through March, which would reduce the risk of overtopping project structures when ice jams occur. No other changes in project operation are proposed. Should Appalachian formally propose to lower the impoundments during winter in its final license application, we would analyze the effects of the proposed measure on potentially affected resources in our Environmental Assessment (EA) for the project.

Project Boundary

Comment: Numerous commenters suggest that the project boundary should include the approximately 1.2-mile-long stretch of river between the two dams of the project, which is not currently enclosed in the existing project boundary. The commenters recommend including this stretch of river due to direct effects of project operation on multiple resources.

Response: The geographic scope of analysis for project effects on a given resource is not limited to the existing project boundary, which is an administrative area that includes all project works, lands, and facilities that are necessary for project operation and/or serve a project purpose. At this time, creating a single, continuous project boundary, encompassing the dams at both developments and the 1.2-mile-long stretch of the New River between those dams, would not affect any studies to be conducted or staff's analysis of the effects of project operation on environmental resources, which is not limited to the project boundary.

Cumulative Effects

Comment: In SD1, staff did not identify any resources that could be cumulatively affected by the continued operation and maintenance of the Byllesby-Buck Project in combination with other hydroelectric projects and activities in the New River Basin. FWS states that the project, in conjunction with other dams and hydropower projects on the New and Kanawha Rivers, contributes to cumulative effects on fish and freshwater mussel populations by: forming barriers to migration and dispersal, causing entrainment impacts, reducing riverine (riffle) habitats and increasing lacustrine habitats where sediments accumulate, causing fish stranding in bypassed reaches with insufficient minimum flows, reducing the transport of suitable spawning substrate, and increasing water temperatures.

Virginia DGIF recommends the following resources could be cumulatively affected: (1) sedimentation impacts to reservoir habitat; (2) downstream sediment transport due to project operation with multiple ecological and recreational effects; (3) temperature and other water quality parameters affected by the existence of the project; and (4) riverine habitat and biota altered by the project reservoirs and in the bypassed reaches.

Response: Neither FWS nor Virginia DGIF provide any evidence supporting how, or to what geographic extent, the continued operation and maintenance of the project would combine with effects from other hydroelectric projects and activities in the New River Basin to contribute to cumulative effects on environmental resources.

Therefore, at this time, we have no basis for including any resources in our cumulative effects analysis. Should data collected during the required studies demonstrate that project effects extend beyond the immediate vicinity of the project and interact with other projects and activities in the New River Basin in a manner that could elicit cumulative effects, the scope of our analyses will be re-evaluated at that time.

Geologic and Soil Resources

Comment: Several commenters state that sedimentation and sediment transport (including the potential re-mobilization of PCBs[4] due to project operation and maintenance dredging) have significant effects on habitats at the project and that such effects need to be assessed.

Response: We have added a bullet to section 4.2.1 of this document to indicate that our environmental analysis will evaluate the effects of continued project operation and maintenance (including localized maintenance dredging via the project's drag rake[5] and more infrequent impoundment-wide dredging after large storm events) on sedimentation in the project impoundments and sediment transport through each development, including the potential for the re-mobilization of PCBs.

Aquatic Resources

Comment: Virginia DGIF, FWS, and NRC state that, in addition to water temperature (already included in SD1), water quality issues need to include a consideration of the effects of project operation and maintenance on turbidity and chlorophyll a levels.

Response: While turbidity could be affected by project operation and maintenance (e.g., by releasing sediment collected by the drag rake through the project intakes), it is unclear, nor do the commenters specify, how chlorophyll a levels could be affected by project operation. Accordingly, we modified a bullet in section 4.2.2 of this document to indicate that our environmental analysis will include the effects of project

---

[4] PCBs, or polychlorinated biphenyls, are an industrial contaminant whose use was banned in 1979, but are still present as legacy contaminants in some aquatic systems, where they associate with, and are bound to, sediments.

[5] The trash rake systems at the project were upgraded in 1997 to include a drag rake that extends into the forebays and scrapes along the bottom of the impoundments to remove built-up sediments that are then passed downstream through the intakes.

operation and maintenance on turbidity levels, but did not add chlorophyll a, at this time, as a resource that will be considered in our environmental analysis.

Comment: Don Orth, FWS, Virginia DGIF, and Caitlin Carey comment that staff's analysis should include the effect of project operation on Eastern hellbender, New River crayfish, and freshwater mussels, including green floater and pistolgrip.

Response: Eastern hellbender were included in section 4.2.2 of SD1 as a species of special concern. We modified this bullet to also include the effects of project operation on freshwater mussels (including green floater and pistolgrip) and New River crayfish.

Comment: Virginia DGIF and NRC state the analysis of the existing 360-cubic foot per second (cfs) minimum flow for aquatic resources (referenced in SD1) needs to include an examination of how power generation flow fluctuations affect aquatic resources in terms of effects on fish and mussel spawning.

Response: In section 4.2.2 of SD1, we included a bullet indicating that our environmental analysis will consider the adequacy of the existing 360-cfs minimum flow at each development. Regarding potential flow fluctuations, Appalachian proposes to continue operating the project in a run-of-river mode, whereby outflow from the project approximates inflow. Therefore, flow fluctuations downstream of the tailraces associated with power generation that could affect fish and mussel spawning are not expected at the Byllesby-Buck Project due to the proposed run-of-river operation. Consequently, no changes have been made to this document.

Terrestrial Resources

Comment: During the scoping meetings, Virginia DGIF noted that the Wetland and Riparian Habitat Characterization study proposed in the PAD was not included in the list of proposed studies provided in SD1.

Response: The list of proposed studies in this document now includes the Wetland and Riparian Habitat Characterization study that was proposed in the PAD.

Comment: Don Orth, FWS, Virginia DGIF, and Caitlin Carey comment that an analysis of continued project operation and maintenance on riparian and wetland habitat needs to include consideration of emergent and submerged aquatic vegetation beds (e.g., hornleaf riverweed and water willow) and the importance of these beds to terrestrial and aquatic species.

Response: *We have added emergent and submerged aquatic vegetation beds, including hornleaf riverweed and water willow, to the bulleted list of resources in section 4.2.3 as terrestrial resources that could be affected by project operation and maintenance.*

Threatened and Endangered Species

Comment: *FWS and Virginia DGIF comment that the candy darter, which occurs in the upper New River watershed, was federally listed as endangered in November 2018 and is known to occur in Cripple Creek, a tributary that enters the New River approximately 5 river miles downstream from the Buck Development.*

Response: *Due to the potential for this listed species to occur in the project area, we have added the candy darter to the bulleted list in section 4.2.4, of federally listed species that could be affected by project operation and maintenance.*

Comment: *FWS states that the potential 1-foot winter drawdown at both developments could impact the federally listed threatened bog turtle (Glyptemus muhlenbergii), which is dependent on wetland habitat for all of its life stages.*

Response: *We have added the bog turtle to the bulleted list in section 4.2.4, as a federally listed species that could be affected by project operation and maintenance.*

Recreation Resources

Comment: *Numerous commenters state that project tailraces tend to be popular locations for fishing and that Appalachian does not provide access to such desirable fishing locations.*

Response: *We have modified a bullet in section 4.2.5 to include evaluation of fishing opportunities in the project developments' tailraces.*

Comment: *Virginia DGIF states the analysis of the existing 360-cfs minimum flow for aquatic resources needs to include an examination of how power generation flow fluctuations impact recreational use.*

Response: *In section 4.2.5 of SD1, we included a bullet on the effects of project operation on recreation in the project area. Appalachian proposes to continue operating the project in a run-of-river mode, whereby outflow from the project approximates inflow. Therefore, flow fluctuations downstream of the tailraces associated with power generation that could affect recreation are not expected at the*

Byllesby-Buck Project due to the proposed run-of-river operation. Consequently, no changes have been made to this document.

3.0 PROPOSED ACTION AND ALTERNATIVES

In accordance with NEPA, the environmental analysis will consider the following alternatives, at a minimum: (1) the no-action alternative, (2) the applicant's proposed action, and (3) alternatives to the proposed action.

3.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Byllesby-Buck Project would continue to operate as required by the current project license (i.e., there would be no change to the existing environment). No new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

3.1.1 Existing Project Facilities

The Byllesby Development consists of: (1) a 64-foot-high, 528-foot-long concrete dam and main spillway section topped with four sections of 9-foot-high flashboards, five sections of 9-foot-high inflatable Obermeyer crest gates, and six bays of 10-foot-high Tainter gates; (2) an auxiliary spillway including six sections of 9-foot-high flashboards; (3) a 239-acre impoundment with a gross storage capacity of 2,000 acre-feet; (4) a powerhouse containing four generating units with a total authorized installed capacity of 21.6 megawatts (MW); and (5) appurtenant facilities.

The Buck Development consists of: (1) a 42-foot-high, 353-foot-long concrete dam; (2) a 1,005-foot-long, 19-foot-high spillway section topped with 20 sections of 9-foot-high flashboards, four sections of 9-foot-high inflatable Obermeyer crest gates, and six bays of 10-foot-high Tainter gates; (3) a 66-acre impoundment with a gross storage capacity of 661 acre-feet; (4) a powerhouse containing three generating units with a total authorized installed capacity of 8.5 MW; and (5) appurtenant facilities

Each development is undergoing modification, as approved by an order amending license issued by the Commission on May 18, 2017,[6] to replace several sections of existing wooden flashboards with inflatable Obermeyer crest gates. Once installed and operational, the available Obermeyer crest gates will serve to smooth project operation by reducing instances of inadvertent flow to the bypassed reaches and

[6] 159 FERC ¶ 62,187.

the frequency of maintenance drawdowns associated with wooden flashboard failure and replacement.

3.1.2 Existing Project Operations

The Byllesby-Buck Project operates in a run-of-river mode under all flow conditions. Because the Buck Development is only about 3 miles downstream from the Byllesby Development, the operation of the two developments is closely coordinated. Buck Development operation is dependent on flows through the Byllesby Development. Under normal operating conditions, Appalachian operates the project to use available flows for powerhouse generation, and maintains the elevation of the Byllesby impoundment between 2,078.2 feet and 2,079.2 feet[7] and the Buck impoundment between 2,002.4 feet and 2,003.4 feet. Under article 403 of the current license, Appalachian is also required to release a minimum flow of 360 cfs or inflow to the project, whichever is less, downstream of the project powerhouses.

When inflow to either development exceeds the maximum hydraulic capacity of the turbines (5,868 cfs for Byllesby and 3,540 cfs for Buck), the Tainter gates are opened to pass the excess flow. Gate openings are planned and based on monitoring of the upstream U.S. Geological Survey (USGS) gage at Galax (#03164000) and Byllesby and Buck forebay elevations. If inflows exceed the capacity of the Tainter gates, the inflatable Obermeyer crest gates are operated to pass additional flow, followed by manual tripping of the wooden flashboards, if required. The wooden flashboards must be subsequently re-installed during a period when the impoundment is drawn down to the spillway crest elevation. During flood-stage flows, all generating units at the powerhouse may need to be shut down due to the loss of operating head. The Byllesby auxiliary spillway is operated after release of all available inflatable crest gate and wooden flashboard sections, typically at flows in excess of 46,690 cfs.

Ramping rates are required under Article 406 of the current license for the protection of fish resources downstream of the Buck spillway. The gradual reduction of flow allows fish to progressively leave the bypassed reach, versus possible stranding at sudden flow discontinuation. Following periods of spill from the Buck spillway when a spillway gate has been opened 2 feet or more, Appalachian is required to discharge flows through a 2-foot-wide gate opening for at least 3 hours. Appalachian is then required to reduce the opening to 1 foot for at least an additional 3 hours, after which Appalachian may close the gate.

---

[7] All elevations refer to National Geodetic Vertical Datum of 1929 (NGVD 29).

Tainter gate operation and electricity generation at both Byllesby and Buck is remotely controlled from Appalachian's 24-hour control center located in Columbus, Ohio. Operators are stationed at the control center 24 hours per day, 7 days per week. Plant personnel are present at the Byllesby-Buck Project during normal working hours (8 hours per day during weekday mornings and afternoons) to perform routine maintenance.

3.2 APPLICANT'S PROPOSAL

The proposed action is to continue the existing operation and maintenance of the Byllesby-Buck Project. The current license for the project expires on February 29, 2024.

3.2.1 Proposed Project Facilities and Operation

Appalachian is presently evaluating the feasibility and benefits of operating the developments with 1-foot-lower impoundment levels (i.e., still a 1-foot operating band, but with 1-foot lower normal maximum and minimum impoundment elevations) during the winter months (e.g., December through March). The purpose of the lower winter impoundment level would be to reduce the risk of overtopping project structures (and the resultant risks to the project, downstream areas, and personnel and public safety) due to ice jams on the New River, such as those that occurred at the project in January 2010. Should Appalachian propose this modification in its license application it is not expected to significantly affect project generation. No other changes to project operation or facilities are proposed at this time.

3.2.2 Proposed Environmental Measures

Appalachian proposes to continue the existing operation and maintenance of the Byllesby-Buck Project which includes the protection, mitigation, and enhancement (PM&E) measures required by the current license and subsequent amendments. These measures are described below.

<u>Geologic and Soil Resources</u>

- There are no existing or proposed PM&E measures related to geology and soils for the Byllesby-Buck Project. The potential need for PM&E measures will be evaluated during the relicensing process.

Aquatic Resources

- Continue operating the project in a run-of-river mode, maintaining elevation of the Byllesby impoundment between 2,078.2 feet and 2,079.2 feet and the elevation of the Buck impoundment between 2,002.4 feet and 2,003.4 feet (Article 401).

- Continue providing a minimum flow of 360 cfs, or inflow to the project, whichever is less, to the New River downstream of each powerhouse (Buck and Byllesby) to protect aquatic resources (Article 403).

- Continue implementing the existing ramping rate[8] for the Buck bypassed reach; whereby, following periods of spill when a spillway gate has been opened 2 feet or more, water will continue to be released into the bypassed reach through a 2-foot-gate opening for at least 3 hours, then the gate opening will be reduced to 1 foot for 3 hours before closing the gate.

Terrestrial Resources

- Continue to follow a Commission-approved Wildlife Management Plan that includes provisions to annually inspect undeveloped land within the project boundary for evidence of increased human disturbance, consult with Virginia Virginia DGIF about activities that affect these lands and notify Virginia DGIF of any unanticipated impacts within these lands, and monitor bank erosion (Article 408).

Threatened and Endangered Species

- There are no existing or proposed PM&E measures related to threatened and endangered species for the Byllesby-Buck Project. The potential need for PM&E measures will be evaluated during the relicensing process.

Recreation and Land Use

- Continue to follow a Commission-approved recreation plan and continue to provide project recreation access, monitor recreation use and demand,

[8] 70 FERC ¶ 62,130 (1995). Order Modifying and Approving Ramping Rate Assessment Plan.

consult with interested stakeholders on potential recreation enhancement measures, and update the recreation plan as needed (Article 411).

Aesthetic Resources

- There are no existing or proposed PM&E measures related to aesthetic resources for the Byllesby-Buck Project. The potential need for PM&E measures will be evaluated during the relicensing process.

Cultural Resources

- Continue to follow a Commission-approved cultural resources management plan (CRMP) and to update the CRMP with the filing of its final license application. Appalachian does not anticipate any adverse effects to cultural resources (Article 409).

3.3 DAM SAFETY

It is important to note that dam safety constraints may exist and should be taken into consideration in the development of proposals and alternatives considered in the pending proceeding. For example, proposed modifications such as the potential 1-foot-lower impoundment levels during winter, could impact the integrity of the dam structure. As the proposal and alternatives are developed, the applicant must evaluate the effects and ensure that the project would meet the Commission's dam safety criteria found in Part 12 of the Commission's regulations and the Engineering Guidelines (http://www.ferc.gov/industries/hydropower/safety/guidelines/eng-guide.asp).

3.4 ALTERNATIVES TO THE PROPOSED ACTION

Commission staff will consider and assess all alternative recommendations for operational or facility modifications, as well as PM&E measures identified by the Commission, the agencies, Indian tribes, NGOs, and the public.

3.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

At present, we propose to eliminate the following alternatives from detailed study in the EA.

3.5.1 Federal Government Takeover

In accordance with § 16.14 of the Commission's regulations, a federal department or agency may file a recommendation that the United States exercise its right to take over a hydroelectric power project with a license that is subject to sections 14 and 15 of the FPA.[9] We do not consider federal takeover to be a reasonable alternative. Federal takeover of the project would require congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence showing that federal takeover should be recommended to Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed interest in operating the project.

3.5.2 Non-power License

A non-power license is a temporary license the Commission would terminate whenever it determines that another governmental agency is authorized and willing to assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this time, no governmental agency has suggested a willingness or ability to take over the project. No party has sought a non-power license, and we have no basis for concluding that the Byllesby-Buck Project should no longer be used to produce power. Thus, we do not consider a non-power license a reasonable alternative to relicensing the project.

3.5.3 Project Decommissioning

Decommissioning of the project could be accomplished with or without dam removal. Either alternative would require denying the relicense application and surrender or termination of the existing license with appropriate conditions. There would be significant costs involved with decommissioning the project and/or removing any project facilities. The project provides a viable, safe, and clean renewable source of power to the region. With decommissioning, the project would no longer be authorized to generate power.

No party has suggested project decommissioning would be appropriate in this case, and we have no basis for recommending it. Thus, we do not consider project decommissioning a reasonable alternative to relicensing the project with appropriate environmental measures.

---

[9] 16 U.S.C. §§ 791(a)-825(r).

4.0 SCOPE OF CUMULATIVE EFFECTS AND SITE-SPECIFIC RESOURCE ISSUES

4.1 CUMULATIVE EFFECTS

According to the Council on Environmental Quality's regulations for implementing NEPA (40 C.F.R. 1508.7), a cumulative effect is the effect on the environment that results from the incremental effect of the action when added to other past, present and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

4.1.1 Resources that could be Cumulatively Affected

Based on information in the PAD for the Byllesby-Buck Project, and preliminary staff analysis, we have not identified any resources that could be cumulatively affected by the proposed continued operation and maintenance of the Byllesby-Buck Project in combination with other hydroelectric projects and other activities in the New River Basin.

4.2 RESOURCE ISSUES

In this section, we present a preliminary list of environmental issues to be addressed in the EA. We identified these issues, which are listed by resource area, by reviewing the PAD and the Commission's record for the Byllesby-Buck Project. This list is not intended to be exhaustive or final, but contains the issues raised to date. After the scoping process is complete, we will review the list and determine the appropriate level of analysis needed to address each issue in the EA.

4.2.1 Geologic and Soils Resources

- Effects of continued project operation and maintenance on shoreline erosion in the impoundments at each development (Buck and Byllesby).

- ***Effects of continued project operation and maintenance (including localized maintenance dredging via the project's drag rakes and more infrequent impoundment-wide dredging after large storm events) on sedimentation in the project impoundments and sediment transport through each development, including the potential for the re-mobilization of PCBs.***

4.2.2 Aquatic Resources

- Effects of continued project operation and maintenance on water quality, including dissolved oxygen (DO), water temperature, and ***turbidity*** upstream and downstream of each development, including the Buck bypassed reach.

- Adequacy of the existing 360-cfs minimum flow for aquatic resources, including resident fish species, downstream of each development (Buck and Byllesby).

- Whether there is a need for a minimum flow (beyond leakage) in the Buck bypassed reach.

- Effects of continued project maintenance (periodic impoundment drawdowns to replace flashboards and periodic dredging to remove sediments from the impoundments) on aquatic resources, particularly freshwater mussels and fish spawning habitat in the impoundments of each development.

- Effects of continued project operation on aquatic resources, including entrainment and impingement mortality of resident fishes, such as walleye, smallmouth bass, and spotted bass at each development.

- Effects of continued project operation and maintenance on species of special concern such as Eastern hellbender, ***freshwater mussels (including green floater and pistolgrip)***, and ***New River crayfish***.

- Adequacy of the existing ramping rate to prevent fish stranding in the Buck bypassed reach.

4.2.3 Terrestrial Resources

- Effects of continued project operation ***and maintenance***, on riparian and wetland habitat, ***emergent and submerged aquatic vegetation beds (including hornleaf riverweed and water willow),*** and associated wildlife.

- Effects of continued project operation and maintenance on upland wildlife habitat and associated wildlife such as bald eagles.

4.2.4 Threatened and Endangered Species

- Effects of continued project operation and maintenance on the federally listed Indiana bat, northern long-eared bat, ***bog turtle, candy darter,*** and Virginia spiraea.

4.2.5 Recreation, Land Use, and Aesthetic Resources

- Effects of continued project operation and maintenance on recreation, land use, and aesthetics within the project area.

- Adequacy of existing recreational facilities and public access to the project***, such as fishing in the project developments' tailraces,*** to meet current and future recreational demand.

4.2.6 Cultural Resources

- Effects of project operation and maintenance on historic properties and archeological resources that are included in, eligible for listing in, or potentially eligible for inclusion in the National Register of Historic Places.

- Effects of project operation and maintenance on any previously unidentified historic or archeological resources or traditional cultural properties that may be eligible for inclusion in the National Register of Historical Places.

4.2.7 Developmental Resources

- Economics of the project and the effects of any recommended environmental measures on the project's economics.

5.0 PROPOSED STUDIES

Depending upon the findings of studies completed by Appalachian and the recommendations of the consulted entities, Appalachian will consider, and may propose certain other measures to enhance environmental resources affected by the project as part of the proposed action. Appalachian's initial study proposals are identified by resource area in table 1. Detailed information on Appalachian's initial study proposals can be found in the PAD. Further studies may need to be added to this list based on comments provided to the Commission and Appalachian from interested participants, including Indian tribes.

Table 1. Appalachian's initial study proposals. (Source: Appalachian)

Resource Area and Study Name	**Proposed Study**
Geology and Soils	
Shoreline Stability Assessment	To provide updated information about existing project conditions, as well as to evaluate the need for any additional erosion control measures at specific areas of concern, Appalachian proposes to conduct a Shoreline Stability Assessment for both the Byllesby and Buck developments. Appalachian anticipates that this assessment will consist of a survey of the project impoundments to locate any sites of erosion or shoreline instability. Appalachian proposes to inventory, map, and photograph any such areas, using a scoring or ranking system (e.g., Bank Erosion Hazard Index) to try to identify areas that have the potential to erode at unnaturally high rates and to prioritize any areas where remedial action may be needed.
Aquatic Resources	
Water Quality Study	Appalachian proposes to conduct a single season water quality study by continuously monitoring (at 15-minute

Resource Area and Study Name	**Proposed Study**
	intervals) water temperature, DO, and water levels from June through October at three locations: (1) upstream of the Byllesby impoundment, (2) downstream of the Byllesby powerhouse, and (3) downstream of the Buck powerhouse. In addition, once per month from June through October, depth profiles of water temperature, DO, pH, and specific conductance will be collected at three locations within each impoundment (Buck and Byllesby). This survey would be used to gather baseline water quality data to determine consistency with applicable water quality standards and designated uses.
Bypass Reach Aquatic Habitat and Flow Assessment	Appalachian proposes to perform a desktop aquatic habitat assessment of each project bypassed reach, utilizing high resolution aerial imagery and/or Light Detection and Ranging (LiDAR) data to: (1) delineate the reach into pool, riffle, run, and shoal habitats; (2) characterize dominant substrate types; and (3) identify instream habitat types (e.g., littoral zones, hard structure, woody debris, vegetative cover). Appalachian proposes to supplement the desktop habitat assessment described above, with limited field reconnaissance to confirm site conditions. In addition, Appalachian would collect water level logger and discharge measurements during controlled test gate openings at the spillway to develop a stage-discharge rating curve for a select location.

Resource Area and Study Name	**Proposed Study**
Inflatable Obermeyer Crest Gate Operational Effectiveness Evaluation	Appalachian proposes to conduct a study to confirm that operation of the project dams with the inflatable Obermeyer crest gates has the desired effects of minimizing impoundment fluctuations and instances of inadvertent spill to the bypassed reaches (especially at the Buck Development). Appalachian proposes to conduct this evaluation utilizing an operations model that has been developed for the project. Using this model, Appalachian will be able to simulate project operation with the Obermeyer crest gates installed, including instances of spills to the bypassed reach(es), impoundment level changes, and powerhouse generation for a hypothetical period of time. The level loggers to be installed in the bypassed reach(es) as part of the Bypass Reach Aquatic Habitat and Flow Assessment described above will serve to collect data about water level changes due to spillway operations. These data can be used to validate the operations model.
Terrestrial Resources	
Wetland and Riparian Habitat Characterization	***Appalachian proposes to conduct a wetland and riparian habitat assessment that will consist of field surveys to confirm, classify, and characterize wetland habitats and communities within the project boundary. Wetlands mapped will be classified using the FWS's wetland classification system, unless otherwise recommended by resource agencies. During the wetland survey, investigators will identify the dominant***

Resource Area and Study Name	Proposed Study
	plants present within a wetland habitat to the species level. During the field habitat surveys, investigators will examine the soil matrix down to a depth of approximately 18 inches, if possible, and analyze soil characteristics in the field for hydric soil indicators. Principal wetland functions and values will also be determined. This study will also include characterization of riparian habitat resources within the project boundary.
Recreation Resources	
Recreational Needs Assessment	Appalachian proposes to conduct a recreational assessment of the project to assess existing recreational opportunities and potential improvements to facilities. Appalachian will incorporate existing monitoring information into the study report and recommendations.

6.0 EA PREPARATION SCHEDULE

At this time, we anticipate the need to prepare an EA. The EA will be sent to all persons and entities on the Commission's service and mailing lists for the Byllesby-Buck Project. The EA will include our recommendations for operating procedures, as well as PM&E measures that should be part of any license issued by the Commission. All recipients will then have 30 days to review the EA and file written comments with the Commission. All comments on the EA filed with the Commission will be considered in preparation of any license order. A schedule for the EA preparation will be provided after a license application is filed.

The major milestones, with pre-filing target dates are as follows:

Major Milestone	Target Date
Scoping Meetings	April 2019
License Application Filed	February 2022
Ready for Environmental Analysis Notice Issued	
Deadline for Filing Comments, Recommendations, and Agency Terms and Conditions/Prescriptions	
Single EA Issued	
Comments on EA Due	
Deadline for Filing Modified Agency Recommendations	
Order Issued	

A copy of Appalachian's process plan, which has a complete list of relicensing milestones for the Byllesby-Buck Project, including those for developing the license application, is attached as Appendix A to this SD1.

7.0 PROPOSED EA OUTLINE

The preliminary outline for the Byllesby-Buck Project EA is as follows:

TABLE OF CONTENTS
LIST OF FIGURES
LIST OF TABLES
ACRONYMS AND ABBREVIATIONS
EXECUTIVE SUMMARY

1.0 INTRODUCTION
- 1.1 Application
- 1.2 Purpose of Action and Need for Power
- 1.3 Statutory and Regulatory Requirements
  - 1.3.1 Federal Power Act
    - 1.3.1.1 Section 18 Fishway Prescriptions
    - 1.3.1.2 Section 10(j) Recommendations
  - 1.3.2 Clean Water Act
  - 1.3.3 Endangered Species Act
  - 1.3.4 Coastal Zone Management Act
  - 1.3.5 National Historic Preservation Act
  - Other statutes as applicable
- 1.4 Public Review and Comment
  - 1.4.1 Scoping
  - 1.4.2 Interventions
  - 1.4.3 Comments on the Application

2.0 PROPOSED ACTION AND ALTERNATIVES
- 2.1 No-action Alternative
  - 2.1.1 Existing Project Facilities
  - 2.1.2 Project Safety
  - 2.1.3 Existing Project Operation
  - 2.1.4 Existing Environmental Measures
- 2.2 Applicant's Proposal
  - 2.2.1 Proposed Project Facilities
  - 2.2.2 Proposed Project Operation
  - 2.2.3 Proposed Environmental Measures
  - 2.2.4 Modifications to Applicant's Proposal—Mandatory Conditions
- 2.3 Staff Alternative
- 2.4 Staff Alternative with Mandatory Conditions
- 2.5 Other Alternatives (as appropriate)
- 2.6 Alternatives Considered but Eliminated from Detailed Study

8.0 COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C. section 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by a project. The staff has preliminarily identified and reviewed the plans listed below that may be relevant to the Byllesby-Buck Project. Agencies are requested to review this list and inform the Commission staff of any changes. If there are other comprehensive plans that should be considered for this list that are not on file with the Commission, or if there are more recent versions of the plans already listed, they can be filed for consideration with the Commission according to 18 CFR 2.19 of the Commission's regulations. Please follow the instructions for filing a plan at http://www.ferc.gov/industries/hydropower/gen-info/licensing/complan.pdf.

The following is a list of comprehensive plans currently on file with the Commission that may be relevant to the Byllesby-Buck Project.

National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.

Ohio River Basin Commission. 1977. Kanawha River Basin comprehensive coordinated joint plan. Cincinnati, Ohio. July 1977.

U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.

U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.

U.S. Forest Service. 1978. Mount Rogers National Recreation Area final management plan. Department of Agriculture. Roanoke, Virginia.

U.S. Forest Service. 2004. Revised Land and Resource Management Plan for the Jefferson National Forest. Management Bulletin R8-MB 115A. Department of Agriculture. Roanoke, Virginia.

U.S. Forest Service. 1993. George Washington National Forest revised land and resource management plan. Department of Agriculture, Harrisonburg, Virginia.

Virginia Department of Conservation and Recreation. The 2007 Virginia outdoors plan (SCORP). Richmond, Virginia.

Virginia Department of Environmental Quality. 2015. Commonwealth of Virginia State Water Resources Plan. Richmond, Virginia. October 2015.

Virginia State Water Control Board. 1986. Minimum instream flow study – final report. Annadale, Virginia. February 1986.

9.0 MAILING LIST

The list below is the Commission's official mailing list for the Byllesby-Buck Project (FERC No. 2514). If you want to receive future mailings for the Byllesby-Buck Project and are not included in the list below, please send your request by email to efiling@ferc.gov or by mail to: Secretary, Federal Energy Regulatory Commission, 888 First Street, N.E., Room 1A, Washington, DC 20426. All written and emailed requests to be added to the mailing list must clearly identify the following on the first page: Byllesby-Buck Project No. 2514-186. You may use the same method if requesting removal from the mailing list below.

Register online at http://www.ferc.gov/esubscribenow.htm to be notified via email of new filings and issuances related to this or other pending projects. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll free at 1-866-208-3676, or for TTY, (202) 502-8659.

<u>Official Mailing List for the Byllesby-Buck Project</u>

Appalachian Power Company
Kenneth E. McDonough, Esq
Assistant General Counsel
1 Riverside Plaza
Columbus, OH 43081

Appalachian Power Company
Frank Michael Simms
Hydro Support Manager
40 Franklin Road
Roanoke, VA 24013

Advisory Council on Historic Preservation
John T Eddins
401 F Street N.W., Suite 308
Washington, DC 20001-2637

American Canal Society, Inc.
William E. Trout, III, Director
3806 S. Amherst Hwy
Madison Heights, VA 24572

American Whitewater
Kevin Richard Colburn
National Stewardship Director
1035 Van Buren Street
Missoula, MT 59802

Coastal Canoeists
Charles Ware, Conservation Chair
PO Box 566
Richmond, VA 23218-0566

Appalachian Power Company
David Mark Shirley
Energy Production Supervisor
1 Riverside Plaza, 24rd Floor
Columbus, OH 43215

Winston & Strawn LLP
John A Whittaker
1700 K St. N.W.
Washington, DC 20006-3817

Appalachian Power Company
Thomas St. Pierre
Associate General Counsel
1 Riverside Plaza, 29th Floor
Columbus, OH 43215

Appalachian Power Company
David M Shirley
PO Box 2021
Roanoke, VA 24022-2121

American Electric Power Service Corporation
Douglas Rosenberger
Plant Manager Hydro
40 Franklin Road SW
Roanoke, VA 24011

Appalachian Power Company
Legal Department
PO Box 16631
Columbus, OH 43216-6631

Dickenson County Board of Supervisor
Mark Vanover, County Administrator
PO Box 1098
Clintwood, VA 24228-1098

Federal Emergency Management Agency
Regional Office
3003 Chamblee Tucker Rd
Atlanta, GA 30341

U.S. Fish & Wildlife Service
Region 1
David W. Sutherland, Sr
177 Admiral Cochrane Dr.
Annapolis, MD 21401

Flannagan Water Authority
William Stokes, Executive Director
52 Flannagan Dam Road
Haysi, VA 24256

Town of Fries
PO Box 452
Fries, VA 24330-0452

County of Grayson
PO Box 217
Independence, VA 24348-0217

Town of Hillsville
PO Box 545
Hillsville, VA 24343-0545

Historic Landmarks Commission
2801 Kensington Ave
Richmond, VA 23221-2470

Jonnie B. Deel Memorial Library
Shelia Phipps, Librarian
PO Box 650
Clintwood, VA 24228-0650

Mt. Rogers Planning District Commission
1021 Terrace Dr
Marion, VA 24354-4137

NOAA National Marine Fisheries Service
Office of Program Planning & Integration
NEPA Coordinator
1315 East-West Highway
Silver Spring, MD 20910

Northern Virginia Region Parks Authority
5400 Ox Rd
Fairfax Station, VA 22039-1022

Town of Pulaski
PO Box 660
Pulaski, VA 24301-0660

Region 2000 Regional Commission
Executive Director
828 Main St, Fl 18
Lynchburg, VA 24504

Town of Clintwood
Donald Baker
PO Box 456
Clintwood, VA 24228-0456

U.S. Army Corps of Engineers
District Office
803 Front St
Norfolk, VA 23510-1011

US Army Corps of Engineers
Louisville District
PO Box 59
Louisville, KY 40201-0059

U.S. Army Corps of Engineers
Divisional Office
Regulatory Branch
550 Main St; Rm 10524
Cincinnati, OH 45202-3222

U.S.Army Corps of Engineers
550 Main Street
Cincinnati, OH 45202

U.S. Bureau of Indian Affairs
Office of the Solicitor
1849 C Street, NW, MS 6557
Washington, DC 20240

U.S. Bureau of Indian Affairs
Director, Trust Services
1849 C St NW, MS-4637
Washington, DC 20240-0001

U.S. Bureau of Land Management
Land & Renewable Resources
FERC Contact
1849 C St NW
Washington, DC 20240

U.S. Department of Interior
Office of Environmental Policy and Compliance
Director
1849 C Street, N.W., MS 2430
Washington, DC 20240

U.S. Department of Interior
U.S. Bureau Reclamation
Michael C. Connor Esq
1849 C Street NW
Washington, DC 20240-0001

U.S. Department of Interior
Anthony R. Conte
300 Westgate Center Dr
Hadley, MA 01035-9587

U.S. Department of Interior
James Epstein
300 Westgate Center Dr
Hadley, MA 01035-9587

U.S. Environmental Protection Agency
Region III
1650 Arch St
Philadelphia, PA 19103-2029

U.S. Environmental Protection Agency
Heinz Mueller
Region IV
61 Forsyth St SW
Atlanta, GA 30303-8931

U.S. Fish & Wildlife Service
Regional Director
300 Westgate Center Dr
Northeast Regional Office
Hadley, MA 01035-9587

U.S. National Park Service
FERC Contact
1924 Building
100 Alabama St SW
Atlanta, GA 30303-8701

U.S. National Park Service
Kevin Mendik, ESQ
NPS Hydro Prgm Coord
15 State Street, 10th floor
Boston, MA 02109

U.S. Senate
Honorable Mark Warner
475 Russell Senate Office Bldg
Washington, DC 20510

U.S. Senate
Honorable Tim Kaine
231 Russell Senate Office Bldg
Washington, DC 20510

USDA Forest Service
Ron Bush
1700 Park Ave SW
Norton, VA 24273-1618

USDA Forest Service
David Purser
NEPA Coordinator
1720 Peachtree St NW
Atlanta, GA 30309

Virginia Dept of Conservation and Recreation
Division of Planning and Recreation
600 E. Main St., 24th Floor
Richmond, VA 23219

Virginia Dept of Conservation and Recreation
Robbie Rhur, Enviro. Program Planner
600 East Main Street, Floor 17
Richmond, VA 23219-2094

Virginia Dept of Environmental Quality
Bettina Sullivan, Manager
PO Box 1105
Richmond, VA 23218

Virginia Dept of Environmental Quality
Director
PO Box 1105
Richmond, VA 23218-1105

Virginia Dept of Environmental Quality
Southwest Regional Office
Jeffrey Hurst, Regional Director
355-A Deadmore St
Abingdon, VA 24210

Virginia Dept of Agriculture and Consumer Services
PO Box 1163
Richmond, VA 23218-1163

Virginia Department of Health
Director
PO Box 2448
Richmond, VA 23218-2448

Virginia Department of Historical Resources
2801 Kensington Ave
Richmond, VA 23221-2470

Virginia Department of Mines, Minerals, and Energy
Director, Div. of Energy
1100 Bank St, 11th Flr
Richmond, VA 23219

Virginia Division of Mined Land Reclamation
Randy Casey, Division Director
PO Box 900
Big Stone Gap, VA 24219-0900

Virginia Marine Resources Commission
Ben McGinnis
2600 Washington Ave Fl 3
Newport News, VA 23607

Virginia Office of Attorney General
Attorney General
900 E Main St
Richmond, VA 23219-3513

Virginia Soil and Water Conservation Commission
Director
600 E. Main St., 24th Floor
Richmond, VA 23219

Virginia State Corporation Commission
Sherry H Bridewell, Senior Counsel
1300 East Main St, 10 Fl
Richmond, VA 23219

Virginia Wildlife Federation
Neal D Emerald, Vice President
21851 Locomotive Ter Ste 303
Sterling, VA 20166-6836

County of Wythe
275 S 4th Street
108 Country Ln Office Building
Wytheville, VA 24382-4900

Town of Wytheville
PO Box 533
Wytheville, VA 24382-0533

APPENDIX A
BYLLESBY-BUCK PROJECT PROCESS PLAN AND SCHEDULE

Shaded milestones are unnecessary if there are no study disputes. If the due date falls on a weekend or holiday, the due date is the following business day. Early filings or issuances will not result in changes to these deadlines.

Responsible Party	Pre-Filing Milestone	Date	FERC Regulation
Appalachian	Issue Public Notice for NOI/PAD	1/7/2019	5.3(d)(2)
Appalachian	File NOI/PAD	1/7/2019	5.5, 5.6
FERC	Tribal Meetings	2/6/2019	5.7
FERC	Issue Notice of Commencement of Proceeding and Scoping Document 1	3/8/2019	5.8
FERC	Scoping Meetings and Project Site Visit	4/10/2019, 4/11/2019	5.8(b)(viii)
All Stakeholders	File Comments on PAD/Scoping Document 1 and Study Requests	5/7/2019	5.9
FERC	Issue Scoping Document 2 (if necessary)	6/21/2019	5.10
Appalachian	File Proposed Study Plan	6/21/2019	5.11(a)
All Stakeholders	Proposed Study Plan Meeting	7/21/2019	5.11(e)
All Stakeholders	File Comments on Proposed Study Plan	9/19/2019	5.12
Appalachian	File Revised Study Plan	10/19/2019	5.13(a)
All Stakeholders	File Comments on Revised Study Plan	11/3/2019	5.13(b)
FERC	Issue Director's Study Plan Determination	11/18/2019	5.13(c)
Mandatory Conditioning Agencies	File Any Study Disputes	12/8/2019	5.14(a)
Dispute Panel	Select Third Dispute Resolution Panel Member	12/23/2019	5.14(d)

Responsible Party	Pre-Filing Milestone	Date	FERC Regulation
Dispute Panel	Convene Dispute Resolution Panel	12/28/2019	5.14(d)(3)
Appalachian	File Comments on Study Disputes	1/2/2020	5.14(i)
Dispute Panel	Dispute Resolution Panel Technical Conference	1/7/2020	5.14(j)
Dispute Panel	Issue Dispute Resolution Panel Findings	1/27/2020	5.14(k)
FERC	Issue Director's Study Dispute Determination	2/16/2020	5.14(l)
Appalachian	First Study Season	Spring - Fall 2020	5.15(a)
Appalachian	File Initial Study Report	11/17/2020	5.15(c)(1)
All Stakeholders	Initial Study Report Meeting	12/2/2020	5.15(c)(2)
Appalachian	File Initial Study Report Meeting Summary	12/17/2020	5.15(c)(3)
All Stakeholders	File Disagreements/Requests to Amend Study Plan	1/16/2021	5.15(c)(4)
All Stakeholders	File Responses to Disagreements/Amendment Requests	2/15/2021	5.15(c)(5)
FERC	Issue Director's Determination on Disagreements/Amendments	3/17/2021	5.15(c)(6)
Appalachian	Second Study Season	Spring - Fall 2021	5.15(a)
Appalachian	File Preliminary Licensing Proposal (or Draft License Application)	10/1/2021	5.16(a)-(c)
All Stakeholders	File Comments on Preliminary Licensing Proposal (or Draft License Application)	12/30/2021	5.16(e)
Appalachian	File Updated Study Report	11/17/2021	5.15(f)
All Stakeholders	Updated Study Report Meeting	12/2/2021	5.15(f)

Responsible Party	Pre-Filing Milestone	Date	FERC Regulation
Appalachian	File Updated Study Report Meeting Summary	12/17/2021	5.15(f)
Appalachian	File Final License Application	2/28/2022	5.17
All Stakeholders	File Disagreements/Requests to Amend Study Plan	1/16/2022	5.15(f)
Appalachian	Issue Public Notice of Final License Application Filing	3/14/2022	5.17(d)(2)
All Stakeholders	File Responses to Disagreements/Amendment Requests	2/15/2022	5.15(f)
FERC	Issue Director's Determination on Disagreements/Amendments	3/17/2022	5.15(f)

Yayac, Maggie

From:	Kulpa, Sarah
Sent:	Monday, June 24, 2019 10:07 AM
To:	ACHP - John Eddins; American Whitewater - Kevin Colburn; Appalachian Trail Conservancy - Andrew Downs; Carroll County - Rex Hill; Carroll County Administrator - Steve Truitt; Cherokee Nation - Elizabeth Toombs; Fish and Wildlife Conservation - Caitlin Carey; Fish and Wildlife Conservation - Donald J. Orth; Friends of the Rivers of VA - Bill Tanger; Harold Peterson; New River Conservancy - George Santucci; New River Conservancy - Laura Walters; New River Outdoor Adventures - Tim Dixon; New River Trail State Park - Sam Sweeney; Town of Fries - Scott McCoy; USFWS Chesapeake Bay Field Office - Janet Norman; USGS - Mark Bennett; VADCR - Jimmy Elliott; VADCR - Lynn Crump; VADCR - Robbie Ruhr; VADCR - Sharon Ewing; VADEQ; VADEQ - Bettina Rayfield; VADEQ - Joe Grist; VADEQ - Matthew Link; VADEQ - Scott Kudlas; VADEQ - Tony Cario; Virginia Council on Indians - Benjamin Hermerding; Virginia Department of Conservation and Recreation - Rene Hypes; Virginia Department of Game and Inland Fisheries - John Copeland; Virginia Department of Game and Inland Fisheries - William Kittrell
Cc:	Jonathan M Magalski; Elizabeth B Parcell; MacVane, Kelly; Yayac, Maggie; Quiggle, Robert
Subject:	Byllesby-Buck Hydroelectric Project (VA) -- Filing of Proposed Study Plan
Attachments:	ByllesbyBuck PSP Transmittal Letter 20190621.pdf
Categories:	Blue Category

Byllesby-Buck Hydroelectric Project Stakeholders:

Appalachian Power Company (Appalachian), a unit of American Electric Power (AEP), is the licensee, owner and operator of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project) located on the New River in Carroll County, Virginia. The Project is operated under a license issued by the Federal Energy Regulatory Commission (FERC). The existing FERC license for the Project expires on February 29, 2024. Appalachian is pursuing a new license for the continued operation of the Project in accordance with FERC's Integrated Licensing Process (ILP). Pursuant to the ILP, Appalachian filed the Proposed Study Plan (PSP) for the Project on June 21, 2019. The PSP describes the studies that Appalachian is proposing to conduct in support of Project relicensing.

On behalf of Appalachian, we are notifying stakeholders of the availability of the PSP. For your convenience, a copy of the cover letter filed with the PSP is attached. Please note that, due to file size restrictions, the PSP has not been included in this email. Appalachian encourages stakeholders to view the filing online at FERC's eLibrary at http://elibrary.ferc.gov:0/idmws/file_list.asp?document_id=14779458. Appalachian will also be adding the PSP to the Project's public relicensing website (http://www.aephydro.com/HydroPlant/ByllesbyBuck) in the coming days.

Should you have any questions regarding this filing, please contact Liz Parcell with AEP at (540) 985-2441 or ebparcell@aep.com.

Thank you,

Sarah Kulpa
Project Manager

HDR
440 S. Church Street, Suite 900
Charlotte, NC 28202-2075
D 704.248.3620 **M** 315.415.8703
sarah.kulpa@hdrinc.com

hdrinc.com/follow-us

Appalachian Power Company
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

Via Electronic Filing June 21, 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514-186)
Filing of Proposed Study Plan for Relicensing Studies

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Applicant), a unit of American Electric Power (AEP) is the Licensee, owner, and operator of the 30.1 megawatt (MW) Byllesby-Buck Hydroelectric Project (Project No. 2514-186) (Project or Byllesby-Buck Project), located on the New River in Carroll County, Virginia. The Byllesby development is located about 9 miles north of the City of Galax, and the Buck development is located approximately three river miles (RM) downstream of Byllesby and 43.5 RM upstream of Claytor Dam and operates in run-of-river mode.

The existing license for the Project was issued by the Federal Energy Regulatory Commission (FERC or Commission) for a 30-year term, with an effective date of March 28, 1994 and expires February 29, 2024. Accordingly, Appalachian is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. In accordance with 18 CFR §5.11 of the Commission's regulations, Appalachian is filing the Proposed Study Plan (PSP) describing the studies that the Licensee is proposing to conduct in support of relicensing the Project.

Appalachian filed a Pre-Application Document (PAD) and associated Notice of Intent (NOI) with the Commission on January 7, 2019, to initiate the ILP. The Commission issued Scoping Document 1 (SD1) for the Project on March 8, 2019. SD1 was intended to advise resource agencies, Indian tribes, non-governmental organizations, and other stakeholders as to the proposed scope of FERC's Environmental Assessment (EA) for the Project and to seek additional information pertinent to the Commission's analysis.

On April 10 and 11, 2019, the Commission held public scoping meetings in Galax, Virginia. During these meetings, FERC staff presented information regarding the ILP and details regarding the study scoping process and how to request a relicensing study, including the Commission's study criteria. In addition, FERC staff solicited comments regarding the scope of issues and analyses for the EA. Pursuant to 18 CFR §5.8(d), a public site visit of the Project was conducted on April 10, 2019.

Resource agencies, Indian tribes, and other interested parties were afforded a 60-day period to request studies and provide comments on the PAD and SD1. The comment period was initiated with the Commission's March 8, 2019 notice and concluded on May 7, 2019. During the comment period, a total of ten stakeholders filed letters with the Commission providing general comments, comments regarding the PAD, comments regarding SD1, and/or study requests.

Proposed Study Plan

Appalachian has evaluated all the study requests and comments submitted by the stakeholders, with a focus on the requests that specifically addressed the seven criteria for study requests as set forth at 18 CFR §5.9(b) of the Commission's ILP regulations. For the study requests that did not address the seven study criteria, where appropriate, Appalachian considered the study in the context of providing the requested information in conjunction with one or more of Appalachian's proposed studies.

The purpose of the PSP is to present the studies that are being proposed by Appalachian and to address the comments and study requests submitted by resource agencies and other stakeholders. The PSP also provides FERC, regulatory agencies, Indian tribes, and other stakeholders with the methodology and details of Appalachian's proposed studies. At this time, Appalachian is proposing to conduct the following studies as described in detail in the PSP:

1. Flow and Bypass Reach Aquatic Habitat Study;
2. Water Quality Study;
3. Aquatic Resources Study;
4. Wetlands, Riparian, and Littoral Habitat Characterization Study;
5. Terrestrial Resources Study;
6. Shoreline Stability Assessment Study;
7. Recreation Study; and
8. Cultural Resources Study.

Appalachian is filing the PSP with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Appalachian is distributing this letter via email; otherwise, Appalachian is distributing this letter via U.S. mail. All parties interested in the relicensing process may obtain a copy of the PSP electronically through FERC's eLibrary system at https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2514-186, or on Appalachian's website at http://www.aephydro.com/HydroPlant/ByllesbyBuck. If any party would like to request a CD containing an electronic copy of the PSP, please contact the undersigned at the information listed below.

Comments on the PSP, including any additional or revised study requests, must be filed within 90 days of the filing date of this PSP which is no later than September 19, 2019. Comments must include an explanation of any study plan concerns, and any accommodations reached with Appalachian regarding those concerns (18 CFR §5.12). Any proposed modifications to this PSP must address the Commission's criteria as presented in 18 CFR §5.9(b).

As necessary, after the comment period closes, Appalachian will prepare a Revised Study Plan (RSP) that will address interested parties' comments to the extent practicable. Pursuant to the ILP, Appalachian will file the RSP with the Commission on or before October 19, 2019, and the Commission will issue a final Study Plan Determination (SPD) by November 18, 2019.

Initial Proposed Study Plan Meeting

In accordance with 18 CFR §5.11(e) of the Commission's regulations, Appalachian intends to hold an initial Proposed Study Plan Meeting (PSP Meeting) to describe the background, concepts, and study methods described in the PSP. The PSP Meeting will begin at 9:00 AM on July 18, 2019 at the AEP Service Center, 200 Appalachian Drive, Wytheville, VA, 24382.

To assist with meeting planning and logistics, Appalachian respectfully requests that individuals or organizations who plan to attend the meeting please RSVP by sending an email to me at ebparcell@aep.com on or before July 12, 2019.

If there are any questions regarding the PSP or PSP Meeting, please do not hesitate to contact me at (540) 985-2441 or the e-mail address above.

Sincerely,

Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

Enclosures

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Federal Agencies

Mr. John Eddins
Archaeologist/Program Analyst
Advisory Council on Historic Preservation
401 F Street NW, Suite 308
Washington, DC 20001-2637
jeddins@achp.gov

Ms. Kimberly Bose
Secretary
Federal Energy Regulatory Commission
888 1st St NE
Washington, DC 20426

FEMA Region 3
615 Chestnut Street
One Independence Mall, Sixth Floor
Philadelphia, PA 19106-4404

Mr. John Bullard
Regional Administrator
NOAA Fisheries Service
Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930-2276

Mr. John A. Bricker
State Conservationist
US Department of Agriculture
Natural Resources Conservation Service
1606 Santa Rosa Road, Suite 209
Richmond, VA 23229-5014

Mr. Harold Peterson
Bureau of Indian Affairs
US Department of the Interior
545 Marriott Dr, Suite 700
Nashville, TN 37214
Harold.Peterson@bia.gov

Office of the Solicitor
US Department of the Interior
1849 C Street, NW
Washington, DC 20240

Ms. Lindy Nelson
Regional Environmental Officer, Office of Environmental Policy & Compliance
US Department of the Interior, Philadelphia Region
Custom House, Room 244
200 Chestnut Street
Philadelphia, PA 19106

Ms. Barbara Rudnick
NEPA Team Leader - Region 3
US Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

Mr. Martin Miller
Chief, Endangered Species - Northeast Region (Region 5)
US Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035

Ms. Cindy Schulz
Field Supervisor, Virginia Field Office
US Fish and Wildlife Service
6669 Short Lane
Gloucester, VA 23061

Ms. Janet Norman
Chesapeake Bay Field Office
US Fish and Wildlife Service
177 Admiral Cochrane Drive
Annapolis, MD 21401
janet_norman@fws.gov

Ms. Elizabeth Merz
US Forest Service
3714 Highway 16
Marion, VA 24354

Mr. Mark Bennett
Center Director of VA and WV Water Science Center
US Geological Survey
John W. Powell Building
12201 Sunrise Valley Drive
Reston, VA 20192
mrbennet@usgs.gov

Hon. Morgan Griffith
US Congressman, 9th District
US House of Representatives
Christiansburg District Office
17 West Main Street
Christiansburg, VA 24073

Mr. Michael Reynolds
Acting Director, Headquarters
US National Park Service
1849 C Street, NW
Washington, DC 20240

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Ms. Catherine Turton
Architectural Historian, Northeast Region
US National Park Service
US Custom House, 3rd Floor
200 Chestnut Street
Philadelphia, PA 19106

Hon. Tim Kaine
US Senate
231 Russell Senate Office Building
Washington, DC 20510

Hon. Mark Warner
US Senate
703 Hart Senate Office Building
Washington, DC 20510

State Agencies

Dr. Elizabeth Moore
President
Archaeological Society of Virginia
PO Box 70395
Richmond, VA 23255

Mr. Donald J. Orth
Certified Fisheries Professional
Department of Fish and Wildlife Conservation
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061
dorth@vt.edu

Ms. Caitlin Carey
Research Associate
Department of Fish and Wildlife Conservation
1900 Kraft Drive, Ste 105
Blacksburg, VA 24061
cscarey@vt.edu

Mr. Jess Jones
Freshwater Mollusk Conservation Center
Virginia Tech
1B Plantation Road
Blacksburg, VA 24061

Tracy Goodson
District Manager
New River Soil and Water Conservation District
968 East Stuart Drive
Galax, VA 24333

Mr. Ralph Northam
Governor
Office of the Governor
PO Box 1475
Richmond, VA 23218

Mr. Benjamin Hermerding
Office of the Secretary of the Commonwealth
Virginia Council on Indians
PO Box 2454
Richmond, VA 23218
benjamin.hermerding@governor.virginia.gov

Ms. Robbie Rhur
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219
Robbie.Rhur@dcr.virginia.gov

Ms. Rene Hypes
Natural Heritage Program
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219
rene.hypes@dcr.virginia.gov

Mr. Clyde Cristman
Division Director
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219

Mr. Sam Sweeney
New River Trail State Park Manager
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Max Meadows, VA 24360
sam.sweeney@dcr.virginia.gov

Ms. Lynn Crump
Environmental Programs Planner
Virginia Department of Conservation and Recreation
600 East Main Street, 24th floor
Richmond, VA 23219
lynn.crump@dcr.virginia.gov

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Ms. Sharon Ewing
Virginia Department of Conservation and Recreation
sharon.ewing@dcr.virginia.gov

Mr. Jimmy Elliott
Virginia Department of Conservation and Recreation - New River Trail
james.elliott@dcr.virginia.gov

Mr. Matthew Link
Water Withdrawal Permit Writer, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
matthew.link@deq.virginia.gov

Mr. Scott Kudlas
Director, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
scott.kudlas@deq.virginia.gov

Mr. Kelly Miller
Southwest Regional Office
Virginia Department of Environmental Quality
355-A Deadmore Street
Abingdon, VA 24210

NEPA Review
Virginia Department of Environmental Quality
eir@deq.virginia.gov

Ms. Bettina Rayfield
Environmental Impact Review and Long Range Priorities Program
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
bettina.rayfield@deq.virginia.gov

Mr. Tony Cario
Water Withdrawal Permit Writer, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
anthony.cario@deq.virginia.gov

Mr. Joe Grist
Water Withdrawl Program Manager
Virginia Department of Environmental Quality
PO Box 1106
Richmond, VA 23218
joseph.grist@deq.virginia.gov

Mr. Chris Sullivan
Senior Area Forester
Virginia Department of Forestry
900 Natural Resources Drive
Charlottesville, VA 22903

Mr. William Kittrell
Manager, Marion Office - Region 3 Office
Virginia Department of Game and Inland Fisheries
1796 Highway Sixteen
Marion, VA 24354
Bill.Kittrell@dgif.virginia.gov

Mr. John Copeland
Fisheries Biologist
Virginia Department of Game and Inland Fisheries
2206 South Main Street, Suite C
Blacksburg, VA 24060
John.Copeland@dgif.virginia.gov

Ms. Julie Langan
Director and State Historic Preservation Officer
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221

<u>Local Governments</u>

Mr. Steve Truitt
Carroll County Administrator
Carroll County
605-1 Pine Street
Hillsville, VA 24343
Steve.Truitt@carrollcountyva.gov

Mr. Rex Hill
Carroll Board of Supervisor
Carroll County
rex.hill@carrollcountyva.gov

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Mr. Scott McCoy
Town Manager
Town of Fries
PO Box 452
Fries, VA 24330
townoffries@friesva.com

Mr. C. M. Mitchell
Mayor
Town of Galax
111 East Grayson Street
Galax, VA 24333

Tribes

Chief Bill Harris
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
P.O. Box 948
Tahlequah, OH 74465
elizabeth-toombs@cherokee.org

Deborah Dotson
President
Delaware Nation
PO Box 825
Anadarko, OK 73005

Administration
Delaware Tribe of Indians
5100 Tuxedo Blvd
Bartlesville, OK 74006

Chief Richard Sneed
Eastern Band of Cherokee Indians
PO Box 455
Cherokee, NC 28719

Chief Dean Branham
Monacan Indian Nation
PO Box 1136
Madison Heights, VA 24572

Administration
United Keetoowah Band of Cherokee Indians
PO Box 746
Tahlequah, OK 74465

Non-governmental Organizations

American Canoe Association
503 Sophia Street, Suite 100
Fredericksburg, VA 22401

Mr. Kevin Richard Colburn
National Stewardship Director
American Whitewater
PO Box 1540
Cullowhee, NC 28779
kevin@americanwhitewater.org

Mr. Andrew Downs
Regional Director
Appalachian Trail Conservancy
799 Washington Street
PO Box 807
Harpers Ferry, WV 25425-0807
adowns@appalachiantrail.org

Mr. Rick Roth
Treasurer
Friends of the New River
1000 Highland Circle
Blacksburg, VA 24060

Mr. George Santucci
President
New River Conservancy
PO Box 1480
1 N Jefferson Avenue, Suite D
West Jefferson, NC 28694
george@newriverconservancy.org

Ms. Laura Walters
Board Chair
New River Conservancy
6718 Dunkard Road
Dublin, VA 24084
claytorlakegirl@gmail.com

Ms. Andrea Langston
New River Land Trust
PO Box 11057
Blacksburg, VA 24062

Mr. Tim Dixon
Owner
New River Outdoor Adventures
5785 Fries Road
Galax, VA 24333
newriveroutdooradventures@yahoo.com

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Mr. Steve Moyer
Vice President for Government Affairs
Trout Unlimited
1777 N. Kent Street, Suite 100
Arlington, VA 22209

Mr. Bill Tanger
Friends of the Rivers of Virginia
PO Box 1750
Roanoke, VA 24008
Bill.tanger@verizon.net

Yayac, Maggie

Subject: FW: Byllesby/Buck Project No. 2514: Requested Mussel Report
Attachments: BuckDamDrawdown_MusselReport_Final 2018.pdf

From: Elizabeth B Parcell [mailto:ebparcell@aep.com]
Sent: Tuesday, September 3, 2019 11:01 AM
To: Jody.Callihan@ferc.gov
Cc: Jonathan M Magalski <jmmagalski@aep.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>
Subject: Byllesby/Buck Project No. 2514: Requested Mussel Report

Hi Jody,

I hope you are well and enjoyed the holiday weekend. At the Byllesby/Buck Proposed Study Plan meeting in July, you requested a copy of the latest report on mussels at the Byllesby/Buck Project. The report, which is attached, was prepared by Stantec Consulting Services, Inc. and is dated August 22, 2018. Please note that I will send Janet Norman (USFWS) a copy by separate email.

Please let me know if we can provide any additional information.

Liz

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

ELIZABETH B PARCELL | **PROCESS SUPV**
EBPARCELL@AEP.COM | D:540.985.2441
40 FRANKLIN ROAD SW, ROANOKE, VA 24011

Yayac, Maggie

Subject: FW: Additional document
Attachments: Byllesby-Buck 1991 fishery survey.pdf

From: Elizabeth B Parcell [mailto:ebparcell@aep.com]
Sent: Tuesday, September 3, 2019 4:39 PM
To: Norman, Janet <janet_norman@fws.gov>
Cc: Jonathan M Magalski <jmmagalski@aep.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>
Subject: Additional document

Janet,

Attached is the 1991 Fish Study that you requested during the Byllesby/Buck Proposed Study Plan meeting held in July.

I believe that is everything that you requested but if I missed anything, just let me know.

Liz

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

ELIZABETH B PARCELL | PROCESS SUPV
EBPARCELL@AEP.COM | D:540.985.2441
40 FRANKLIN ROAD SW, ROANOKE, VA 24011

Yayac, Maggie

Subject: FW: [EXTERNAL] Buck Mussel Study - Final Report

From: Norman, Janet <janet_norman@fws.gov>
Sent: Tuesday, September 3, 2019 8:12 PM
To: Elizabeth B Parcell <ebparcell@aep.com>
Subject: Re: [EXTERNAL] Buck Mussel Study - Final Report

Liz,
Thanks very much for sending the report, and following up from my request.

Labor Day holiday was fun visiting Colorado, as I hope yours was as well.

Janet

On Tue, Sep 3, 2019 at 3:41 PM Elizabeth B Parcell <ebparcell@aep.com> wrote:

> Hi Janet,
>
> Hope you had a great holiday weekend. Attached please find the latest report on mussels at the Byllesby/Buck Project. You may recall that you requested a copy of the report at the Proposed Study Plan meeting in July. The report, which was prepared by Stantec Consulting Services, Inc., is dated August 22, 2018. Please note that I sent a copy to FERC by separate email.
>
> Please let me know if we can provide any additional information.
>
> Liz
>
> AMERICAN ELECTRIC POWER
> BOUNDLESS ENERGY

ELIZABETH B PARCELL | PROCESS SUPV
EBPARCELL@AEP.COM | D:540.985.2441
40 FRANKLIN ROAD SW, ROANOKE, VA 24011

--
Janet Norman
Biologist
U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Dr.
Annapolis, MD 21401
Office: 410-573-4533
Fax: 410-269-0832
Janet_Norman@fws.gov
www.fws.gov/chesapeakebay

Yayac, Maggie

Subject: FW: [EXTERNAL] Buck Mussel Study - Final Report
Attachments: 19970916 ByllsBuck ramping rate assessment.pdf

From: Elizabeth B Parcell [mailto:ebparcell@aep.com]
Sent: Wednesday, September 4, 2019 9:39 AM
To: Norman, Janet <janet_norman@fws.gov>
Cc: Jonathan M Magalski <jmmagalski@aep.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>
Subject: RE: [EXTERNAL] Buck Mussel Study - Final Report

Janet,

Colorado sounds very exciting.

I double checked my list and found one more item for you. If you see anything else, just let me know.

Many thanks.
Liz

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY
ELIZABETH B PARCELL | **PROCESS SUPV**
EBPARCELL@AEP.COM | D:540.985.2441
40 FRANKLIN ROAD SW, ROANOKE, VA 24011

Matthew J. Strickler
Secretary of Natural Resources

COMMONWEALTH of VIRGINIA
Department of Game and Inland Fisheries

Ryan J. Brown
Executive Director

September 18, 2019

Secretary Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Byllesby-Buck Project (P-2514-186) Comments on Proposed Study Plans

Dear Secretary Bose:

We appreciate the opportunity to comment on the Byllesby-Buck Hydroelectric Project (Number 2514-186) Proposed Study Plans. Virginia Department of Game and Inland Fisheries (VDGIF) Aquatic Wildlife Resources staff attended the Proposed Study Plan meeting on July 18, 2019 and reviewed the Proposed Study Plan document. We offer the following comments.

Section 1.3 Project Description, Location, and Study Area: The Byllesby-Buck Project affects a larger area of the New River upstream and downstream from the project area. New River ecological and geologic processes are influenced by the Project for some distance upstream and downstream from the Project Area. Examples include: (1) The Project reservoirs influence ambient New River water temperature and other water quality parameters, with habitat effects on resident coolwater flora and fauna, including New River endemic fishes; (2) Liberation of reservoir sediment deposits during Project operations result in increased turbidity in downstream reaches influenced by Project flow, disrupting ecological processes and negatively affecting angling and recreational use; (3) New River walleye populations are affected by Project placement, with the dams likely inundating historic New River walleye spawning areas; (4) Project dams block New River walleye migration, requiring substantial VDGIF effort and expense to maintain walleye populations upstream and downstream of the Project via hatchery rearing and stocking programs; and, (5) Loss of upstream mussel fauna due to Project dams blocking migration of host fishes.

The magnitude and spatial scale of this Project influence is not adequately addressed in the Proposed Study Plan Study Area, which limits assessment of the Project's influence to a small area upstream and downstream from the Project. Determining the spatial scale of this Project influence will help determine adequate reference conditions for ecological comparisons during multiple study efforts. Determining the downstream spatial influence will involve consideration of Project flow attenuation and downstream turbidity effects of Project operations, as well as other downstream water quality and recreational impacts. Making this determination needs to be a high priority before study plans are finalized.

Section 3.2 Study Requests Not Deemed Appropriate for Study: In our May 7, 2019 comments on the Pre-Application Document, VDGIF requested a Comprehensive Sediment Study, providing the needed justification for that study. We request that FERC determine whether this study is appropriate for the Project.

Section 6.1 Flow and Bypass Reach Aquatic Habitat Study
6.4 Background and Existing Information: This section states that both bypass reaches normally receive seepage and leakage, but there is no mention of existing estimates for the amount of this seepage and leakage, nor is there any mention of a plan to document the amount in the current studies. Existing information should be reported or a plan to document it should be mentioned. The 1997 Ramping Rate Effectiveness study is mentioned in this section as an adequate measure of the impacts of ramping in the Buck bypass reach. At the time of that study, the New River walleye population downstream from Buck dam was not as robust as it is now due to more than 20 years of an active stocking and management program. Walleye are one of the species likely attracted by bypass reach flows, so the 1997 study results may not apply under current Walleye population conditions. The Buck bypass reach receives flow frequently during most normal and wet years in months when Walleye are likely to be attracted to the bypass reach (February to May) during the spawn and post-spawn periods. Finally, this section reviews hydrologic data used in the CHEOPS modeling effort and for use in related flow evaluations during this study, but does not provide enough information to characterize the range of flows typical for the Project Area. More information should be provided about why the proposed 21-year period of record from January 1, 1997 to December 31, 2017 on the Ivanhoe gauge is considered sufficient for these analyses.

Section 6.6.4.3 Substrate Characterization and Mapping: What will be used as a reference condition for this characterization? If data is only collected in these bypass reaches, how will that information be analyzed without an adequate reference data set in a free-flowing section of the New River?

Section 7 Water Quality Study
The study plan indicates this study will provide data to determine if the Project reservoirs undergo thermal and/or dissolved oxygen stratification using data sondes at 2 discrete depths. VDGIF staff question whether vertical temperature/dissolved oxygen profiles need to be done on at least a bi-weekly basis to determine stratification depths prior to or in concert with deploying data sondes. The study plan also indicates that data sondes will be deployed in both Project tailrace areas for a single season. VDGIF staff question whether a single season data collection effort will adequately characterize water quality in these areas, since critical habitat conditions may only be observed in a dry water year. Finally, VDGIF staff mentioned concerns about downstream turbidity effects of the Project in our May 7 comments, but this study fails to provide a plan for assessing turbidity effects.

Section 8 Aquatic Resources Study
8.4.1 Fish Community: The final paragraph on page 49 includes a review of New River Muskellunge stocking. For the record, VDGIF discontinued Muskellunge stocking in the New River downstream from Claytor Dam in 2011 due to documented natural reproduction. Muskellunge stocking in the New River upstream from Claytor Dam was suspended in 2018.

Eastern Hellbender: In the Aquatic Resources Study Plan, there is no mention of survey efforts for the Eastern Hellbender (*Cryptobranchus allieganiensis allieganiensis*). At the July 18, 2019 Study Plan meeting, discussion of this species centered on assuming presence of this species in the Project Area in the absence of directed surveys. VDGIF staff agree that the presence of this species in the Project Area should be assumed by all parties to the Aquatic Resources Study, including FERC.

8.6.2 Field Sampling: VDGIF staff request that spring fish collection efforts be commenced in April for comparability to VDGIF data and for adequate assessment of resident Walleye populations downstream from Buck Dam. We also request total length measurements of up to 100 individuals of each game fish (specifically Walleye, Smallmouth Bass, and Rock Bass) collected during sampling (in place of the proposed 30 individuals in the collection protocols) to allow assessment of angling potential. Having more than 30 individual measurements of the above species in this dataset will provide data for calculating size structure indices and developing length-frequency diagrams, standard techniques used in evaluating angling potential (Zale, Parrish, and Sutton. 2012. Fisheries Techniques, 3rd Edition. American Fisheries Society, Bethesda, Maryland).

Section 8.6.3 Mussel Community Study: The presence in the Project Area of the state threatened Pistolgrip (*Tritogonia verrucosa*) and the likelihood of the presence of the state threatened Green Floater (*Lasmigona subviridis*) justify including a mussel community study. The mussel community data gap from the Buck Reservoir islands upstream to Byllesby Dam needs to be filled. VDGIF staff suggest performing a habitat assessment followed by directed surveys as indicated by habitat availability.

Section 9 Wetlands, Riparian, and Littoral Habitat Characterization Study
In Table 9-1, the schedule for this study is outlined, with field verification planned for April to June. Since submerged aquatic vegetation beds are not fully developed until late summer, this field verification should be performed into the late summer/early fall months of August and September. Regarding the methodology to be employed in these surveys, it is not clear whether transect based sampling will be performed on the submerged aquatic vegetation beds. Without the quantitative information provided by transect based sampling, the extent and composition of these beds will not be adequate, so VDGIF staff recommend transect based sampling be performed on the submerged aquatic vegetation beds.

Section 12 Recreation Study
Section 12.6.3 Recreation Visitor Use Online Survey: Notice of this survey needs to be done in other ways than just posting it at kiosks in the Project Area. The survey can be advertised via local outfitters and river guides as well as social media outlets.

Section 12.6.4: Regarding the use of trail cameras for monitoring recreation use, VDGIF requests that this technique be used for monitoring recreational use of the tailrace areas, particularly given FERC's interest in recreational use of these areas, as expressed in Scoping Document 2.

Thank you for the opportunity to provide comments on the Proposed Study Plans for the Byllesby-Buck Hydroelectric Project. If you have questions regarding our comments, please contact me at the address and phone number listed below.

Sincerely,

William B. Kittrell, Jr.

William B. Kittrell, Jr.
Regional Aquatic Resources Manager
1796 Highway Sixteen
Marion, VA 24354
(276) 783-4860
Email: bill.kittrell@dgif.virginia.gov

WBK/jrc

Cc: E. Aschenbach
M. Bednarski
J. R. Copeland
R. Fernald
M. Pinder
R. Southwick
B. Watson

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
September 19, 2019

OFFICE OF ENERGY PROJECTS

Project No. 2514-186 – Virginia
Byllesby-Buck Hydroelectric Project
Appalachian Power Company

VIA FERC Service

Ms. Elizabeth Parcell, Process Supervisor
American Electric Power Services Corporation
P.O. Box 2021
Roanoke, VA 24022-2021

Reference: Staff Comments on the Proposed Study Plan and Additional Information Requests for the Byllesby-Buck Hydroelectric Project

Dear Ms. Parcell:

We have reviewed your Proposed Study Plan for the Byllesby-Buck Hydroelectric Project (Byllesby-Buck Project), filed with the Federal Energy Regulatory Commission on June 21, 2019. In addition to our verbal comments provided during the July 18, 2019, proposed study plan meeting, we are providing comments (Schedule A) pursuant to section 5.12 of the Commission's regulations. We have also included additional information requests in Schedule B. We anticipate that Appalachian Power Company will take our comments into consideration during development of the revised study plan, which must be filed with the Commission by October 19, 2019.

We appreciate the opportunity to comment on your Proposed Study Plan for the Byllesby-Buck Project. Please contact Allyson Conner at (202) 502-6082 or allyson.conner@ferc.gov if you have any questions.

Sincerely,

John B. Smith, Chief
Mid-Atlantic Branch
Division of Hydropower Licensing

Enclosure: Schedule A
Schedule B

SCHEDULE A

Comments on the Proposed Study Plan (PSP)

Flow and Bypass Reach Aquatic Habitat Study (Flow Study)

1. One objective of the Flow Study is to demonstrate the efficacy of existing ramping rates,[1] but you do not describe how you will meet this objective. Therefore, in the revised study plan (RSP), please describe the methodology that will be used to demonstrate the efficacy of the existing ramping rates for the Buck bypassed reach.

2. You propose to use two-dimensional hydraulic modeling to evaluate both hydraulic connectivity and habitat suitability as a function of flow in each development's bypassed reach. However, the flow ranges for evaluating aquatic habitat suitability and hydraulic connectivity appear to be very different in this case. For instance, the range of flows used to evaluate aquatic habitat suitability (e.g., to support minimum flow recommendations) would likely be on the order of several hundred cubic feet per second (cfs), whereas those to support evaluations of hydraulic connectivity would likely be an order of magnitude higher (several thousand cfs). This disparity is particularly relevant to the 4,100-foot-long Buck bypassed reach, where fish stranding in isolated pools is a concern during receding water levels following spill events in the spring. For the Buck bypassed reach, you propose to link the hydraulic model with an operations model to determine which spillway gates should be used to pass spill events to ensure that hydraulic connectivity in the bypassed reach is optimized such that transient[2] fish (e.g., walleye) that may be attracted to these spill events (which are often about 6,000 cfs in the spring)[3] are afforded a contiguously wetted exit route for a sufficient amount of time that allows them to exit the bypassed reach during receding water levels.

---

[1] Article 406 of the current license states that following periods of spill from the Buck spillway when a spillway gate has been opened 2 feet or more, the licensee shall discharge flows through a 2-foot-wide gate opening for at least 3 hours. The licensee shall then reduce the opening to 1 foot for at least an additional 3 hours. Thereafter, the licensee may close the gate.

[2] Fish that move in and out of the bypassed reach (e.g., because they are attracted to spillage flows) and do not permanently reside in pool habitats therein.

[3] Ramping Rate Assessment. Appalachian Power Company. Byllesby/Buck Hydroelectric Project. FERC Project No. 2514. June 1997. Accession No. 19970916-0311.

Hydraulic modeling results are most reliable within the range of calibration flows that are used to develop the model as reliability decreases as results are extrapolated to flows beyond the calibration range.[4] You propose to develop the hydraulic model for your Flow Study using just three calibration flows, the values of which would be based on consultation with interested relicensing participants. However, given the wide range of flows that would need to be modeled to assess *both* habitat suitability and hydraulic connectivity in the Buck bypassed reach, additional calibration flows appear warranted. Therefore, in the RSP, please explain why you believe just three calibration flows would provide data of sufficient resolution to determine how both aquatic habitat suitability and hydraulic connectivity vary with flow in the bypassed reaches, particularly at the Buck Development.

Aquatic Resources Survey

1. You do not specify whether the fishery surveys you propose to conduct in the spring and summer of 2020 would include targeted sampling for the federally endangered candy darter. This species is known to occur in the Cripple Creek tributary (5 miles downstream of the Buck Development), but the presence of this species in the immediate vicinity of the project is unknown. Therefore, in the RSP, please indicate if you plan to sample for candy darter as part of your proposed fishery surveys; if so, describe what sampling gear and methodology would be used.

2. In lieu of mussel field surveys, you propose to conduct a desktop literature review to compile and summarize all mussel data that have been collected in the vicinity of the project. In the RSP, please indicate if size (shell length) data are available from these prior collection efforts; and if so, whether size data would be included and analyzed as part of your desktop study.

3. Several different resource agencies and stakeholders (e.g., U.S. Fish and Wildlife Service [FWS], Virginia Department of Game and Inland Fisheries, Virginia Tech, New River Conservancy), in response to the pre-application document (PAD), recommended that the eastern hellbender, a state and federal species of concern, be included in a multi-taxa study of the project area. Although you state that macroinvertebrates, including crayfish, will be included in the study, there is no specific mention of including hellbender in the Aquatic Resources Study or an explanation as to why eastern hellbender

---

[4] HDR. December 2015. Instream Flow Study Report filed on December 29, 2015, as part of the final license application for the Hawks Nest Hydroelectric Project (FERC Project No. 2512). Accession No. 20151229-4003.

was excluded. Therefore, please explain your rationale for not including the eastern hellbender in the multi-taxa study to assess its presence within the project area.

SCHEDULE B

Additional Information Requests

1. In section 4.3 of the PAD, Appalachian Power Company (Appalachian) states that American Electric Power completed installation of a 4-megawatt (MW) energy storage system at the project in partnership with Greensmith Energy (a Wärtsilä Company) in 2018. The storage system is composed of a lithium-ion battery and a software system that operates simultaneously with the powerhouses and provides ancillary services to PJM. In the PAD, Appalachian states that the storage system is outside the scope of the FERC license. However, Appalachian did not explain in the PAD why the battery storage facility was not considered to be a project facility.

At the April 10, 2019 environmental site review and daytime scoping meeting on April 11, 2019, Appalachian explained that the storage facility's batteries did not increase the capacity of the project, but are not sustainable without the hydropower project; electricity generated at the Byllesby-Buck Project provides, in part, the power to maintain charge in the batteries for use at a later time (e.g., to provide a more steady base load to the grid when river flows are low and below the maximum hydraulic capacity of the project during the summer). Therefore, it appears to staff that the battery storage facility may serve a project purpose and may need to be considered a project facility enclosed within the project boundary. In addition, although Appalachian stated that the battery storage facility does not increase the capacity of the project, Appalachian did not explain why this is the case.

Based on the single line diagram included in PJM's combined feasibility and impact study (feasibility study) for the interconnection request,[5] the interconnection point with the grid is shown at the location where project power (either from the Byllesby Development, Buck Development, or battery storage facility) is stepped up from 13.8-kilovolts (kV) to 69-kV. The feasibility study describes this location as the 13.8-kV bus. It is not clear to staff whether the switchyard, buildings, and related components at the Byllesby Development that provide project power to AEP's distribution system would exist were it not for the Byllesby and Buck Project.

---

[5] Generation Interconnection Combined Feasibility/System Impact Study Report for PJM Generation Interconnection Request Queue Position AD2-205 Buck-Byllesby 69-kV, October 2018. https://www.pjm.com/planning/services-requests/interconnection-queues.aspx

Therefore, please clarify how and where project power currently connects to AEP's distribution system and specify the project component(s) (i.e., bus, switch, transformer, etc.,) where the connection is made; whether the battery storage facility, switchyard, and its related components should be considered project facilities; and how project operation is affected by the presence of the battery storage facility and what factors limit its capacity.

2. In the PSP, you note that sediment was dredged from the front of the intakes at the Byllesby Development in 1997 to create an upland marsh and more recently in 2014 to remove storm-related sand deposits. You indicate this dredged material was tested for polychlorinated biphenyls (PCBs) and these tests indicated the material was safe for its intended uses. To support staff's environmental analysis, please file, with your RSP, the results of these PCB testing results and any accompanying reports.

3. On May 7, 2019, FWS provided comments regarding potential impacts to bog turtles due to proposed drawdown activities. In that letter, FWS noted that it would consult with a FERC representative; however, to date, consultation has not occurred with Commission staff. In the meantime, staff have reviewed available information and found that bog turtles are known or are likely to occur in only four counties in Virginia,[6] including Carroll County (where the Byllesby-Buck Project is located). Therefore, staff requests any information (including past consultation with FWS) on the occurrence of bog turtles within the vicinity of the project.

[6] https://www.dgif.virginia.gov/wildlife/information/bog-muhlenberg-turtle/

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
http://www.fws.gov/chesapeakebay

September 18, 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N. E.
Washington, DC 20426

Re: Byllesby-Buck Hydroelectric Project (FERC # 2514 - 186) - Review of Proposed Study Plans

Dear Secretary Bose:

The U.S. Fish and Wildlife Service (Service) has reviewed the June 21, 2019, Proposed Study Plan for Relicensing Studies for the Byllesby-Buck Hydroelectric Project (Number 2514-186) (Project), filed by Appalachian Power Company, a unit of American Electric Power. The project is located at the existing Byllesby and Buck Dams on the upper New River, near the city of Galax, in Carroll County, VA. The capacity of the project is 21.6 megawatts (MW) and 8.5 MW, respectively.

The Service filed comments on the Pre-Application Document, Scoping Document 1, and Request for Studies on May 7, 2019. The Service's staff attended the Proposed Study Plan (PSP) meeting on July 18, 2019 in Wytheville, Virginia to discuss the PSP document and project needs and operations.

The following comments are provided pursuant to the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended: 16 U.S.C. 1531 *et seq.*), the Migratory Bird Treaty Act (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat.755), and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*).

<u>Section 1.3 Project Description, Location and Study Area</u>
The Byllesby-Buck Project has large ecological process impacts on the New River for many river miles upstream and downstream of the dams and hydroelectric facilities which should be fully considered in the study's examination of impacts. The PSP does not address the magnitude and spatial scale of Project influence. Determining the spatial scale of Project influence should include consideration of Project flow attenuation and downstream turbidity effects of Project operations, as well as other upstream and downstream water quality and recreational impacts. The Project's influence on ambient New River water temperature affects resident coolwater fishes, including New River endemic fishes, and other species such as Eastern hellbender (*Cryptobanchus allieganiensis allieganiensis*) and coolwater fauna. Mussel fauna are lost to suitable upstream habitats due to Project dams blocking migration of host fishes.

Additionally, as the Service stated in our May 7, 2019 comments, we believe the project area delineated for this license application should include the affected impounded area between these two dam hydroelectric facilities that are operated in synchrony.

Section 6.1 Flow and Bypass Reach Aquatic Habitat Study
The current study must sufficiently quantify seepage and leakage rates into the bypass reaches. As leakage is being proposed by the applicant as part of a minimum flow component into the bypass reaches, it must be a quantified value.

As the Service discussed at the PSP meeting in July, data from the USGS 03165500 gage New River at Ivanhoe should be fully considered. The proposed usage of a 21-year hydrographic record of January 1, 1997 to December 31, 2017 has not been proven to be a sufficient period of record to examine for modelling scenarios. Additional data from the Galax, VA gage may be useful to consider as well.

Section 7 Water Quality Study
The Service supports the comments of Virginia Department of Game and Inland Fisheries (VDGIF) that vertical temperature/dissolved oxygen profiles may need to be done bi-weekly to determine stratification depths prior to or in concert with the data sonde deployment. We agree that one season of sampling within the tailrace may not adequately capture what the tailrace may experience over the license term within dry years, and recommend more than one year sampling.

Section 8 Aquatic Resources Study
The Service, other state and Federal resource agency staff, and the applicant discussed at our PSP meeting, what would be required to do a survey for Eastern hellbender, a Virginia species of special concern and a Tier II species in the Virginia Wildlife Action Plan. Eastern hellbender has been documented a number of times recently within the upper New River in the greater vicinity of the Byllesby and Buck dams. A November 19, 2015 correspondence from Professor Don Orth of Virginia Polytechnic Institute and State University on the Fries Dam project (FERC # 2883) confirmed Eastern hellbender existence in the New River at two locations nearby in the vicinity of Independence, Virginia. A February, 2018 angler capture of an adult Eastern hellbender occurred within the Fries Dam impoundment (Carey *et al.* 2017).

The applicant proposed to the agencies that the positive presence of Eastern hellbender within the study area could be assumed from earlier survey data and captures. The Service agrees with this position that based upon the data, Eastern hellbenders can be assumed to occur within the study area and should be considered for habitat water quality and quantity issues, and we would not recommend surveys be conducted.

Section 8.4.3 Mussel Community Study
The Service believes a mussel community study should be conducted for the relicensing process, which is currently not offered in the PSP document. A habitat assessment of the project area can refine focus areas of where mussels should be surveyed. The green floater (*Lasmigona subviridis*) which is under review for listing under the Endangered Species Act, was found live within the April-May 2018 mussel salvage operation above Byllesby Dam. The presence of this mussel species underscores the need for further information on the mussel community and

project impacts upon mussel species and upon host fishes for those species that require them. Earlier records indicate that other species that may occur within the project area include the state listed threatened pistolgrip (*Tritogonia verrucosa*), the purple wartyback (*Cyclonaias tuberculate*), spike (*Elliptio dilatata*), pocketbook (*Lampsilis ovate*), wavy-rayed lampmussel (*Lampsilis fasciola*) and giant floater (*Pyganodon grandis*). The area between Buck Dam and Lake, and Byllesby Dam is especially lacking in current information.

Section 8.4.4 Impingement and Entrainment
The Service recommends the usage of the U.S. Fish and Wildlife Service Turbine Blade Strike Analysis model to assist in the review of fish injury and mortality through the turbines. The model can be found on our Northeast Region website, https://www.fws.gov/northeast/fisheries/fishpassageengineering.html. If specific questions arise in the use of the model, we can coordinate a discussion with our Regional hydropower engineers.

Section 9 Wetlands, Riparian and Littoral Habitat Characterization Study
The Service supports the comment of VDGIF regarding the appropriate study season of August and September for the submerged aquatic vegetation beds, rather than April to June, and the use of transect based sampling.

Section 12 Recreation Study
The Service supports the technical expertise provided by our sister agency, the National Park Service, in their May 7, 2019 comments and our state partner, VDGIF, in their comments on the Proposed Study Plan. Their comments include consideration of recreational use of the river and riparian zone between Buck Dam and Lake and Byllesby Dam, expanded methods of survey outreach, and usage of trail cameras to monitor angler usage of the tailrace areas.

We appreciate the opportunity to provide these recommendations in our review of the Proposed Study Plan developed by the applicant. If you have any questions regarding this matter, please contact Janet Norman of my staff at 410-573-4533 or Janet_Norman@fws.gov.

Sincerely,

Julie Slacum

for Genevieve LaRouche
Field Supervisor

cc: Lindy Nelson
Stephanie Nash

Literature Cited:

Carey, C., D. Orth, and V. Emrick. 2017. Biological Surveys for Fries Hydroelectric Project in the upper New River, Grayson County, Virginia. Final Report to TRC Solutions, Reston, Virginia. Conservation Management Institute, Department of Fish and Wildlife Conservation, College of Natural Resources and Environment, Virginia Polytechnic Institute and State University, Blacksburg. VTCMI-Final Report 04-2018. 65 pp.

From: Jonathan M Magalski <jmmagalski@aep.com>
Sent: Wednesday, October 9, 2019 5:51 PM
To: Copeland, John; Bill Kittrell (Bill.Kittrell@dgif.virginia.gov)
Cc: Elizabeth B Parcell; Kulpa, Sarah
Subject: Byllesby / Buck Relicensing Fisheries Study
Attachments: Fish Map 1991 Byllesby-Buck Survey.pdf; Fish_Sampling_Locations_Buck_RSP.PDF; Fish_Sampling_Locations_Byllesby_RSP.PDF

Good afternoon John and Bill,

As we work on the Revised Study Plan (RSP), we wanted to get your thoughts on a few proposed modifications we are considering. We would like to check with you now to potentially avoid unnecessary work on your part (i.e. filing comments on the RSP). Based on a review of historical data, comments and additional information provided to-date, Appalachian proposes to revise the sample locations and methodology for the Fish Community Study being presented in the RSP for the Byllesby-Buck Project. Background and supporting information is provided below for your review along with a summary of the proposed changes in methodology and to sampling locations. See attached figures which demonstrate the revised study design along with a copy of the historical study locations for reference.

Gillnet deployments below Buck dam in the historical study (Appalachian 1991) were eliminated due to difficulties with net fouling and at least one net was believed stolen during field efforts. Additionally, the use of hoop nets resulted in collection of only 4 additional fish taxa (Largemouth Bass, Black Crappie, Yellow Perch, and Muskellunge), all of which are susceptible to electrofishing gear. The previous study also included both day and nighttime boat electrofishing samples, however results were not reported separately for the diel periods.
Under the proposed sampling design, electrofishing samples will be collected during daylight hours to minimize safety concerns associated with nighttime boat work on the New River.

Appalachian proposes to perform the fish community study using a combination of boat electrofishing (reservoirs) and backpack electrofishing with seines in non-reservoir, wadeable habitats. The proposed study replaces the gillnet (6 per reservoir) and hoop net (6 per reservoir) methodologies with boat electrofishing sites (3 per reservoir) in the same pool habitats sampled during the historical study. Appalachian also proposes to add additional backpack electrofishing sites in riffle/run habitats (including one of the tributary streams), which serves to balance the study design and to allow for greater representation/potential collection of non-game species.

These proposed changes would reduce study effort and costs and minimize safety concerns while still providing comparable data and adequate coverage of the project area. We welcome and would appreciate your thoughts on this proposal. If you have any questions or would like to discuss further, please let us know. Thanks….Jon

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY
JONATHAN M MAGALSKI | ENVIRONMENTAL SPEC CONSULT
JMMAGALSKI@AEP.COM | D:614.716.2240
1 RIVERSIDE PLAZA, COLUMBUS, OH 43215

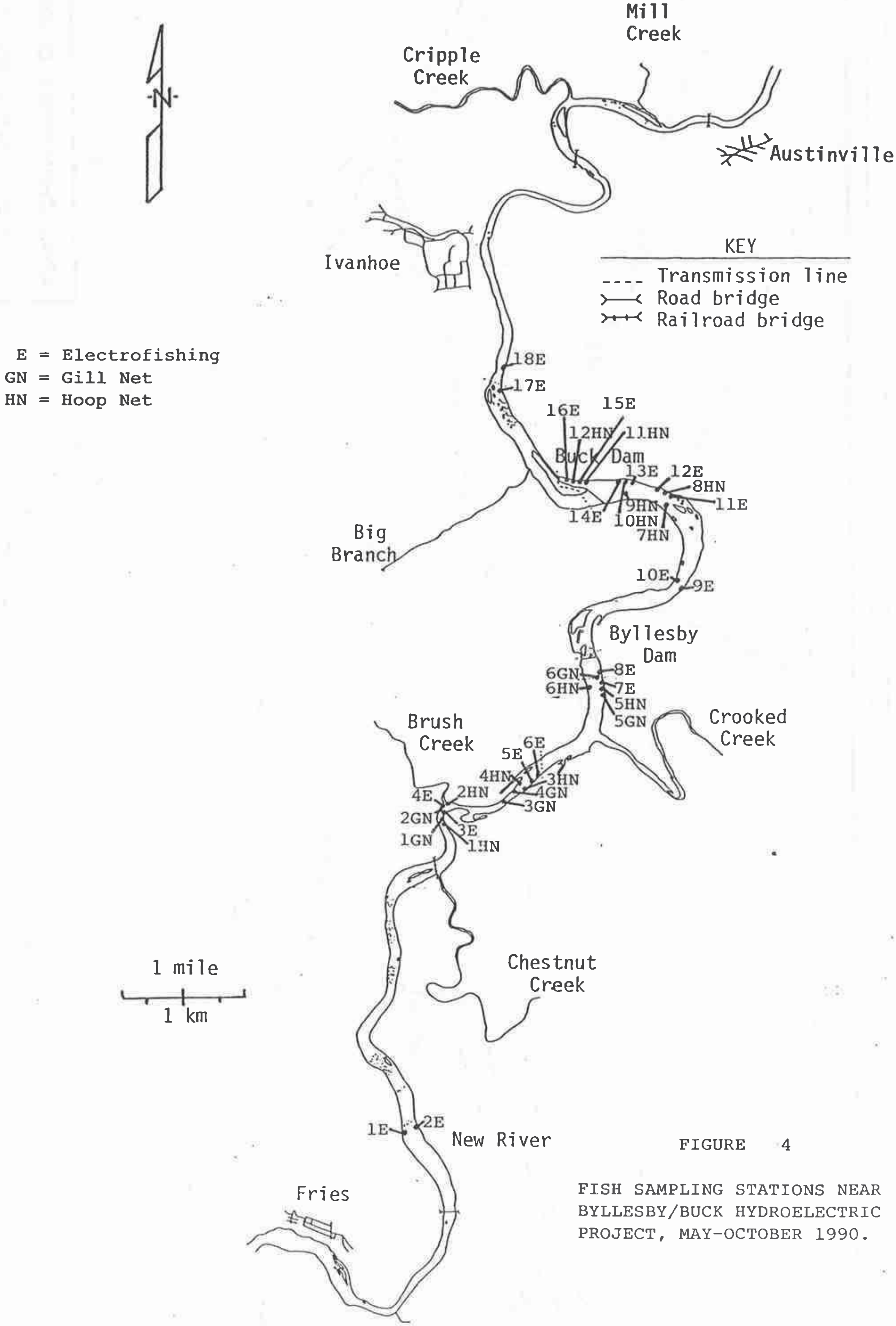
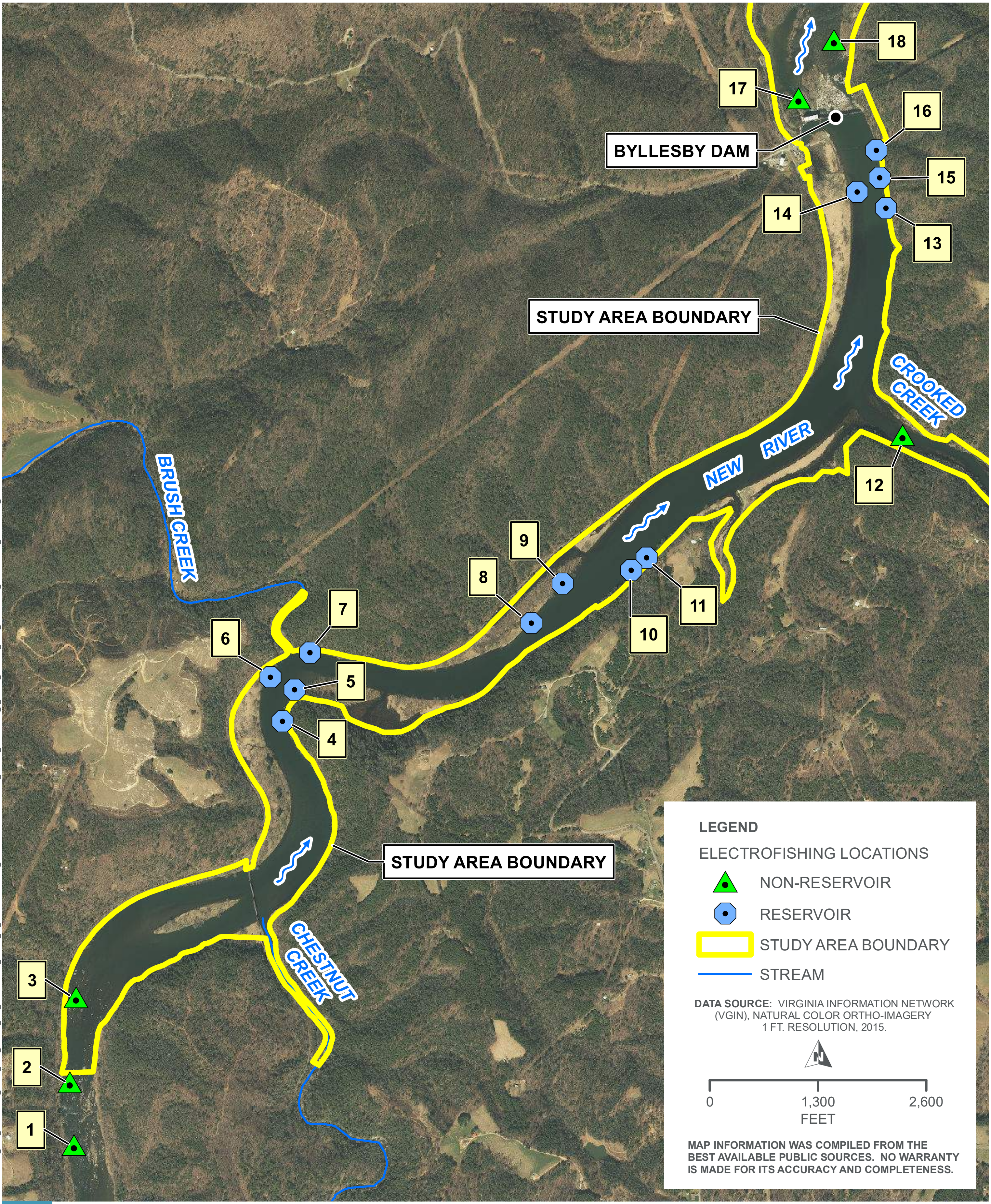


FIGURE 4

FISH SAMPLING STATIONS NEAR BYLLESBY/BUCK HYDROELECTRIC PROJECT, MAY-OCTOBER 1990.



PATH: N:\GIS2\PROJECTS\AEP\10067919_AEP_BYLLESBY_BUCK_PAD_NOI\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MAP_DOCS\FINAL\PROPOSED_STUDY_PLAN\MAP_8_5X11P_0191009_FISH_SAMPLING_LOCATIONS_BYLLESBY_PSP.MXD - USER: DSOUCIE - DATE: 10/9/2019

HDR

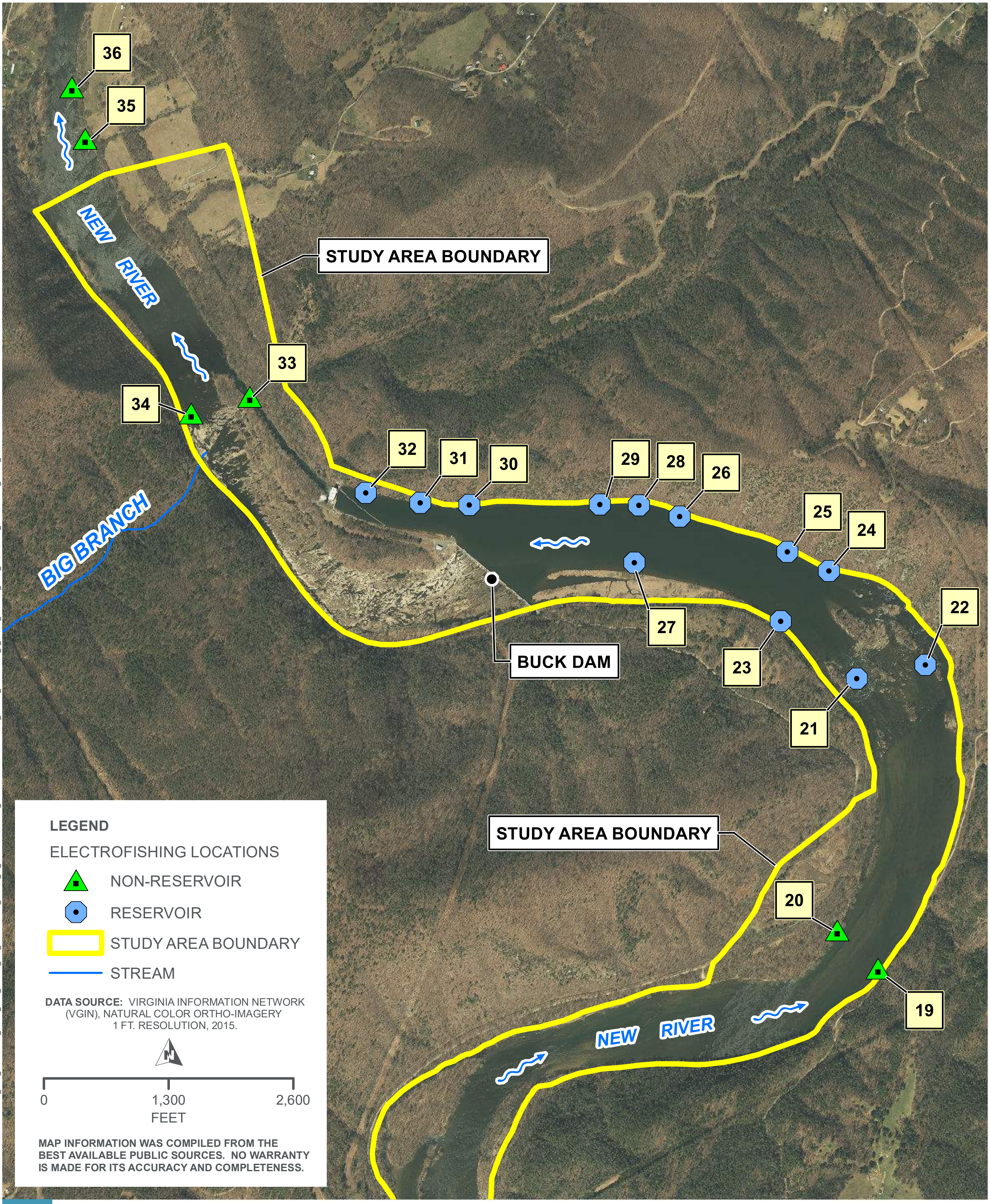
APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY

BYLLESBY PROPOSED FISH SAMPLING LOCATIONS

BYLLESBY & BUCK HYDROELECTRIC PROJECT (FERC NO. 2514)

CARROLL COUNTY, VIRGINIA

OCTOBER 2019



PATH: \\PWME-INFS01\GIS\GIS2\PROJECTS\AEP\10067919_AEP_BYLLESBY_BUCK_PAD_NOI\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MAP_DOCS\FINAL\PROPOSED_STUDY_PLAN\MAP_8_5X11P_0191009_FISH_SAMPLING_LOCATIONS_BUCK_PSP.MXD - USER: DSOUCIE - DATE: 10/9/2019

HDR | APPALACHIAN POWER — An AEP Company — BOUNDLESS ENERGY

BUCK PROPOSED FISH SAMPLING LOCATIONS

BYLLESBY & BUCK HYDROELECTRIC PROJECT (FERC NO. 2514)

CARROLL COUNTY, VIRGINIA

OCTOBER 2019

Appalachian Power Company
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

Via Electronic Filing

October 18, 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514-186)
Filing of Revised Study Plan for Relicensing Studies

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Applicant), a unit of American Electric Power (AEP) is the Licensee, owner, and operator of the 30.1 megawatt (MW) Byllesby-Buck Hydroelectric Project (Project No. 2514-186) (Project or Byllesby-Buck Project), located on the New River in Carroll County, Virginia. The Byllesby development is located about nine miles north of the City of Galax, and the Buck development is located approximately three river miles (RM) downstream of Byllesby and 43.5 RM upstream of Claytor Dam.

The existing license for the Project was issued by the Federal Energy Regulatory Commission (FERC or Commission) for a 30-year term, with an effective date of March 28, 1994 and expires February 29, 2024. Accordingly, Appalachian is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. In accordance with 18 CFR §5.11 of the Commission's regulations, Appalachian is filing the Revised Study Plan (RSP) describing the studies that the Licensee is proposing to conduct in support of relicensing the Project.

Background

Appalachian filed a Pre-Application Document (PAD) and associated Notice of Intent (NOI) with the Commission on January 7, 2019, to initiate the ILP. The Commission issued Scoping Document 1 (SD1) for the Project on March 8, 2019. SD1 was intended to advise resource agencies, Indian tribes, non-governmental organizations, and other stakeholders as to the proposed scope of FERC's Environmental Assessment (EA) for the Project and to seek additional information pertinent to the Commission's analysis.

On April 10 and 11, 2019, the Commission held public scoping meetings in Galax, Virginia. During these meetings, FERC staff presented information regarding the ILP and details regarding the study scoping process and how to request a relicensing study, including the Commission's study criteria. In addition, FERC staff solicited comments regarding the scope of issues and analyses for the EA. Pursuant to 18 CFR §5.8(d), a public site visit of the Project was conducted on April 10, 2019.

Resource agencies, Indian tribes, and other interested parties were afforded a 60-day period to request studies and provide comments on the PAD and SD1. The comment period was initiated with the Commission's March 8, 2019 notice and concluded on May 7, 2019. During the comment period, a total of ten stakeholders filed letters with the Commission providing general comments, comments regarding the PAD, comments regarding SD1, and/or study requests. FERC issued Scoping Document 2 (SD2) on June 21, 2019 to provide information on the proposed action and alternatives, the environmental analysis process FERC staff will follow to prepare the EA, and a revised list of issues to be addressed in the EA.

In accordance with 18 CFR §5.11, Appalachian developed a Proposed Study Plan (PSP) for the Project that was filed with the Commission and made available to stakeholders on June 21, 2019. The purpose of the PSP was to present the studies proposed by Appalachian and to address the comments and study requests submitted by resource agencies and other stakeholders. The PSP described Appalachian's proposed approaches for conducting studies and addressed agency and stakeholder study requests. Pursuant to 18 CFR §5.11(e), Appalachian held a PSP Meeting on July 18, 2019, for the purpose of clarifying the PSP, explaining any initial information gathering needs, and addressing any outstanding issues associated with the PSP. Appalachian distributed additional information requested during the meeting to FERC staff and agencies by email communications subsequent to the PSP meeting.

Resource agencies and stakeholders were afforded 90 days from the date of the PSP filing (i.e., until September 19, 2019) to provide comments on the PSP or to request additional studies. The Commission's regulations require that comments on the PSP include an explanation of any study plan concerns and any accommodations reached with Appalachian regarding those concerns (18 CFR §5.12). Any proposed modifications to the PSP are also required to address the Commission's criteria as presented in 18 CFR §5.9(b).

Appalachian received timely formal comments on the PSP from FERC, the U.S. Fish and Wildlife Service (USFWS), and the Virginia Department of Game and Inland Fisheries (VDGIF), as described and included in the enclosed RSP. In developing the RSP, Appalachian has carefully evaluated and considered all agency and stakeholder comments and study requests received, as well as discussions during and communications following the PSP meeting.

Revised Study Plan

In developing the RSP, Appalachian evaluated all the study requests and comments submitted by the stakeholders, with a focus on the requests that specifically addressed the seven criteria for study requests as set forth at 18 CFR §5.9(b) of the Commission's ILP regulations. For the study requests that did not address the seven study criteria, where appropriate, Appalachian considered the study in the context of providing the requested information in conjunction with one or more of Appalachian's proposed studies.

This RSP takes into account the Commission's June 21, 2019 SD2 as well as comments on the PSP filed by stakeholders. Based on Appalachian's review of the requested studies, the FERC criteria for study requests under the ILP, the discussions during the PSP meeting, and formal comments on the PSP, Appalachian is proposing to conduct the following studies as described in detail in the RSP:

1. Flow and Bypass Reach Aquatic Habitat Study;
2. Water Quality Study;
3. Aquatic Resources Study;
4. Wetlands, Riparian, and Littoral Habitat Characterization Study;
5. Terrestrial Resources Study;
6. Shoreline Stability Assessment Study;
7. Recreation Study; and
8. Cultural Resources Study.

Appalachian is filing the RSP with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Appalachian is distributing this letter via email; otherwise, Appalachian is distributing this letter via U.S. mail. All parties interested in the relicensing process may obtain a copy of the RSP electronically through FERC's eLibrary system at https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2514-186, or on Appalachian's website at http://www.aephydro.com/HydroPlant/ByllesbyBuck.

Comments on the RSP must be filed within 15 days of the filing date of this RSP which is no later than November 3, 2019. The Commission will issue a final Study Plan Determination by November 18, 2019.

If there are any questions regarding the RSP or the overall relicensing process for the Project, please do not hesitate to contact me at (540) 985-2441 or via email at ebparcell@aep.com.

Sincerely,

Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

Enclosures

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Federal Agencies

Mr. John Eddins
Archaeologist/Program Analyst
Advisory Council on Historic Preservation
401 F Street NW, Suite 308
Washington, DC 20001-2637
jeddins@achp.gov

Ms. Kimberly Bose
Secretary
Federal Energy Regulatory Commission
888 1st St NE
Washington, DC 20426

FEMA Region 3
615 Chestnut Street
One Independence Mall, Sixth Floor
Philadelphia, PA 19106-4404

Mr. John Bullard
Regional Administrator
NOAA Fisheries Service
Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930-2276

Mr. John A. Bricker
State Conservationist
US Department of Agriculture
Natural Resources Conservation Service
1606 Santa Rosa Road, Suite 209
Richmond, VA 23229-5014

Mr. Harold Peterson
Bureau of Indian Affairs
US Department of the Interior
545 Marriott Dr, Suite 700
Nashville, TN 37214
Harold.Peterson@bia.gov

Office of the Solicitor
US Department of the Interior
1849 C Street, NW
Washington, DC 20240

Ms. Lindy Nelson
Regional Environmental Officer, Office of Environmental Policy & Compliance
US Department of the Interior, Philadelphia Region
Custom House, Room 244
200 Chestnut Street
Philadelphia, PA 19106

Ms. Barbara Rudnick
NEPA Team Leader - Region 3
US Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

Mr. Martin Miller
Chief, Endangered Species - Northeast Region (Region 5)
US Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035

Ms. Janet Norman
Chesapeake Bay Field Office
US Fish and Wildlife Service
177 Admiral Cochrane Drive
Annapolis, MD 21401
janet_norman@fws.gov

Ms. Cindy Schulz
Field Supervisor, Virginia Field Office
US Fish and Wildlife Service
6669 Short Lane
Gloucester, VA 23061

Ms. Elizabeth Merz
US Forest Service
3714 Highway 16
Marion, VA 24354

Mr. Mark Bennett
Center Director of VA and WV Water Science Center
US Geological Survey
John W. Powell Building
12201 Sunrise Valley Drive
Reston, VA 20192
mrbennet@usgs.gov

Hon. Morgan Griffith
US Congressman, 9th District
US House of Representatives
Christiansburg District Office
17 West Main Street
Christiansburg, VA 24073

Mr. Michael Reynolds
Acting Director, Headquarters
US National Park Service
1849 C Street, NW
Washington, DC 20240

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Ms. Catherine Turton
Architectural Historian, Northeast Region
US National Park Service
US Custom House, 3rd Floor
200 Chestnut Street
Philadelphia, PA 19106

Hon. Tim Kaine
US Senate
231 Russell Senate Office Building
Washington, DC 20510

Hon. Mark Warner
US Senate
703 Hart Senate Office Building
Washington, DC 20510

State Agencies

Dr. Elizabeth Moore
President
Archaeological Society of Virginia
PO Box 70395
Richmond, VA 23255

Ms. Caitlin Carey
Research Associate
Department of Fish and Wildlife Conservation
1900 Kraft Drive, Ste 105
Blacksburg, VA 24061
cscarey@vt.edu

Mr. Donald J. Orth
Certified Fisheries Professional
Department of Fish and Wildlife Conservation
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061
dorth@vt.edu

Mr. Jess Jones
Freshwater Mollusk Conservation Center
Virginia Tech
1B Plantation Road
Blacksburg, VA 24061

Tracy Goodson
District Manager
New River Soil and Water Conservation District
968 East Stuart Drive
Galax, VA 24333

Mr. Ralph Northam
Governor
Office of the Governor
PO Box 1475
Richmond, VA 23218

Ms. Emma Williams
Office of the Secretary of the Commonwealth
Virginia Council on Indians
PO Box 2454
Richmond, VA 23218
emma.williams@governor.virginia.gov

Mr. Clyde Cristman
Division Director
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219

Ms. Lynn Crump
Environmental Programs Planner
Virginia Department of Conservation and Recreation
600 East Main Street, 24th floor
Richmond, VA 23219
lynn.crump@dcr.virginia.gov

Ms. Sharon Ewing
Virginia Department of Conservation and Recreation
sharon.ewing@dcr.virginia.gov

Ms. Rene Hypes
Natural Heritage Program
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219
rene.hypes@dcr.virginia.gov

Ms. Robbie Rhur
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219
Robbie.Rhur@dcr.virginia.gov

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Mr. Sam Sweeney
New River Trail State Park Manager
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Max Meadows, VA 24360
sam.sweeney@dcr.virginia.gov

Mr. Jimmy Elliott
Virginia Department of Conservation and Recreation - New River Trail
james.elliott@dcr.virginia.gov

Mr. Tony Cario
Water Withdrawal Permit Writer, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
anthony.cario@deq.virginia.gov

Mr. Joe Grist
Water Withdrawl Program Manager
Virginia Department of Environmental Quality
PO Box 1106
Richmond, VA 23218
joseph.grist@deq.virginia.gov

Mr. Scott Kudlas
Director, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
scott.kudlas@deq.virginia.gov

Mr. Matthew Link
Water Withdrawal Permit Writer, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
matthew.link@deq.virginia.gov

Mr. Kelly Miller
Southwest Regional Office
Virginia Department of Environmental Quality
355-A Deadmore Street
Abingdon, VA 24210

Ms. Bettina Rayfield
Environmental Impact Review and Long Range Priorities Program
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
bettina.rayfield@deq.virginia.gov

NEPA Review
Virginia Department of Environmental Quality
eir@deq.virginia.gov

Mr. Chris Sullivan
Senior Area Forester
Virginia Department of Forestry
900 Natural Resources Drive
Charlottesville, VA 22903

Mr. John Copeland
Fisheries Biologist
Virginia Department of Game and Inland Fisheries
2206 South Main Street, Suite C
Blacksburg, VA 24060
John.Copeland@dgif.virginia.gov

Mr. William Kittrell
Manager, Marion Office - Region 3 Office
Virginia Department of Game and Inland Fisheries
1796 Highway Sixteen
Marion, VA 24354
Bill.Kittrell@dgif.virginia.gov

Ms. Julie Langan
Director and State Historic Preservation Officer
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221

Local Governments

Mr. Rex Hill
Carroll Board of Supervisor
Carroll County
rex.hill@carrollcountyva.gov

Mr. Steve Truitt
Carroll County Administrator
Carroll County
605-1 Pine Street
Hillsville, VA 24343
Steve.Truitt@carrollcountyva.gov

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Mr. Scott McCoy
Town Manager
Town of Fries
PO Box 452
Fries, VA 24330
townoffries@friesva.com

Mr. C. M. Mitchell
Mayor
Town of Galax
111 East Grayson Street
Galax, VA 24333

Tribes

Chief Bill Harris
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
P.O. Box 948
Tahlequah, OH 74465
elizabeth-toombs@cherokee.org

Deborah Dotson
President
Delaware Nation
PO Box 825
Anadarko, OK 73005

Administration
Delaware Tribe of Indians
5100 Tuxedo Blvd
Bartlesville, OK 74006

Chief Richard Sneed
Eastern Band of Cherokee Indians
PO Box 455
Cherokee, NC 28719

Chief Dean Branham
Monacan Indian Nation
PO Box 1136
Madison Heights, VA 24572

Administration
United Keetoowah Band of Cherokee Indians
PO Box 746
Tahlequah, OK 74465

Non-Governmental

Mr. Bill Tanger
Friends of the Rivers of Virginia
PO Box 1750
Roanoke, VA 24008
Bill.tanger@verizon.net

American Canoe Association
503 Sophia Street, Suite 100
Fredericksburg, VA 22401

Mr. Kevin Richard Colburn
National Stewardship Director
American Whitewater
PO Box 1540
Cullowhee, NC 28779
kevin@americanwhitewater.org

Mr. Andrew Downs
Regional Director
Appalachian Trail Conservancy
799 Washington Street
PO Box 807
Harpers Ferry, WV 25425-0807
adowns@appalachiantrail.org

Mr. Rick Roth
Treasurer
Friends of the New River
1000 Highland Circle
Blacksburg, VA 24060

Mr. George Santucci
President
New River Conservancy
PO Box 1480
1 N Jefferson Avenue, Suite D
West Jefferson, NC 28694
george@newriverconservancy.org

Ms. Laura Walters
Board Chair
New River Conservancy
6718 Dunkard Road
Dublin, VA 24084
claytorlakegirl@gmail.com

Ms. Andrea Langston
New River Land Trust
PO Box K
Blacksburg, VA 24063-1025

Mr. Tim Dixon
Owner
New River Outdoor Adventures
5785 Fries Road
Galax, VA 24333
newriveroutdooradventures@yahoo.com

Mr. Steve Moyer
Vice President for Government Affairs
Trout Unlimited
1777 N. Kent Street, Suite 100
Arlington, VA 22209

Yayac, Maggie

Subject: FW: Byllesby-Buck Hydroelectric Project (VA) -- Filing of Revised Study Plan
Attachments: Byllesby-Buck Revised Study Plan Transmittal_20191016.pdf

From: Kulpa, Sarah
Sent: Monday, October 21, 2019 11:21 AM
To: ACHP - John Eddins <jeddins@achp.gov>; American Whitewater - Kevin Colburn <kevin@americanwhitewater.org>; Appalachian Trail Conservancy - Andrew Downs <adowns@appalachiantrail.org>; Carroll County - Rex Hill <rex.hill@carrollcountyva.gov>; Carroll County Administrator - Steve Truitt <steve.truitt@carrollcountyva.gov>; Cherokee Nation - Elizabeth Toombs <elizabeth-toombs@cherokee.org>; Fish and Wildlife Conservation - Caitlin Carey <cscarey@vt.edu>; Fish and Wildlife Conservation - Donald J. Orth <dorth@vt.edu>; Friends of the Rivers of VA - Bill Tanger <bill.tanger@verizon.net>; Harold Peterson <harold.peterson@bia.gov>; New River Conservancy - George Santucci <george@newriverconservancy.org>; New River Conservancy - Laura Walters <claytorlakegirl@gmail.com>; New River Outdoor Adventures - Tim Dixon <newriveroutdooradventures@yahoo.com>; New River Trail State Park - Sam Sweeney <Sam.Sweeney@dcr.virginia.gov>; Town of Fries - Scott McCoy <townoffries@friesva.com>; USFWS Chesapeake Bay Field Office - Janet Norman <janet_norman@fws.gov>; USGS - Mark Bennett <mrbennet@USGS.gov>; VADCR - Jimmy Elliott <james.elliott@dcr.virginia.gov>; VADCR - Lynn Crump <lynn.crump@dcr.virginia.gov>; VADCR - Robbie Ruhr <Robbie.Rhur@dcr.virginia.gov>; VADCR - Sharon Ewing <sharon.ewing@dcr.virginia.gov>; VADEQ <eir@deq.virginia.gov>; VADEQ - Bettina Rayfield <Bettina.rayfield@deq.virginia.gov>; VADEQ - Joe Grist <joseph.grist@deq.virginia.gov>; VADEQ - Matthew Link <matthew.link@deq.virginia.gov>; VADEQ - Scott Kudlas <scott.kudlas@deq.virginia.gov>; VADEQ - Tony Cario <anthony.cario@deq.virginia.gov>; Virginia Council on Indians - Emma Williams <emma.williams@governor.virginia.gov>; Virginia Department of Conservation and Recreation - Rene Hypes <rene.hypes@dcr.virginia.gov>; Virginia Department of Game and Inland Fisheries - John Copeland <John.Copeland@dgif.virginia.gov>; Virginia Department of Game and Inland Fisheries - William Kittrell <bill.kittrell@dgif.virginia.gov>
Cc: Jonathan M Magalski <jmmagalski@aep.com>; Elizabeth B Parcell <ebparcell@aep.com>; MacVane, Kelly <Kelly.MacVane@hdrinc.com>; Yayac, Maggie <Maggie.Yayac@hdrinc.com>; Quiggle, Robert <Robert.Quiggle@hdrinc.com>
Subject: Byllesby-Buck Hydroelectric Project (VA) -- Filing of Revised Study Plan

Byllesby-Buck Hydroelectric Project Stakeholders:

Appalachian Power Company (Appalachian), a unit of American Electric Power (AEP), is the licensee, owner and operator of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) (Project) located on the New River in Carroll County, Virginia. The Project is operated under a license issued by the Federal Energy Regulatory Commission (FERC). The existing FERC license for the Project expires on February 29, 2024. Appalachian is pursuing a new license for the continued operation of the Project in accordance with FERC's Integrated Licensing Process (ILP). Pursuant to the ILP, Appalachian filed the Revised Study Plan (RSP) for the Project on October 18, 2019. The RSP responds to additional study comments Appalachian received in response to the Proposed Study Plan filing and describes the studies that Appalachian is proposing to conduct in support of Project relicensing.

On behalf of Appalachian, we are notifying stakeholders of the availability of the RSP. For your convenience, a copy of the cover letter filed with the RSP is attached. Please note that, due to file size restrictions, the RSP has not been included in this email. Appalachian encourages stakeholders to view the filing online at FERC's eLibrary at https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20191018-5274. Appalachian will also be adding the RSP to the Project's public relicensing website (http://www.aephydro.com/HydroPlant/ByllesbyBuck) in the coming days.

Should you have any questions regarding this filing, please contact Liz Parcell with AEP at (540) 985-2441 or ebparcell@aep.com.

Thank you,

Sarah Kulpa
Project Manager

HDR
440 S. Church Street, Suite 900
Charlotte, NC 28202-2075
D 704.248.3620 **M** 315.415.8703
sarah.kulpa@hdrinc.com

hdrinc.com/follow-us

Appalachian Power Company
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

Via Electronic Filing

October 18, 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514-186)
Filing of Revised Study Plan for Relicensing Studies

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Applicant), a unit of American Electric Power (AEP) is the Licensee, owner, and operator of the 30.1 megawatt (MW) Byllesby-Buck Hydroelectric Project (Project No. 2514-186) (Project or Byllesby-Buck Project), located on the New River in Carroll County, Virginia. The Byllesby development is located about nine miles north of the City of Galax, and the Buck development is located approximately three river miles (RM) downstream of Byllesby and 43.5 RM upstream of Claytor Dam.

The existing license for the Project was issued by the Federal Energy Regulatory Commission (FERC or Commission) for a 30-year term, with an effective date of March 28, 1994 and expires February 29, 2024. Accordingly, Appalachian is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. In accordance with 18 CFR §5.11 of the Commission's regulations, Appalachian is filing the Revised Study Plan (RSP) describing the studies that the Licensee is proposing to conduct in support of relicensing the Project.

Background

Appalachian filed a Pre-Application Document (PAD) and associated Notice of Intent (NOI) with the Commission on January 7, 2019, to initiate the ILP. The Commission issued Scoping Document 1 (SD1) for the Project on March 8, 2019. SD1 was intended to advise resource agencies, Indian tribes, non-governmental organizations, and other stakeholders as to the proposed scope of FERC's Environmental Assessment (EA) for the Project and to seek additional information pertinent to the Commission's analysis.

On April 10 and 11, 2019, the Commission held public scoping meetings in Galax, Virginia. During these meetings, FERC staff presented information regarding the ILP and details regarding the study scoping process and how to request a relicensing study, including the Commission's study criteria. In addition, FERC staff solicited comments regarding the scope of issues and analyses for the EA. Pursuant to 18 CFR §5.8(d), a public site visit of the Project was conducted on April 10, 2019.

Resource agencies, Indian tribes, and other interested parties were afforded a 60-day period to request studies and provide comments on the PAD and SD1. The comment period was initiated with the Commission's March 8, 2019 notice and concluded on May 7, 2019. During the comment period, a total of ten stakeholders filed letters with the Commission providing general comments, comments regarding the PAD, comments regarding SD1, and/or study requests. FERC issued Scoping Document 2 (SD2) on June 21, 2019 to provide information on the proposed action and alternatives, the environmental analysis process FERC staff will follow to prepare the EA, and a revised list of issues to be addressed in the EA.

In accordance with 18 CFR §5.11, Appalachian developed a Proposed Study Plan (PSP) for the Project that was filed with the Commission and made available to stakeholders on June 21, 2019. The purpose of the PSP was to present the studies proposed by Appalachian and to address the comments and study requests submitted by resource agencies and other stakeholders. The PSP described Appalachian's proposed approaches for conducting studies and addressed agency and stakeholder study requests. Pursuant to 18 CFR §5.11(e), Appalachian held a PSP Meeting on July 18, 2019, for the purpose of clarifying the PSP, explaining any initial information gathering needs, and addressing any outstanding issues associated with the PSP. Appalachian distributed additional information requested during the meeting to FERC staff and agencies by email communications subsequent to the PSP meeting.

Resource agencies and stakeholders were afforded 90 days from the date of the PSP filing (i.e., until September 19, 2019) to provide comments on the PSP or to request additional studies. The Commission's regulations require that comments on the PSP include an explanation of any study plan concerns and any accommodations reached with Appalachian regarding those concerns (18 CFR §5.12). Any proposed modifications to the PSP are also required to address the Commission's criteria as presented in 18 CFR §5.9(b).

Appalachian received timely formal comments on the PSP from FERC, the U.S. Fish and Wildlife Service (USFWS), and the Virginia Department of Game and Inland Fisheries (VDGIF), as described and included in the enclosed RSP. In developing the RSP, Appalachian has carefully evaluated and considered all agency and stakeholder comments and study requests received, as well as discussions during and communications following the PSP meeting.

Revised Study Plan

In developing the RSP, Appalachian evaluated all the study requests and comments submitted by the stakeholders, with a focus on the requests that specifically addressed the seven criteria for study requests as set forth at 18 CFR §5.9(b) of the Commission's ILP regulations. For the study requests that did not address the seven study criteria, where appropriate, Appalachian considered the study in the context of providing the requested information in conjunction with one or more of Appalachian's proposed studies.

This RSP takes into account the Commission's June 21, 2019 SD2 as well as comments on the PSP filed by stakeholders. Based on Appalachian's review of the requested studies, the FERC criteria for study requests under the ILP, the discussions during the PSP meeting, and formal comments on the PSP, Appalachian is proposing to conduct the following studies as described in detail in the RSP:

1. Flow and Bypass Reach Aquatic Habitat Study;
2. Water Quality Study;
3. Aquatic Resources Study;
4. Wetlands, Riparian, and Littoral Habitat Characterization Study;
5. Terrestrial Resources Study;
6. Shoreline Stability Assessment Study;
7. Recreation Study; and
8. Cultural Resources Study.

Appalachian is filing the RSP with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Appalachian is distributing this letter via email; otherwise, Appalachian is distributing this letter via U.S. mail. All parties interested in the relicensing process may obtain a copy of the RSP electronically through FERC's eLibrary system at https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2514-186, or on Appalachian's website at http://www.aephydro.com/HydroPlant/ByllesbyBuck.

Comments on the RSP must be filed within 15 days of the filing date of this RSP which is no later than November 3, 2019. The Commission will issue a final Study Plan Determination by November 18, 2019.

If there are any questions regarding the RSP or the overall relicensing process for the Project, please do not hesitate to contact me at (540) 985-2441 or via email at ebparcell@aep.com.

Sincerely,

Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

Enclosures

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Federal Agencies

Mr. John Eddins
Archaeologist/Program Analyst
Advisory Council on Historic Preservation
401 F Street NW, Suite 308
Washington, DC 20001-2637
jeddins@achp.gov

Ms. Kimberly Bose
Secretary
Federal Energy Regulatory Commission
888 1st St NE
Washington, DC 20426

FEMA Region 3
615 Chestnut Street
One Independence Mall, Sixth Floor
Philadelphia, PA 19106-4404

Mr. John Bullard
Regional Administrator
NOAA Fisheries Service
Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930-2276

Mr. John A. Bricker
State Conservationist
US Department of Agriculture
Natural Resources Conservation Service
1606 Santa Rosa Road, Suite 209
Richmond, VA 23229-5014

Mr. Harold Peterson
Bureau of Indian Affairs
US Department of the Interior
545 Marriott Dr, Suite 700
Nashville, TN 37214
Harold.Peterson@bia.gov

Office of the Solicitor
US Department of the Interior
1849 C Street, NW
Washington, DC 20240

Ms. Lindy Nelson
Regional Environmental Officer, Office of Environmental Policy & Compliance
US Department of the Interior, Philadelphia Region
Custom House, Room 244
200 Chestnut Street
Philadelphia, PA 19106

Ms. Barbara Rudnick
NEPA Team Leader - Region 3
US Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

Mr. Martin Miller
Chief, Endangered Species - Northeast Region (Region 5)
US Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035

Ms. Janet Norman
Chesapeake Bay Field Office
US Fish and Wildlife Service
177 Admiral Cochrane Drive
Annapolis, MD 21401
janet_norman@fws.gov

Ms. Cindy Schulz
Field Supervisor, Virginia Field Office
US Fish and Wildlife Service
6669 Short Lane
Gloucester, VA 23061

Ms. Elizabeth Merz
US Forest Service
3714 Highway 16
Marion, VA 24354

Mr. Mark Bennett
Center Director of VA and WV Water Science Center
US Geological Survey
John W. Powell Building
12201 Sunrise Valley Drive
Reston, VA 20192
mrbennet@usgs.gov

Hon. Morgan Griffith
US Congressman, 9th District
US House of Representatives
Christiansburg District Office
17 West Main Street
Christiansburg, VA 24073

Mr. Michael Reynolds
Acting Director, Headquarters
US National Park Service
1849 C Street, NW
Washington, DC 20240

Byllesby/Buck Hydroelectric Project (FERC No. 2514) Distribution List

Ms. Catherine Turton
Architectural Historian, Northeast Region
US National Park Service
US Custom House, 3rd Floor
200 Chestnut Street
Philadelphia, PA 19106

Hon. Tim Kaine
US Senate
231 Russell Senate Office Building
Washington, DC 20510

Hon. Mark Warner
US Senate
703 Hart Senate Office Building
Washington, DC 20510

State Agencies

Dr. Elizabeth Moore
President
Archaeological Society of Virginia
PO Box 70395
Richmond, VA 23255

Ms. Caitlin Carey
Research Associate
Department of Fish and Wildlife Conservation
1900 Kraft Drive, Ste 105
Blacksburg, VA 24061
cscarey@vt.edu

Mr. Donald J. Orth
Certified Fisheries Professional
Department of Fish and Wildlife Conservation
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061
dorth@vt.edu

Mr. Jess Jones
Freshwater Mollusk Conservation Center
Virginia Tech
1B Plantation Road
Blacksburg, VA 24061

Tracy Goodson
District Manager
New River Soil and Water Conservation District
968 East Stuart Drive
Galax, VA 24333

Mr. Ralph Northam
Governor
Office of the Governor
PO Box 1475
Richmond, VA 23218

Ms. Emma Williams
Office of the Secretary of the Commonwealth
Virginia Council on Indians
PO Box 2454
Richmond, VA 23218
emma.williams@governor.virginia.gov

Mr. Clyde Cristman
Division Director
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219

Ms. Lynn Crump
Environmental Programs Planner
Virginia Department of Conservation and Recreation
600 East Main Street, 24th floor
Richmond, VA 23219
lynn.crump@dcr.virginia.gov

Ms. Sharon Ewing
Virginia Department of Conservation and Recreation
sharon.ewing@dcr.virginia.gov

Ms. Rene Hypes
Natural Heritage Program
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219
rene.hypes@dcr.virginia.gov

Ms. Robbie Rhur
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219
Robbie.Rhur@dcr.virginia.gov

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Mr. Sam Sweeney
New River Trail State Park Manager
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Max Meadows, VA 24360
sam.sweeney@dcr.virginia.gov

Mr. Jimmy Elliott
Virginia Department of Conservation and Recreation - New River Trail
james.elliott@dcr.virginia.gov

Mr. Tony Cario
Water Withdrawal Permit Writer, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
anthony.cario@deq.virginia.gov

Mr. Joe Grist
Water Withdrawl Program Manager
Virginia Department of Environmental Quality
PO Box 1106
Richmond, VA 23218
joseph.grist@deq.virginia.gov

Mr. Scott Kudlas
Director, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
scott.kudlas@deq.virginia.gov

Mr. Matthew Link
Water Withdrawal Permit Writer, Office of Water Supply
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
matthew.link@deq.virginia.gov

Mr. Kelly Miller
Southwest Regional Office
Virginia Department of Environmental Quality
355-A Deadmore Street
Abingdon, VA 24210

Ms. Bettina Rayfield
Environmental Impact Review and Long Range Priorities Program
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218
bettina.rayfield@deq.virginia.gov

NEPA Review
Virginia Department of Environmental Quality
eir@deq.virginia.gov

Mr. Chris Sullivan
Senior Area Forester
Virginia Department of Forestry
900 Natural Resources Drive
Charlottesville, VA 22903

Mr. John Copeland
Fisheries Biologist
Virginia Department of Game and Inland Fisheries
2206 South Main Street, Suite C
Blacksburg, VA 24060
John.Copeland@dgif.virginia.gov

Mr. William Kittrell
Manager, Marion Office - Region 3 Office
Virginia Department of Game and Inland Fisheries
1796 Highway Sixteen
Marion, VA 24354
Bill.Kittrell@dgif.virginia.gov

Ms. Julie Langan
Director and State Historic Preservation Officer
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221

<u>Local Governments</u>

Mr. Rex Hill
Carroll Board of Supervisor
Carroll County
rex.hill@carrollcountyva.gov

Mr. Steve Truitt
Carroll County Administrator
Carroll County
605-1 Pine Street
Hillsville, VA 24343
Steve.Truitt@carrollcountyva.gov

Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

Mr. Scott McCoy
Town Manager
Town of Fries
PO Box 452
Fries, VA 24330
townoffries@friesva.com

Mr. C. M. Mitchell
Mayor
Town of Galax
111 East Grayson Street
Galax, VA 24333

<u>Tribes</u>

Chief Bill Harris
Catawba Indian Nation
996 Avenue of the Nations
Rock Hill, SC 29730

Elizabeth Toombs
Tribal Historic Preservation Officer
Cherokee Nation
P.O. Box 948
Tahlequah, OH 74465
elizabeth-toombs@cherokee.org

Deborah Dotson
President
Delaware Nation
PO Box 825
Anadarko, OK 73005

Administration
Delaware Tribe of Indians
5100 Tuxedo Blvd
Bartlesville, OK 74006

Chief Richard Sneed
Eastern Band of Cherokee Indians
PO Box 455
Cherokee, NC 28719

Chief Dean Branham
Monacan Indian Nation
PO Box 1136
Madison Heights, VA 24572

Administration
United Keetoowah Band of Cherokee Indians
PO Box 746
Tahlequah, OK 74465

<u>Non-Governmental</u>

Mr. Bill Tanger
Friends of the Rivers of Virginia
PO Box 1750
Roanoke, VA 24008
Bill.tanger@verizon.net

American Canoe Association
503 Sophia Street, Suite 100
Fredericksburg, VA 22401

Mr. Kevin Richard Colburn
National Stewardship Director
American Whitewater
PO Box 1540
Cullowhee, NC 28779
kevin@americanwhitewater.org

Mr. Andrew Downs
Regional Director
Appalachian Trail Conservancy
799 Washington Street
PO Box 807
Harpers Ferry, WV 25425-0807
adowns@appalachiantrail.org

Mr. Rick Roth
Treasurer
Friends of the New River
1000 Highland Circle
Blacksburg, VA 24060

Mr. George Santucci
President
New River Conservancy
PO Box 1480
1 N Jefferson Avenue, Suite D
West Jefferson, NC 28694
george@newriverconservancy.org

Ms. Laura Walters
Board Chair
New River Conservancy
6718 Dunkard Road
Dublin, VA 24084
claytorlakegirl@gmail.com

Ms. Andrea Langston
New River Land Trust
PO Box K
Blacksburg, VA 24063-1025

Mr. Tim Dixon
Owner
New River Outdoor Adventures
5785 Fries Road
Galax, VA 24333
newriveroutdooradventures@yahoo.com

Mr. Steve Moyer
Vice President for Government Affairs
Trout Unlimited
1777 N. Kent Street, Suite 100
Arlington, VA 22209

Yayac, Maggie

Subject: FW: [EXTERNAL] Revised Fish Community Sampling Design

From: Copeland, John <john.copeland@dgif.virginia.gov>
Sent: Tuesday, October 22, 2019 1:06 PM
To: Jonathan M Magalski <jmmagalski@aep.com>
Cc: Kittrell, Bill (DGIF) <Bill.Kittrell@dgif.virginia.gov>; Elizabeth B Parcell <ebparcell@aep.com>; John Copeland <john.copeland@dgif.virginia.gov>; Sarah.Kulpa@hdrinc.com
Subject: [EXTERNAL] Revised Fish Community Sampling Design

Jon:

I can't seem to find your original email in my inbox or folders, so here's a response to those I figured were copied.

I'm sorry I didn't respond to your inquiry about fish sampling design. I was either out of town on DGIF business (James River fish survey assistance) or on personal business with the sale and clean out of my Dad's home near Charlottesville. At this point, I see that the Revised Study Plan is out, so I will provide a review of that document in November. Again, I'm sorry I could not get to your request sooner.

John R. Copeland

Fisheries Biologist III
P 540.961.8304

M 540.871.6064

Virginia Department of Game & Inland Fisheries
A **2206 South Main Street, Suite C, Blacksburg, VA 24060**
www.dgif.virginia.gov

CONSERVE. CONNECT. PROTECT.

---------- Forwarded message ----------
From: Jonathan M Magalski <jmmagalski@aep.com>
To: "Copeland, John" <john.copeland@dgif.virginia.gov>, "Bill Kittrell (Bill.Kittrell@dgif.virginia.gov)"

<Bill.Kittrell@dgif.virginia.gov>
Cc: Elizabeth B Parcell <ebparcell@aep.com>, "Kulpa, Sarah" <Sarah.Kulpa@hdrinc.com>
Bcc:
Date: Wed, 9 Oct 2019 21:51:26 +0000
Subject: Byllesby / Buck Relicensing Fisheries Study

Good afternoon John and Bill,

As we work on the Revised Study Plan (RSP), we wanted to get your thoughts on a few proposed modifications we are considering. We would like to check with you now to potentially avoid unnecessary work on your part (i.e. filing comments on the RSP). Based on a review of historical data, comments and additional information provided to-date, Appalachian proposes to revise the sample locations and methodology for the Fish Community Study being presented in the RSP for the Byllesby-Buck Project. Background and supporting information is provided below for your review along with a summary of the proposed changes in methodology and to sampling locations. See attached figures which demonstrate the revised study design along with a copy of the historical study locations for reference.

Gillnet deployments below Buck dam in the historical study (Appalachian 1991) were eliminated due to difficulties with net fouling and at least one net was believed stolen during field efforts. Additionally, the use of hoop nets resulted in collection of only 4 additional fish taxa (Largemouth Bass, Black Crappie, Yellow Perch, and Muskellunge), all of which are susceptible to electrofishing gear. The previous study also included both day and nighttime boat electrofishing samples, however results were not reported separately for the diel periods.

Under the proposed sampling design, electrofishing samples will be collected during daylight hours to minimize safety concerns associated with nighttime boat work on the New River.

Appalachian proposes to perform the fish community study using a combination of boat electrofishing (reservoirs) and backpack electrofishing with seines in non-reservoir, wadeable habitats. The proposed study replaces the gillnet (6 per reservoir) and hoop net (6 per reservoir) methodologies with boat electrofishing sites (3 per reservoir) in the same pool habitats sampled during the historical study.

Appalachian also proposes to add additional backpack electrofishing sites in riffle/run habitats (including one of the tributary streams), which serves to balance the study design and to allow for greater representation/potential collection of non-game species.

These proposed changes would reduce study effort and costs and minimize safety concerns while still providing comparable data and adequate coverage of the project area. We welcome and would appreciate your thoughts on this proposal. If you have any questions or would like to discuss further, please let us know. Thanks….Jon

JONATHAN M MAGALSKI | **ENVIRONMENTAL SPEC CONSULT**
JMMAGALSKI@AEP.COM | D:614.716.2240
1 RIVERSIDE PLAZA, COLUMBUS, OH 43215

--

John R. Copeland
Fisheries Biologist III
P 540.961.8304
M 540.871.6064
Virginia Department of Game & Inland Fisheries
A **2206 South Main Street, Suite C, Blacksburg, VA 24060**
www.dgif.virginia.gov
CONSERVE. CONNECT. PROTECT.

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
October 30, 2019

OFFICE OF ENERGY PROJECTS

Project No. 2514-186 – Virginia
Byllesby-Buck Hydroelectric Project
Appalachian Power Company

VIA FERC Service

Ms. Elizabeth Parcell, Process Supervisor
American Electric Power Services Corporation
P.O. Box 2021
Roanoke, VA 24022-2021

Reference: Extension of Time to Respond to Additional Information Request

Dear Ms. Parcell:

On October 18, 2019, Appalachian Power Company (Appalachian) filed the Revised Study Plan (RSP) for the Byllesby-Buck Hydroelectric Project No. 2514. In that filing, Appalachian also provided responses to the three additional information requests included in Commission staff's September 19, 2019 comments on the Proposed Study Plan. One of the additional information requests sought clarification as to whether a battery storage facility located adjacent to the Byllesby-Buck Project should be considered a project facility and included in the project boundary. In the RSP, Appalachian requested a 60-day extension of time to gather the appropriate technical information and documentation to properly respond to the additional information request. Appalachian also indicated in the RSP that it would expand the geographic scope for all eight studies to include the battery storage facility in the event the facility was determined to be part of the project and needed to be incorporated into the project boundary.

Because the extension of time would not delay the ongoing pre-filing milestones under the Integrated Licensing Process and Appalachian has modified the geographic scopeto account for the additional land occupied by the battery storage facility, the extension of time request is approved. Please file the additional information on the battery storage facility by December 17, 2019.

Please contact Allyson Conner at (202) 502-6082 or allyson.conner@ferc.gov if you have questions.

Sincerely,

Vince Yearick
Director
Office of Energy Projects

COMMONWEALTH of VIRGINIA
Department of Game and Inland Fisheries

Matthew J. Strickler
Secretary of Natural Resources

Ryan J. Brown
Executive Director

November 4, 2019

Secretary Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Byllesby-Buck Project (P-2514-186) Comments on Revised Study Plans

Dear Secretary Bose:

We appreciate the opportunity to comment on the Byllesby-Buck Hydroelectric Project (Number 2514-186) Revised Study Plans. Virginia Department of Game and Inland Fisheries (VDGIF) Aquatic Wildlife Resources staff attended the Proposed Study Plan meeting on July 18, 2019, and reviewed and commented on the Proposed Study Plan document. We offer the following comments on the Revised Study Plan document.

Section 1.3 Project Description, Location, and Study Area: The Byllesby-Buck Project affects a larger area of the New River upstream and downstream from the project area. New River ecological and geologic processes are influenced by the Project for some distance upstream and downstream from the Project Area. Examples include: (1) The Project reservoirs influence ambient New River water temperature and other water quality parameters, with habitat effects on resident coolwater flora and fauna, including New River endemic fishes; (2) Liberation of reservoir sediment deposits during Project operations result in increased turbidity in downstream reaches influenced by Project flow, disrupting ecological processes and negatively affecting angling and recreational use; (3) New River Walleye populations are affected by Project placement, with the dams likely inundating historic New River Walleye spawning areas; (4) Project dams block New River Walleye migration, requiring substantial VDGIF effort and expense to maintain Walleye populations upstream and downstream of the Project via hatchery rearing and stocking programs; and, (5) Loss of upstream mussel fauna due to Project dams blocking migration of host fishes.

The magnitude and spatial scale of this Project influence is not adequately addressed in the Revised Study Plan Study Area, which limits assessment of the Project's influence to a small area upstream and downstream from the Project. Determining the spatial scale of this Project influence will help determine adequate reference conditions for ecological comparisons during multiple study efforts. Determining the downstream spatial influence will involve consideration of Project flow attenuation and downstream turbidity effects of Project operations, as well as other downstream water quality and recreational impacts. Making this determination needs to be a high priority before study plans are finalized.

While Appalachian Power Company made concessions in the Revised Study Plan by extending the Project Area downstream 0.5 miles below the Buck Dam bypass reach to accommodate our concerns about freshwater mussels, they still demonstrate reluctance to adequately address our concerns about the extent of the Study Area. For example, in Section 3.2.2.1 of the Revised Study Plan, under the first bullet on page 36, our request for a reference reach to compare with the particle size distributions in the Byllesby and Buck bypass reaches is described as being 'not reasonably available'. We disagree with this conclusion (ILP Study Criteria No. 7), since a reference reach is readily available in the New River upstream from Byllesby Reservoir (refer to the Biological Survey of the Fries Project for more information on recovery of reference particle size distributions downstream from that project). In addition, we contend that the use of a reference reach to determine likely Project impacts to the bypass reaches is 'consistent with generally accepted practice in the scientific community and within FERC relicensing criteria' (ILP Study Criteria No. 6).

Section 3.1.1 Study Requests Not Deemed Appropriate for Study: In our May 7, 2019 comments on the Pre-Application Document, VDGIF requested a Comprehensive Sediment Study, providing the needed justification for that study. We reviewed the arguments against this study in the Proposed Study Plan document and the Revised Study Plan document.

We call into question the following statements, since they contain no documentation or scientific references:

1. In the second major bullet on page 24, the applicant contends that 'the river's sediment load is most likely replenished by abundant tributaries with confluences between the Byllesby and Buck dams'. We are not aware of any major tributaries between Byllesby and Buck dams. Byllesby Reservoir has two major tributaries feeding it, including Chestnut Creek and Crooked Creek, but these tributaries are located upstream from Byllesby dam. In addition, the applicant argues that the form and profile of the New River in the area between Byllesby and Buck dams are 'indicative of a geomorphically healthy system', but there is no documentation or photography provided to support this contention.

2. The applicant continues this line of reasoning in their discussion in the second paragraph on page 25, stating that 'the New River likely transports its entire annual sediment load over just a few flooding events, or 5 to 10 days per year'. This statement stands alone without documentation or support.

Therefore, we request that FERC determine whether a Comprehensive Sediment Study will fill an information need for this Project.

Section 4 Flow and Bypass Reach Aquatic Habitat Study
4.4 Background and Existing Information: The 1997 Ramping Rate Effectiveness study is mentioned in this section as an adequate measure of the impacts of ramping in the Buck bypass reach. At the time of that study, the New River Walleye population downstream from Buck dam was not as robust as it is now due to more than 20 years of an active stocking and management program. Walleye are one of the species likely attracted by bypass reach flows, so the 1997 study results may not apply under current Walleye population conditions or varying water years. The Buck bypass reach receives flow frequently during most normal and wet years in months when Walleye are likely to be attracted to the bypass reach (February to May) during the spawn and post-spawn periods. While we appreciate the applicant's recognition of the change in the Walleye population from 1997 to 2019, we think it is reasonable to collect current information on the likelihood of Walleye stranding in the Buck bypass reach, particularly with regard to likely impact variance in wet versus dry or average years during the spawn and post-spawn periods.

Section 4.6.3.3 Substrate Characterization and Mapping: We ask, as we did earlier in this letter, what will be used as a reference condition for this characterization? If data is only collected in these bypass reaches, how will that information be analyzed without an adequate reference data set in a free-flowing section of the New River?

Section 4.6.3.2 Flow and Water Level Assessment: In a bullet at the top of page 52, the collection of leakage flow measurements for each bypass reach is discussed. We need to know more about the planned methodology for these measurements and we ask to be consulted about these methodologies before the data is collected. On page 28 in Table 3-2, the development of calibration flows are discussed in the second block. As an 'interested relicensing participant', we specifically request that we be consulted about these flows prior to any field data collection.

Section 5 Water Quality Study
On page 30 in Table 3-2, the applicant states that 'if 2020 is not a suitable year for collecting water quality data, the 2021 field season would be used'. This statement does not provide much guidance regarding the need for collecting this data in more than one year. Since water quality is likely to vary significantly with annual flow regimes, we request that data be collected in more than one year under the Revised Study Plan.

We appreciate the applicant providing useful preliminary reservoir water quality profile data in the Revised Study Plan. These profiles indicate the likelihood that stratification does occur in Byllesby Reservoir. However, these profiles were done under a 9 foot drawdown, which could significantly change the nature and depth of the thermocline. As a result, we emphasize our earlier request that the Revised Study Plan include vertical profile data collection to determine whether the Project reservoirs undergo thermal and/or dissolved oxygen stratification. Doing so will inform our understanding of potential water quality impacts in the bypass reaches as well.

Finally, we appreciate the inclusion of data collection on both turbidity and chlorophyll a at the Project reservoirs.

Section 6 Aquatic Resources Study
6.6.1 Fish Community Study: VDGIF staff appreciate the cooperation of the applicant with regard to the methodology proposed for the fish community study, including honoring our request that spring fish collection efforts be commenced in April for comparability to VDGIF data and for adequate assessment of resident Walleye populations downstream from Buck Dam. We also appreciate the cooperation of the applicant with regard to collecting total length measurements of suitable numbers of each game fish (specifically Walleye, Smallmouth Bass, and Rock Bass) collected during sampling to allow assessment of angling potential.

The applicant contacted us via email on October 9, 2019, with specific questions regarding changing methodologies from the fish community studies during the previous relicensing. We have no problem with changing methodologies to account for field safety. In fact, we do not employ night boat electrofishing in free-flowing sections of the New River due to safety considerations and the fact that our daytime electrofishing methods provide adequate fishery independent data. We have no issue with discontinuing gill net deployments below Buck dam due to the stated reasons in the October 9, 2019 email. We also agree that the hoop net data did not yield important enough information to warrant their use in the current study.

We still have questions regarding assessment of the Walleye population in Byllesby Reservoir, since we stock Walleye in the riverine reach upstream and have employed a pelagic stocking methodology in Byllesby Reservoir in a recent year. Walleye stocked in the riverine reach upstream will exhibit a seasonal migration into the reservoir, so the population needs to be assessed. Boat electrofishing in the reservoir will not be an adequate means to assess the Walleye population in Byllesby Reservoir. Gill nets are a standard methodology for assessing reservoir Walleye populations, so we request that the applicant use this methodology to assess the Walleye population in Byllesby Reservoir. Gill net deployment will also be an effective collection technique for the resident native catfish populations (Flathead and Channel Catfish). These catfish populations will not be adequately sampled with boat electrofishing.

Candy Darter: According to Jenkins and Burkhead's species account in Freshwater Fishes of Virginia, Candy Darter habitat use "extends into the large New River" where it occupies runs, riffles, and swift pockets (Jenkins and Burkhead 1993). Given the federally endangered status of this species, and the unknowns regarding its mainstem New River distribution downstream from the Project, which could be affected by Project flows and downstream water quality and quantity impacts, VDGIF contends that exploratory sampling should be done downstream from Buck dam in areas determined in discussion with our agency's nongame aquatic biologist and appropriate federal authorities.

Section 6.6.3 Mussel Community Study: We appreciate the applicant's cooperation in conducting a survey of the mussel community in Buck Reservoir, including the plan to conduct a habitat assessment prior to any mussel survey work. We request consultation with our mussel biologist as follows: (1). If the applicant determines that a survey is not needed based on the habitat assessment, we request consultation regarding the habitat results; and, (2). If the applicant determines that a survey is needed, based on the habitat survey, our mussel biologist needs to be consulted about the survey design.

Eastern Hellbender: We appreciate the acknowledgement that the Eastern Hellbender (*Cryptobranchus allieganiensis allieganiensis*) is assumed to be present in the Project Area in the absence of directed surveys.

Section 7 Wetlands, Riparian, and Littoral Habitat Characterization Study
We appreciate the modifications in this study design, including field verification of submerged aquatic vegetation beds during the late summer/early fall months, as well as the inclusion of transect based sampling methodology. Without the quantitative information provided by transect based sampling during the appropriate season, the documentation of the extent and composition of these beds will not be adequate.

Section 10 Recreation Study
We appreciate the proposed modifications and improvements in the planned Recreation Study and look forward to continuing collaboration on this critical study and associated PME measures.

Thank you for the opportunity to provide comments on the Revised Study Plans for the Byllesby-Buck Hydroelectric Project. If you have questions regarding our comments, please contact me at the address and phone number listed below.

Sincerely,

John R Copeland

John R. Copeland
Fisheries Biologist III
2206 South Main Street, Suite C
Blacksburg, VA 24060
(540) 871-6064
Email: john.copeland@dgif.virginia.gov

Cc: E. Aschenbach
M. Bednarski
J. R. Copeland
R. Fernald
W.B. Kittrell, Jr.
M. Pinder
R. Southwick
B. Watson

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
http://www.fws.gov/chesapeakebay

November 4, 2019

Secretary Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Byllesby-Buck Hydroelectric Project (FERC #2514-186) Review of Revised Study Plans

Dear Secretary Bose:

The U.S. Fish and Wildlife Service (Service) has reviewed the October 18, 2019 Revised Study Plan for the Byllesby-Buck Hydroelectric Project (FERC #2514-186), filed by Appalachian Power Company, a unit of American Electric Power. Service staff participated in the Proposed Study Plan meeting on July 18, 2019, in Wytheville, Virginia, reviewed, and provided our comments on the Proposed Study Plan document.

The following comments are provided pursuant to the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended: 16 U.S.C. 1531 *et seq*.), the Migratory Bird Treaty Act (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat.755), and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq*.).

<u>Section 1.3 Project Description, Location, and Study Area</u>

The Byllesby-Buck Project affects a larger area of the New River upstream and downstream from the Project area. New River ecological and geologic processes are influenced by the Project for some distance upstream and downstream from the Project Area. The Project reservoirs influence ambient New River water temperature and other water quality parameters, with habitat effects on resident cool water flora and fauna, including New River endemic fishes. Liberation of reservoir sediment deposits during Project operations result in increased turbidity in downstream reaches influenced by Project flow, disrupting ecological processes and negatively affecting angling and recreational use. Loss of upstream mussel fauna due to Project dams block migration of host fishes. The magnitude and spatial scale of the Project's influence is not adequately addressed in the Revised Study Plan (RSP) Study Area, which limits assessment of the Project's influence to a small area upstream and downstream from the Project. Determining the spatial scale of the Project's influence will help determine adequate reference conditions for ecological comparisons during multiple study efforts. Determining the downstream spatial influence will involve consideration of Project flow attenuation and downstream turbidity effects of operations, as well as other downstream water quality and recreational impacts. Making this determination needs to be a high priority before study plans are finalized.

While Appalachian Power Company made revisions in the RSP to acknowledge the downstream impacts by extending the Project Area downstream 0.5 miles below the Buck Dam bypass reach to accommodate our concerns about freshwater mussels, this minor expansion does not adequately address our concerns about the extent of the Project Area and Study Area.

Section 3.1.1 Study Requests Not Deemed Appropriate for Study

The Service appreciates that our September 18, 2019 comments on the need for a comprehensive mussel survey have been included in the RSP, however the Comprehensive Sediment Study has not been. We believe it is helpful to have the Project Area include the habitat in between these two synchronized dam operations, which has been designated as “Study Area” but not “Project Area.”

The RSP contention that the river’s sediment load is most likely replenished by abundant tributaries with confluences between the Byllesby and Buck Dams (page 24 of the RSP) is not supported by documentation or local knowledge. The Service and our state resource partners are not aware of any major tributaries existing between Byllesby and Buck Dams to provide these sediment substrate loads to the downstream New River. Byllesby Reservoir has two major tributaries feeding it, including Chestnut Creek and Crooked Creek, but these tributaries are located upstream from Byllesby Dam. The RSP statement that the form and profile of the New River in the area between Byllesby and Buck Dams are ‘indicative of a geomorphically healthy system’ is not supported by documentation. Similarly, the Service would appreciate reviewing the supporting documentation for the statement that ‘the New River likely transports its entire annual sediment load over just a few flooding events, or 5 to 10 days per year’ (p. 25 of RSP).

Section 4 Flow and Bypass Reach Aquatic Habitat Study
4.4 Background and Existing Information

As stranding within the extensive bypass reaches, especially Buck Dam, is a significant concern to the Service and Virginia Department of Game and Inland Fisheries (VDGIF), we do not believe the 1997 Ramping Rate Effectiveness Study fully measures the impacts of ramping in the Buck bypass reach on many fishes that serve as glochidial hosts for mussels or important recreational resources. At the time of that study, the New River walleye population downstream from Buck Dam was not as robust as it is now due to more than 20 years of an active stocking and management program. Walleye are one of the species likely attracted by bypass reach flows, so the 1997 study results may not apply under current walleye population conditions or varying water years. The Buck bypass reach receives flow frequently during most normal and wet years in months when walleye and other species are likely to be attracted to the bypass reach (February to May) during the spawn and post-spawn periods. While the RSP acknowledges the significant change in the walleye population from 1997 to 2019, the Service believes it is reasonable to collect current information on the likelihood of stranding in the Buck bypass reach, particularly with regard to likely impact variance in wet versus dry or average years during the spawn and post-spawn periods.

Section 4.6.3.3 Substrate Characterization and Mapping

It is unclear what will be used as a reference condition for the substrate characterization. If data is only collected in these bypass reaches, how will that information be analyzed without an adequate reference data set in a free-flowing section of the New River?

Section 4.6.3.2 Flow and Water Level Assessment

It remains unclear to the Service exactly how the collection of leakage flow data for each bypass reach will be measured, and under what conditions. Please inform us about the planned methodology for these measurements. We would like to be included in the discussion of developing these methods before the data is collected. In addition, the development of calibration flows are discussed on page 51 of the RSP. The Service requests to be considered an 'interested relicensing participant' for the review and comment on the framework for flow model scenarios as proposed in the RSP, prior to any field data collection.

Section 5 Water Quality Study

On pages 57-58, the RSP states that if 2020 is not a suitable year for collecting water quality data, the 2021 field season would be used. The Service is not aware what definitions will be used for a "suitable year." Since water quality is likely to vary significantly with annual flow regimes, we advocate to address the information need for this long term riverine impact with water quality data collected in more than one year under the Revised Study Plan.

We appreciate the applicant providing useful preliminary reservoir water quality profile data in the RSP. These profiles indicate the likelihood that stratification does occur in Byllesby Reservoir. However, these profiles were done under a 9-foot drawdown, which could significantly change the nature and depth of the thermocline. As a result, we emphasize our earlier request that the RSP include vertical profile data collection to determine whether the Project reservoirs undergo thermal and/or dissolved oxygen stratification. Doing so will inform our understanding of potential water quality impacts in the bypass reaches as well. Data collection for both turbidity and chlorophyll a at the Project reservoirs are important improvements that have been made for the RSP.

Section 6 Aquatic Resources Study
6.6.1 Fish Community Study

The Service appreciates the cooperation of the applicant with regard to the methodology proposed for the fish community study, including agreeing to the request that spring fish collection efforts be commenced in April for comparability to state data. We also appreciate the RSP provision to collect total length measurements of suitable numbers of each game fish (specifically walleye, smallmouth bass, and rock bass) during sampling to evaluate recreational resources within this section of the New River.

As stated in the RSP, the candy darter (*Etheostoma osburni*), a federally listed endangered species under the Endangered Species Act, has a known population in Cripple Creek, 5 miles downstream of the Buck Dam. According to Jenkins and Burkhead's (1993) species account in Freshwater Fishes of Virginia, candy darter habitat use "extends into the large New River" where it occupies runs, riffles, and swift pockets. Given the likelihood of occurrence and lack of data regarding its mainstem New River distribution downstream from the Project, which could be affected by Project flows and downstream water quality and quantity impacts, the Service believes that exploratory sampling should be done downstream from Buck Dam in areas determined in discussion with us and VDGIF's fisheries specialists.

Section 6.6.3 Mussel Community Study

We appreciate the applicant's cooperation in conducting a survey of the mussel community in Buck Reservoir, including the plan to conduct a habitat assessment prior to any mussel survey work. The Service would like to stay informed of this work, and we suggest consultation with VDGIF's mussel biologist for survey design parameters. If the applicant determines that a survey is not needed based on the habitat assessment, please consult with VDGIF regarding the habitat results before a final decision.

Eastern Hellbender

We appreciate the acknowledgement that the eastern hellbender (*Cryptobranchus allieganiensis allieganiensis*) is assumed to be present in the Project Area in the absence of directed surveys and concur that specific sampling efforts are not needed.

Section 6.4.4 Impingement and Entrainment

The Service looks forward to working with the applicant on the usage of the Turbine Blade Strike Analysis Model, as proposed for inclusion in the RSP.

Section 7 Wetlands, Riparian, and Littoral Habitat Characterization Study

We appreciate the modifications in this study design, including field verification of submerged aquatic vegetation beds during the late summer/early fall months, as well as the inclusion of transect based sampling methodology. Without the quantitative information provided by transect based sampling during the appropriate season, the documentation of the extent and composition of these beds will not be adequate.

Section 10 Recreation Study

The Service appreciates that the requests of the National Park Service, in their May 7, 2019 comments, for additional detail on methods and efforts to assess recreational needs are incorporated into the RSP. We also believe that the expertise of our state agency partners which was incorporated in the RSP will make the study more beneficial and applicable for future protection, mitigation, and enhancement measures.

We appreciate the opportunity to provide these recommendations in our review of the Revised Study Plans developed by the applicant. If you have questions regarding this matter, please contact Janet Norman of my staff at 410-573-4533 or Janet_Norman@fws.gov.

Sincerely,

Genevieve LaRouche
Field Supervisor

cc: Lindy Nelson
Stephanie Nash

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
November 18, 2019

OFFICE OF ENERGY PROJECTS

Project No. 2514-186 Virginia
Byllesby-Buck Hydroelectric Project
Appalachian Power Company

VIA FERC Service

Ms. Elizabeth Parcell, Process Supervisor
American Electric Power Services Corporation
P.O. Box 2021
Roanoke, VA 24022-2021

Reference: Study Plan Determination for the Byllesby-Buck Hydroelectric Project

Dear Ms. Parcell:

Pursuant to 18 C.F.R. § 5.13(c) of the Commission's regulations, this letter contains the study plan determination for the Byllesby-Buck Hydroelectric Project (Byllesby-Buck Project) located on the New River in Carroll County, Virginia. The determination is based on the study criteria set forth in section 5.9(b) of the Commission's regulations, applicable law, Commission policy and practice, and the record of information.

Background

On June 21, 2019, Appalachian Power Company (Appalachian) filed its proposed plan for eight studies covering water quality, aquatic habitat and fishery resources, terrestrial resources, recreation resources, and cultural resources in support of its intent to relicense the project.

Appalachian held its initial Study Plan Meeting on July 18, 2019. Comments on the Proposed Study Plan (PSP) were filed by Commission staff, the U.S. Fish and Wildlife Service (FWS), and the Virginia Department of Game and Inland Fisheries (Virginia DGIF). Virginia Tech's College of Natural Resources and Environment (Virginia Tech) filed multiple study requests on March 15, 2019.

On October 18, 2019, Appalachian filed a Revised Study Plan (RSP) that includes revisions to five of the eight studies included in the PSP. Comments on the RSP were filed by Virginia DGIF and FWS.

Study Plan Determination

Appalachian's RSP is approved with the staff-recommended modifications discussed in Appendix B. As indicated in Appendix A, of the eight studies proposed by Appalachian, three are approved with staff-recommended modifications and five are approved as filed by Appalachian. This determination also addresses seven additional studies requested by stakeholders that were not adopted by Appalachian and are not required by this determination (see Appendix A). In Appendix B, we explain the specific modifications to the study plan and the bases for modifying, adopting, or not adopting requested studies. Although Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations, staff only reference the specific study criteria that are particularly relevant to the determination.

Recommendations for protection, mitigation, and enhancement measures are not study requests, and therefore, are not discussed in this determination. Unless otherwise indicated, all components of the approved studies not modified in this determination must be completed as described in Appalachian's RSP. Pursuant to section 5.15(c)(1) of the Commission's regulations, the initial study report for all studies in the approved study plan must be filed by November 17, 2020.

Nothing in this study plan determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies. In addition, Appalachian may choose to conduct any study not specifically required herein that it feels would add pertinent information to the record.

If you have any questions, please contact Allyson Conner at allyson.conner@ferc.gov or (202) 502-6082.

Sincerely,

for
Terry L. Turpin
Director
Office of Energy Projects

Enclosures: Appendix A – Summary of determinations on proposed and requested study modifications and studies requested but not adopted by Appalachian
Appendix B – Staff's recommendations on proposed and requested study modifications and studies requested

APPENDIX A

SUMMARY OF DETERMINATIONS ON PROPOSED AND REQUESTED STUDY MODIFICATIONS AND STUDIES REQUESTED BUT NOT ADOPTED BY APPALACHIAN

Study	Recommending Entity	Approved	Approved with Modifications	Not Required
Flow and Bypass Reach Aquatic Habitat Study	Appalachian		X	
Water Quality Study	Appalachian		X	
Aquatic Resources Study	Appalachian		X	
Wetlands, Riparian, and Littoral Habitat Characterization Study	Appalachian	X		
Terrestrial Resources Study	Appalachian	X		
Shoreline Stability Assessment Study	Appalachian	X		
Recreation Study	Appalachian	X		
Cultural Resources Study	Appalachian	X		
Comprehensive Sediment Study to Develop a Sediment Management Plan	Virginia DGIF			X
Fish Protection and Downstream Passage Studies	FWS			X

Study	Recommending Entity	Approved	Approved with Modifications	Not Required
PCB Contamination and Pollution Minimization Plan	Virginia Tech			X
Water Willow Propagation, Rehabilitation, and Water Level Plan	Virginia Tech			X
Target Biological Community in the Two Bypass Reaches and Rehabilitation of the Foundational Plant, Riverweed	Virginia Tech			X
Survey of Rare Dragonflies and Multi Taxa Survey	Virginia Tech			X
Recreational Value and Access Development Mitigation	Virginia Tech			X

APPENDIX B

STAFF'S RECOMMENDATIONS ON PROPOSED AND REQUESTED STUDY MODIFICATIONS AND STUDIES REQUESTED

The following discusses staff's recommendations on studies proposed by Appalachian Power Company (Appalachian), requests for study modifications, and requests for additional studies. We base our recommendations on the study criteria outlined in the Commission's regulations [18 C.F.R. section 5.9(b)(1)-(7)].

I. General Issues

The Virginia Department of Game and Inland Fisheries (Virginia DGIF) and the U.S. Fish and Wildlife Service (FWS) submitted comments stating that the Byllesby-Buck Project impacts the New River for many miles both upstream and downstream of the project's dams and hydroelectric facilities. Both agencies identify multiple project-related impacts including influencing ambient New River water temperature and water quality parameters (habitat effects on resident coolwater flora and fauna), liberation of project sediment deposits during project operation resulting in increased downstream turbidity, placement of the dams causing inundation of historic New River walleye spawning habitat and blocking the upstream migration of walleye, and the loss of upstream mussel fauna due to the dams blocking migration of host fishes. Virginia DGIF and FWS state that the magnitude and spatial scale of the project's influence is not adequately addressed in the revised study plan (RSP) and that expanding the study area would help determine adequate reference conditions for ecological comparisons during multiple study efforts.

Generally, the geographic scope (or study area) of the required studies is established based on the anticipated extent of direct project-related effects. Neither agency identifies the specific studies that neglect to address potential direct project-related effects. Neither Virginia DGIF nor FWS state which studies should have extended geographic scopes beyond what Appalachian defines as the study area in the RSP. Further, the agencies have not provided an estimate of how far upstream or downstream they believe the geographic scope should be expanded or how the geographic scope of potential project effects should be determined for various resources. In the following sections, we address the geographic scope of individual studies to the extent that comments and requested study modifications specifically address this issue.

Regarding the recommendation that expanding the study area would help determine adequate reference conditions (i.e., a reference reach) for purposes of informing an analysis of project effects, we note that the environmental baseline for our effects analysis is the condition that exists at the time of relicensing, not pre-project conditions or a surrogate for pre-project conditions like a reference reach. Therefore, we do not recommend expanding the overall geographic scope or documenting reference conditions for the purposes of determining environmental effects.

II. Required Studies

Flow and Bypassed Reach Aquatic Habitat Study

Applicant's Proposed Study

Appalachian proposes to develop and calibrate a two-dimensional (2-D) hydraulic model that would be used in conjunction with an operations model [the Computerized Hydro Electric Operations Planning Software (CHEOPS) platform] to assess how aquatic habitat (depth and flow velocity) in each development's tailrace and bypassed reach varies across a range of flows and project operation scenarios. Hydrology data from the U.S. Geological Survey (USGS) gage (No. 03165500) at Ivanhoe, Virginia (years 1996 through 2019) would be used to develop the CHEOPS model, which is capable of simulating flow releases under various gate opening scenarios. For example, Appalachian plans to use the CHEOPS model to help determine which of the 10 total (six Tainter and four Obermeyer) spillway gates at the Buck Development should be used during down-ramping[1] to ensure a safe, continuously wetted and sufficiently deep, exit route for walleye or other spring-spawning fishes that may be attracted to intermittent spill events into the 4,100-foot-long Buck bypassed reach.[2] The results from the hydraulic model would be coupled with a Physical Habitat Simulation (PHABSIM) model to evaluate how aquatic habitat suitability varies as a function of flow for fish species of interest. The species and range of flows (calibration and test flows) to be evaluated at each development (Buck and Byllesby) would be determined through consultation with stakeholders and resource agencies and based on the management objectives for each bypassed reach. Appalachian would also measure leakage into each bypassed reach at the low end of the tested flow regime. Lastly, Wolman pebble counts would be conducted along at least three transects in each bypassed reach to characterize substrate type and size to aid in development of the PHABSIM model.

---

[1] Following periods of spill into the Buck bypassed reach when a spillway gate has been opened 2 feet or more [corresponding to a release of at least 320 cubic feet per second (cfs)], Article 406 of the current license requires Appalachian to discharge flows through a 2-foot-wide gate opening for at least 3 hours. Appalachian is then required to reduce the gate opening to 1 foot for at least an additional 3 hours, after which time Appalachian may close the gate.

[2] On an annual basis, spillage into the Buck bypassed reach occurs 13 percent of the time on average, but spillage is most common in the spring (March through May). There is no existing minimum flow requirement for the Buck bypassed reach.

Ramping Rate Assessment

Comments on the Study

A study was conducted in 1997 to assess the effectiveness of the current ramping rates at the Buck development by electrofishing in the bypassed reach following three spill events that ranged from 4,300 cfs to 6,140 cfs (amount of spillage through the spillway gates).[3] In its comments on the RSP, Virginia DGIF states the results of that study may not apply to the current walleye population in the New River because the population is more robust today than it was 20 years ago due to an active stocking and management program. Virginia DGIF believes that it is reasonable to collect current information on walleye stranding in the Buck bypassed reach, particularly with regards to how such impacts vary in wet and dry versus average flow years during the spawning and post-spawning periods. In its comments on the RSP, FWS supports Virginia DGIF's request for current information on the likelihood of walleye stranding in the Buck bypassed reach and notes that fish serving as mussel hosts could also be impacted by stranding.

Discussion and Staff Recommendation

Neither Virginia DGIF or FWS explicitly recommend a methodology such as that used in the 1997 Ramping Rate study or an alternative methodology for assessing the likelihood of fish stranding in the Buck bypassed reach. As described above, the modeling efforts proposed by Appalachian as part of its Flow and Bypassed Reach Aquatic Habitat Study (Flow Study), will evaluate a range of gate opening and water release scenarios for the Buck spillway to help determine the optimal gate operation scenario(s) for minimizing walleye stranding risk during intermittent spill events. For example, output from the models will include the depths of various exit routes under different ramping rate and/or gate opening scenarios, which could be compared to the body depths of adult walleye (or other species of interest) to provide information on stranding risk under different operation scenarios. Therefore, because the Flow Study, as proposed, will inform the development of potential license requirements concerning project operation [section 5.9(b)(5)], we do not recommend that additional field studies of fish stranding be performed in the Buck bypassed reach.

[3] Ramping Rate Assessment. Appalachian Power Company Byllesby/Buck Hydroelectric Project FERC No. 2514. Filed on September 12, 1997. Accession No. 19970916-0311.

Substrate Sizes in a Reference Reach

Comments on the Study

In comments on the PSP and RSP, Virginia DGIF and FWS question how the sediment size data Appalachian proposes to collect in the bypassed reaches (at Byllesby and Buck) would be analyzed without an adequate reference data set from a free-flowing section of the New River.

In the RSP, Appalachian states that a suitable reference reach, with comparable high gradient and substrate conditions, proximate to the project for the purposes of study execution, is not reasonably available. Appalachian notes the river has a gradient of 6.3 feet per mile throughout the upper New River Basin, but within the Buck bypassed reach and just downstream (1 mile below) the gradient is higher, at 24 feet per mile and 20 feet per mile, respectively.

In its comments on the RSP, Virginia DGIF states that a reference reach (for the purpose of substrate size comparisons) is readily available in the New River upstream of the Byllesby impoundment.

Discussion and Staff Recommendation

In addition to depth and velocity, substrate type is one of the main input variables for PHABSIM modeling, which Appalachian proposes to use to determine how aquatic habitat suitability varies across a range of flows for fish species of interest. As such, the sediment size data (Wolman pebble counts) proposed to be collected in each bypassed reach is appropriate to inform and develop the PHABSIM model and to characterize existing sediment conditions in the bypassed reach.

As noted above, the Commission's long-standing baseline for environmental analysis at relicensing is the existing conditions, not pre-project conditions or a surrogate for pre-project conditions like a reference reach. Therefore, we do not recommend that Appalachian be required to collect sediment size data from a reference reach of the New River outside of the influence of the project.

Consultation on Leakage Measurements and Calibration Flows

Comments on the Study

In comments on the RSP, Virginia DGIF and FWS state that the proposed methodology for estimating leakage flows at each dam is unclear and request to be consulted prior to any measurements being made. In addition, these entities request to be included as an ‘interested licensing participant’ and consulted in regards to the selection of calibration and test flows for Appalachian’s Flow Study.

Discussion and Staff Recommendation

In the RSP, Appalachian proposes to conduct leakage flow measurements at the ‘low end of the flow regime.’ It is unclear as to what constitutes the low end of the flow regime. Therefore, we recommend that Appalachian conduct leakage measurements at each dam under low-flow (e.g., summer) conditions when impoundment elevations are normal (i.e., within their respective 1-foot allowable fluctuation bands) and no spill is occurring. Further, we recommend that Appalachian consult with Virginia DGIF and FWS regarding its methodology for measuring leakage. With respect to the selection and development of calibration and test flow scenarios, Appalachian already proposes, in the RSP, to consult with interested stakeholders on this topic.

Water Quality Study

Applicant’s Proposed Study

Appalachian proposes to conduct a Water Quality Study to assess the potential effects of project operation on water quality parameters, including water temperature and dissolved oxygen (DO). The single year study would be conducted from May 1, 2020 through September 30, 2020. Appalachian notes that if 2020 is not a suitable year for collecting water quality data, then the 2021 field season would be used. Continuously recording data sondes would be placed at eight sites to measure water temperature and DO at 15-minute intervals. These sites include the: (1) upper end of the Byllesby impoundment; (2) Byllesby forebay; (3) Byllesby bypassed reach; (4) Byllesby tailrace; (5) Buck forebay; (6) upper Buck bypassed reach; (7) lower Buck bypassed reach; and (8) Buck tailrace (see figures 5-3 and 5-4 of the RSP).

Two sondes would be deployed at discrete depths in each forebay to assess the extent of DO and temperature stratification in the project’s impoundments. In the Byllesby forebay, which is about 35 feet deep, sondes would be deployed at depths of 12 feet and 24 feet; and at the Buck forebay, which is about 17 feet deep, sondes would be deployed at depths of 6 feet and 12 feet. Data would be downloaded from the sondes every month; during these monthly downloading events, surface measurements of water temperature, DO, pH, specific conductance, and turbidity would also be taken at each site. Additionally, monthly depth profiles of temperature and DO would be collected at each forebay site. Appalachian notes that, based on the results of the monthly depth profiles, it may adjust the deployment depths of the sondes in the forebays, if needed, as well as increase the frequency of depth profile collections, from monthly to bi-weekly, if stratification appears to be occurring based on a comparison of continuously recorded sonde data (temperature and DO) with vertical profile data.

Deployment Depths of Data Sondes in the Forebays

Comments on the Study

In comments on the PSP, Virginia DGIF and FWS suggest that vertical temperature and DO profiles may need to be conducted on at least a bi-weekly (rather than monthly) basis in the project's forebays to determine stratification depths prior to, or in concert with, deploying the data sondes. In response to this comment, Appalachian proposes (in the RSP, as described above) to potentially adjust the deployment depths of the sondes mid-study and increase the frequency of vertical profile sampling if stratification appears to be occurring. In comments on the RSP, both Virginia DGIF and FWS reiterated their earlier comments from the PSP concerning water quality sampling.

Discussion and Staff Recommendation

It is likely that the onset of stratification (to the extent stratification occurs in the impoundments) will not begin until well after the proposed start date (May 1) for the Water Quality Study, perhaps not until mid-summer. Therefore, conducting depth profiles prior to, or in concert with, sonde deployments, as suggested by Virginia DGIF and FWS, would not appear to inform decisions regarding the proper deployment depths of the sondes. Moreover, adjusting the depths of the sondes mid-study (e.g., based on bi-weekly vertical profiles) could bias and complicate interpretation of the study results.

The greatest (vertical) differences in temperature and DO in the forebays would be expected between the surface and bottom water rather than the middle portions of the water column within which Appalachian proposes to monitor via placement of the sondes at depths of 12 feet and 24 feet at Byllesby and 6 feet and 12 feet at Buck. As such, we recommend that, in each forebay, the sondes be placed as close to the surface and bottom of the water column as possible, and that their locations remain fixed, to ensure the data collected is representative of the maximal degree of stratification that occurs in the forebays. Placing sondes as vertically far apart as possible would obviate the need to continuously re-evaluate (e.g., on a bi-weekly basis during the 5 month study) and possibly re-adjust the location of the sondes to ensure they are above and below any thermoclines that develop. As such, we do not recommend that Appalachian be required to conduct bi-weekly depth profiles in the project's forebays as suggested by Virginia DGIF and FWS.

Turbidity Monitoring

Comments on the Study

In comments on the PSP, Virginia DGIF notes the Water Quality Study plan does not provide for assessing the effects of project operation on downstream turbidity. In response, Appalachian proposes to collect monthly surface samples of turbidity at the eight water quality monitoring sites described above. In comments on the RSP, Virginia DGIF and FWS state the inclusion of monthly turbidity sampling is an improvement to the RSP, but that their concern remains regarding the mobilization of impoundment sediment deposits during project operation, which could result in increased turbidity in downstream reaches that disrupts ecological processes and negatively affects angling and recreational use.

Discussion and Staff Recommendation

A drag rake is operated in each forebay (Byllesby and Buck) to remove and pass debris downstream of each development. The drag rake operates by extending outward (via a beam and cable) from each forebay and scraping along the bottom. The rake is then dragged upward along the face of the trashracks and collected debris passes downstream through a trash chute.[4] When the drag rakes are operated, sediment is likely re-suspended from the bottom (due to the scraping action of the rake) and passed downstream through the intakes, which may increase downstream turbidity and affect aquatic and recreation resources.

The frequency of operation of the drag rake depends on debris loading in the forebays, but it generally operates multiple times per day. Therefore, Appalachian's proposal to sample turbidity once per month at each water quality sampling site lacks the sampling frequency needed to properly assess the effects of project operation (drag rake) on downstream turbidity at each development. Accordingly, we recommend that Appalachian install continuously-recording turbidity sensors (with 15-minute measurement intervals) on each of the 10 multiparameter data sondes that would be deployed across the eight sampling sites described above. We also recommend that Appalachian maintain, and provide in the study report, a log of daily drag rake operations (e.g., daily start and stop times for the drag rakes). This operation log would allow upstream and downstream turbidity values to be compared between time periods when the drag rakes are operating and when they are not, which would facilitate an evaluation of the relative role of (natural) high-flow events versus drag rake operations in causing

---

[4] For a more detailed descriptions of the project's drag rakes, see letters filed by Appalachian on July 2, 1997 (Accession No. 19970716-0506) and July 6, 1998 (Accession No. 19980708-0258).

turbidity spikes. The results of this study could inform the development of potential license requirements (e.g., the optimal timing of drag rake operation in terms of maintaining desirable turbidity levels during prime angling periods) [section 5.9(b)(5)]. The cost would be minimal and largely depend on whether Appalachian currently has access to additional turbidity sensors or needs to purchase them (the approximate cost of the sensors is $10,000 to $15,000). Additional field efforts associated with staff's recommended turbidity monitoring would be minimal because the turbidity sensors would be added to the same sondes that would be used for continuous monitoring of temperature and DO.

Need for a Second Study Season

Comments on the Study

In the RSP, Appalachian indicates that if 2020 is not a suitable year for collecting water quality data, then the 2021 field season would be used. In comments on the RSP, Virginia DGIF and FWS state it is unclear what constitutes a "suitable year" for the collection of water quality data. Both entities request that more than one year of water quality data be collected given that water quality is likely to vary significantly with annual flow regimes.

Discussion and Staff Recommendation

If weather conditions in 2020 are unusually wet and cool, then the Water Quality Study may need to be repeated in 2021 as Appalachian notes in its RSP. On the other hand, if summer weather conditions are unusually dry and hot (e.g., a worst-case scenario for water quality parameters) and water quality parameters are consistent with state water quality standards, there would be no need to collect an additional year of data. The need for a potential second study season will be evaluated based upon review of the water quality study results presented in the Initial Study Report (due November 17, 2020). Therefore, at this time, it is premature to recommend a second study season.

Aquatic Resources Study

Applicant's Proposed Study

Appalachian proposes to conduct an Aquatic Resources Study that includes four main components or sub-studies,[5] including a: (1) Fish Community sub-study, (2)

[5] The term 'sub-study' is used herein by staff to help differentiate and describe the multiple studies contained within the broad Aquatic Resources Study. This term was not used by Appalachian in the RSP.

Macroinvertebrate and Crayfish Community sub-study, (3) Mussel Community sub-study, and (4) Impingement and Entrainment Desktop sub-study.

For the Fish Community sub-study, Appalachian proposes to conduct electrofishing surveys at each development during two seasons, in the: (1) late spring/early summer (April-May), and (2) late summer/early fall (August-September) of 2020. During each seasonal survey, daytime boat electrofishing would be conducted at 12 sites in each impoundment and backpack electrofishing would be conducted at 6 riverine (non-impoundment) sites located in riffle/run habitats at each development, including the tailrace and bypassed reach of each development (see figures 6-2 and 6-3 of the RSP). Appalachian does not plan on conducting gill net or hoop net sampling in the project's impoundments, similar to that conducted during fisheries surveys performed as part of the previous re-licensing (May-October 1990) due to concerns over gear fouling and potential theft (of gill nets) and sampling inefficiency (of hoop nets). In the Byllesby impoundment, six of the proposed boat electrofishing sites (below Chestnut Creek) are the same boat electrofishing sites that were used in the 1990 survey, and the remaining six boat electrofishing sites coincide with previous gill net and/or hoop net sites. Appalachian would enumerate, measure (total length), and weigh fish collected at each site and also measure temperature, DO, pH, specific conductance, and record Secchi disk depths at each sampling site.

For the Macroinvertebrate and Crayfish Community sub-study, Appalachian proposes to conduct two field sampling events, one in the spring (March 1 through May 31) and another in the fall (September 1 through November 30) of 2020. Crayfish would be targeted by sampling in appropriate habitats using kick-netting, seine hauling, and dip-netting techniques. Other macroinvertebrates (e.g., mayflies) would be collected according to the Virginia Department of Environmental Quality's "Methods for Habitat Assessment for Streams" protocol and the data analyzed using common indices to evaluate benthic macroinvertebrate community health and similarity (e.g., the Hilsenhoff Biotic Index,[6] percent intolerant species, etc.).

The Mussel Community sub-study would include a desktop literature review to compile and summarize existing mussel data (e.g., abundance and size data) that have been collected in the vicinity of the project. This sub-study would also include a two-phase field survey. The first phase would include a reconnaissance-level habitat survey to identify potentially suitable mussel habitat in the Buck tailrace and stretch of river between the Byllesby and Buck Dams (see figure 6-1 of the RSP)—this 'transition reach' has not been sampled previously but is thought to contain suitable mussel habitat (islands containing mixed sand/gravel substrates). Along the Buck tailrace, surveyors would walk

[6] The Hilsenhoff Biotic Index estimates the overall tolerance of the macroinvertebrate community in a sampled area by weighting the relative abundance of various taxonomic groups.

the length of the reach while looking for evidence of mussel presence such as live animals or spent valves. Surveyors would visually assess habitat characteristics such as substrate composition and record observations regarding habitat quality. In the transition reach between the dams, field personnel would conduct a reconnaissance-level field habitat assessment to verify or adjust the approximate geographic limits of the hydraulic habitat types (pool, deep shoal, shallow shoal, and side channel) that were preliminarily delineated (see figure 6-1 of the RSP) based on a review of existing aerial imagery. These results from phase one would be used to guide phase two, in which field personnel would survey representative hydraulic habitat types, based on their perceived potential to support mussels, within the geographic extent of each hydraulic habitat type. Mussel sampling (phase two) would be performed using snorkeling, tactile searches and/or viewing scopes in shallow water habitats; via SCUBA or surface supplied air in deeper water habitats (greater than 3 feet deep). Surveyors would conduct wandering timed searches of channel substrates for a minimum of 30 person-minutes per search, with two to three searches expected in each of the four, tentatively defined, hydraulic habitat types (pool, deep shoal, shallow shoal, and side channel; see figure 6-1 and table 6-2 of the RSP).

The Impingement and Entrainment desktop sub-study would include a standard desktop evaluation of entrainment and impingement risk, including blade strike mortalities, of selected target species—the list for which would be based on the results of the Fish Community sub-study (i.e., species common in the impoundments) and those species of conservation and management interest based on consultation with the resource agencies. In addition, approach velocities would be measured in front of each development's intakes with an Acoustic Doppler Current Profiler (transect sampling approach) when each development is operating at its maximum hydraulic capacity and when operating at their most efficient gate setting (as feasible based on project conditions).

Start Date of Spring Fish Sampling

Comments on the Study

In comments on the PSP, Virginia DGIF requests that spring fish collection efforts be commenced in April to ensure that the data collected are representative of the resident walleye population downstream of Buck Dam. In response to this comment, Appalachian shifted the sampling window for the late spring/early summer survey from May-June (in the PSP) to April-May in the RSP. In comments on the RSP, Virginia DGIF acknowledges Appalachian's change to the spring sampling schedule.

Discussion and Staff Recommendation

Appalachian does not explicitly state that it will commence sampling for the late spring/early summer survey in April, only that sampling for the spring/late summer seasonal survey would be conducted sometime during "April-May." In the RSP, Appalachian states that specific sampling dates within this timeframe would be determined based on factors including (but not limited to) weather conditions, water temperatures, river flows and impoundment elevations, and safety of field staff and the general public.

Walleye in the New River are known to start congregating at spawning areas (including just below Buck Dam) by mid-March and remain on or near spawning sites until late April, depending on water temperatures.[7] If spring sampling does not start until May, walleye may have dispersed from the spawning site, in which case sampling would occur too late to obtain representative information on the relative abundance and size structure of the walleye population that congregates downstream of Buck Dam in the spring and is sought after by recreational anglers. Therefore, we recommend that Appalachian commence sampling as early in April as possible, and choose sampling dates in consultation with Virginia DGIF, to ensure that representative data is collected for walleye, which is a focal management species in this portion of the New River.

Walleye Sampling in the Byllesby Impoundment

Comments on the Study

In its comments on the RSP, Virginia DGIF states that boat electrofishing (as proposed by Appalachian) is not an adequate means to assess the walleye population in the Byllesby impoundment. Virginia DGIF notes that it stocks walleye upstream of the Byllesby impoundment and that these fish seasonally use the impoundment. Virginia DGIF states that gill nets are a standard methodology for assessing reservoir walleye populations and should be used to assess the walleye population in the Byllesby impoundment. It also notes that gill nets would be effective in sampling resident catfish populations (flathead and channel catfish).

Discussion and Staff Recommendation

Virginia DGIF does not state why it believes daytime boat electrofishing would be an ineffective method for sampling walleye in the Byllesby impoundment, which is the

[7] Palmer, G.C., Murphy, B.R., and E.M. Hallerman. 2005. Movements of walleyes in Claytor Lake and the Upper New River, Virginia, indicate distinct lake and river populations. North American Journal of Fisheries Management 25:1448-1455.

most lentic-type environment in the project area, with a maximum depth of 35 feet. Virginia DGIF's rationale may stem from the fact that walleye have been shown, at least in lakes with relatively low turbidity (Secchi depths greater than 3 feet) to undergo diel vertical migrations, moving up in the water column at night to feed and down in the water column during the day to avoid high light levels,[8,9] thus rendering them less susceptible to capture during the day by electrofishing, which is most effective in shallow littoral zones along the shoreline rather than deeper habitats.[10] Accordingly, adding gill net sampling, which is standard sampling gear for walleye in lentic environments,[11] [section 5.9(b)(6)] would provide more accurate information on the current walleye population in the Byllesby impoundment than daytime boat electrofishing alone. Information obtained from gill net sampling would also inform Appalachian's impingement and entrainment sub-study and aid staff's analysis of project effects (e.g., entrainment mortality) [section 5.9(b)(5)] for this focal management species.

Virginia DGIF does not provide any specific recommendations for a gill net sampling methodology, such as the: (1) number and location of gill net samples, (2) frequency of sampling, (3) duration of sampling (i.e., gill net soak times), or (4) physical dimensions and specifications of the gill nets that would be used (e.g., panel mesh sizes, float line heights, etc.). Consequently, staff recommends that 6 of the 12 boat electrofishing sites proposed by Appalachian in its Fish Community sub-study be converted to gill net sites that would be sampled during each of the two seasonal surveys (described above). Specifically, the six gill-netting sites should coincide with sites at which gill nets and/or hoop nets were previously deployed (during the aforementioned 1990 fisheries survey). Appalachian should consult with Virginia DGIF to ensure the gill nets it deploys are of the appropriate dimensions and fished for sufficient durations to ensure representative sampling of the walleye population in the Byllesby impoundment.

---

[8] Ryder, R. 1977. Effects of ambient light variations on behavior of yearling, subadult, and adult Walleyes (*Stizostedion vitreum vitreum*). Journal of the Fisheries Board of Canada 34:1481-1491.

[9] Kelso, J.R.M. 1978. Diel rhythm in activity of Walleye, *Stizostedion vitruem vitreum*. Journal of Fish Biology 12:593-599.

[10] Reynolds, J.B., and A.L. Kolz 2012. Electrofishing. Pages 305-361 *in* Zale, A.V., Parrish, D.L., and T.M. Sutton, editors. Fisheries Techniques, 3rd edition. American Fisheries Society, Bethesda, Maryland.

[11] Bonar, S.A., Hubert, W.A., and D.W. Willis, editors. 2009. Standard methods for sampling North American freshwater fishes. American Fisheries Society, Bethesda, Maryland.

The addition of gill net sampling would result in minimal additional cost or effort because the same total number of samples would be collected in the study, the only difference being that 6 of the 12 sampling sites in the Byllesby impoundment would be collected with a different gear type (gill nets instead of boat electrofishing).

Candy darter

Comments on the Study

Appalachian does not propose to conduct targeted sampling for candy darter[12] because this species is only known to occur in tributary streams and is therefore not anticipated to occur within the mainstem of the New River near the project. Nevertheless, Appalachian notes that should a candy darter specimen be collected, sampling would be halted and Virginia DGIF and FWS would be notified, with sampling being reinitiated only after consultation with the agencies and receipt of the necessary protected species permits.

In comments on the RSP, Virginia DGIF and FWS note that the species account for candy darter given in the book *Freshwater Fishes of Virginia*[13] suggests that candy darter habitat use "…extends into the large New River…" where it occupies runs, riffles, and swift pockets. Given the federally endangered status of the candy darter and unknowns regarding its distribution in the mainstem New River downstream from the project, both entities recommend that exploratory sampling be conducted downstream from Buck Dam in areas determined in discussion with the agencies' respective resource specialists. Virginia DGIF and FWS state that the river reach downstream from Buck Dam contains potential candy darter habitat and could be affected by project flows and downstream water quality and quantity impacts.

Discussion and Staff Recommendation

It is unclear what is meant by the "exploratory sampling" recommended by Virginia DGIF and FWS. As described above, Appalachian proposes to conduct backpack electrofishing at six riffle/run sites at each development. Candy darter are known to be habitat specialists and primarily occupy riffle habitats (especially as adults)

[12] Candy darter is a federally endangered species; one area in which critical habitat has been designated for this species is the Cripple Creek tributary of the New River, which is 5 miles downstream of the Buck Dam.

[13] Jenkins, R.E., and N.M. Burkhead. 1993. Freshwater Fishes of Virginia. American Fisheries Society, Bethesda, Maryland. 1079 pp.

in the New River Basin.[14,15] Furthermore, backpack electrofishing has been shown to: (1) be an effective technique for determining the presence of this rare species, (2) not result in mortalities of candy darter, and (3) be superior to snorkeling in the shallow, fast habitats and turbid conditions expected at Appalachian's proposed riffle sampling sites.[16] Therefore, because Appalachian's sampling efforts would occur in the principal habitat of candy darter (riffles) using sampling gear (backpack electrofishing) that has been shown to be effective for detecting this species from spring through fall,[17] Appalachian's Fish Community sub-study, as proposed, should be adequate for determining the presence of candy darter in the project area and staff does not recommend the exploratory sampling recommended by Virginia DGIF and FWS.

Field Surveys for Mussels

Comments on the Study

In comments on the RSP, Virginia DGIF and FWS request that Virginia DGIF's mussel biologist be consulted regarding study design parameters if Appalachian determines that a survey is not needed based on the results of the phase one habitat assessment, that the agencies be consulted before a final decision is made as to whether to conduct phase two.

Discussion and Staff Recommendation

The agencies' requests for mussel field surveys contain little information regarding a suggested sampling methodology. The two-phase study protocol proposed by Appalachian is a reasonable and sufficient approach that uses generally accepted practices in the scientific community [section 5.9(b)(6)]; as such, we have no reason to modify Appalachian's proposed sub-study at this time. Therefore, although consultation could be beneficial, we do not recommend requiring Appalachian to consult with the agencies regarding the design of the study, because ideally such discussions pertaining to

---

[14] Dunn, C.G., and P.L. Angermeier. 2016. Development of habitat suitability indices for the candy darter, with cross-scale validation across representative populations. Transactions of the American Fisheries Society 145:1266-1281.

[15] Dunn, C.G. 2013. Comparison of habitat suitability among sites supporting strong, localized, and extirpated populations of candy darter (*Etheostoma osburni*). Final Report submitted to Virginia DGIF. October 2013. 74 pp.

[16] *Ibid.*

[17] *Ibid.*

study design should have occurred prior to, or in concert with, the development and filing of the RSP under the ILP study plan development process. After the first year of studies are completed, following the Initial Study Report, entities may file requests for modifications of ongoing studies (such as the Mussel Community sub-study) pursuant to section 5.15(d) of the Commission's regulations.

III. Studies Requested but Not Adopted by Appalachian

Comprehensive Sediment Study to Develop Sediment Management Plan (Sediment Study)

Study Request

Virginia DGIF requests that Appalachian conduct a Sediment Study to assess the current sediment transport condition at the project to support the formulation of a sediment management plan to mitigate for the effects of sedimentation on fisheries and other aquatic life (e.g., macroinvertebrates and mussels) managed by the agency. Specific goals and objectives of the study include determining the volume of sediment deposited in the project's impoundments to date (i.e., since emplacement of the dams in 1912) and estimating annual sediment deposition rates (via topographic differencing)[18] to predict the remaining lifespan of the impoundments. In addition, the study would assess the extent of the coarse-substrate deficit in the project's bypassed reaches and mainstem channels downstream of the dams and powerhouses via comparisons to the historic rate of sediment transport and sediment-size distributions prior to construction of the project dams. Virginia DGIF indicates the study would inform the development of a sediment management plan for the project that could include activities such as scheduled dredging in the impoundments and coarse substrate (e.g., gravel) augmentation downstream of the project dams.

Discussion and Staff Recommendation

Appalachian does not propose to conduct the Sediment Study. It states that significant sedimentation does not appear to be occurring behind the Byllesby Dam because the river channel, which is 35 feet deep in the forebay, appears to be aligned with the spillway gates and that sediment removal via dredging has not been necessary since the installation of the drag rakes at the project, which in conjunction with the run-of-river operation of the project, appear to pass adequate amounts of fine and coarse-grained sediment downstream of the dams. Appalachian also notes that maintaining a supply of coarse sediment in the bypassed reaches is not feasible due to the turbulent and high

[18] Topographic differencing uses differences in bed topography and bathymetry between time periods of interest (e.g., pre-dam versus post-dam construction) to estimate sediment deposition rates in a waterbody.

velocity hydraulic conditions that occur as a result of the high gradient of the natural streambed in the vicinity of the project and periodic high-flow events. Appalachian believes that any gravel added to the system would likely be moved downstream during the next high-flow event under present-day conditions and that adding sediment in one-time, large volume applications has the potential to smother substrates that support mussels, macroinvertebrates, and provide spawning substrates for fish. Lastly, Appalachian does not believe that aquatic resources are being significantly impacted by current project operation.

As to Virginia DGIF's request that the sediment study be conducted, in part, to document the extent of the coarse-substrate deficit in the project's bypassed reaches and mainstem channels downstream of the dams and powerhouses relative to pre-project conditions, the Commission's long-standing baseline for the environmental effects analysis during relicensing is the existing conditions, not pre-project conditions.

Information to be collected as part of Appalachian's Flow Study—Wolman pebble counts in each bypassed reach—will be sufficient to describe the current sediment conditions at the project such that a sedimentation study is not needed; therefore, we do not recommend the Sediment Study.

Fish Protection and Downstream Passage Studies

Study Request

FWS states that because Appalachian has not proposed additional measures (other than its existing trash racks)[19] to ensure safe, timely, and effective downstream fish passage, it is requesting that downstream passage protection studies be undertaken. FWS indicates these studies should include a literature search of available passage designs for species of concern, such as smallmouth bass, walleye, white sucker, and northern hog sucker, as well as information on the relative effectiveness of each design. FWS also recommends that site-specific data (flows, velocities, water depths, and substrates) be collected to aid in the design of protection and passage facilities.

Appalachian states the potential for fish entrainment or impingement will be evaluated as part of the Aquatic Resources Study (Impingement and Entrainment Desktop sub-study, described above). Appalachian notes that, based on the results of that study, additional fish protection measures may be considered, but are not being proposed at this time.

[19] The existing trash racks at each development have 2.28-inch clear-bar-spacing and are inclined 15 degrees.

Discussion and Staff Recommendation

Once completed, the proposed desktop entrainment and impingement study would provide information on the magnitude of impingement and entrainment mortality of resident fishes[20] at the project. In addition, the information collected from the fish sampling survey would inform potential population-level effects of the project (e.g., a lack of particular size or age classes suggestive of reduced spawning success and/or failed recruitment of resident fishes). Therefore, until that study has been completed, it is premature, at this time, to explore additional downstream fish protection and passage options. As such, we do not recommend that Appalachian be required to conduct the Fish Passage and Downstream Protection Studies requested by FWS.

PCB Contamination and Pollution Minimization Plan (PCB Study)

Study Request

Virginia Tech requests a study to determine the PCB[21] concentrations of sediment accumulated behind the project dams. Virginia Tech indicates the study is needed because these sediments may be disturbed during potential maintenance dredging in the project impoundments, and the information gained from the study would help develop a plan for the removal and safe disposition of these dredged materials.

Appalachian states the following reasons for not adopting the PCB study: (1) a draft Total Maximum Daily Load (TMDL) developed for the New River in September 2018 indicates that PCB impairment occurs downstream of the project, (2) no dredging of impoundment sediment is proposed at this time, and (3) any future dredging and disposal would be coordinated with the U.S. Army Corps of Engineers and Virginia Department of Environmental Quality.

[20] No diadromous fishes (i.e., those fishes that must move between freshwater and saltwater for the purposes of reproduction to complete their life cycle, such as salmon and eels) are present in the project area.

[21] PCBs, or polychlorinated biphenyls, are an industrial contaminant whose use was banned in 1979 but are still present as legacy contaminants in some aquatic systems, where they associate with, and are bound to, sediments.

Discussion and Staff Recommendation

The Total Maximum Daily Load for PCBs developed for the New River[22] indicates that PCB-impairment is limited to the portion of the river downstream of the Interstate 77 Bridge crossing, which is approximately 10 miles downstream of the project. Thus, even if maintenance dredging were conducted at the project intakes (e.g., on an as-needed basis to remove accumulated sediment that could reduce generation potential), there is no reason to believe that such dredging would liberate or contain harmful levels of PCBs.[23] As such, there appears to be no nexus between project operation and potential effects (of PCBs) on aquatic resources [section 5.9(b)(5)]. Therefore, we do not recommend requiring the PCB Study.

Water Willow Propagation, Rehabilitation, and Water Level Plan

Study Request

Virginia Tech states that aerial photos provided in the Pre-Application Document (PAD) do not include vegetation mapping that sufficiently indicates current locations of American water willow. As such, Virginia Tech requests a survey to identify shoreline habitats within the project boundary that would be suitable for propagating and planting water willow. Specific goals and objectives include stabilizing banks from erosion, reducing sediment additions to the New River, creating nursery habitat for shoreline fish and other aquatic life, and enhancing fish and wildlife productivity and biological diversity. Public interest considerations include enhanced habitat for wildlife viewing and fishing and increasing water clarity in the New River. This request also calls for a water-level management plan to address concerns that water-level fluctuations and long periods of inundation will cause mortality of water willow.

Appalachian does not propose to conduct this study, but its planned Wetland and Riparian Habitat Characterization Study will include surveys for existing water willow within the study area and its planned Shoreline Stability Assessment Study will include surveys for shorelines that can potentially benefit from vegetative plantings (to reduce erosion).

[22] https://www.deq.virginia.gov/Programs/Water/WaterQualityInformation TMDLs/TMDL/TMDLDevelopment/ApprovedTMDLReports.aspx

[23] Appalachian states in the RSP that it does not plan to conduct routine maintenance dredging at the project.

Discussion and Staff Recommendation

Once completed, the Wetland and Riparian Habitat Characterization Study and Shoreline Stability Assessment Study will identify current water willow locations and areas where future propagation and planting measures could provide potential erosion control benefits. The results from the Wetland and Riparian Habitat Characterization Study will also be used to evaluate the potential for project effects on study habitats, and the Shoreline Stability Assessment Study will be used to identify areas where remedial action or further assessment may be needed. Therefore, the information requested by Virginia Tech will be obtained from studies proposed by Appalachian. Therefore, we do not recommend Virginia Tech's requested study.

Target biological community in the two bypass reaches and rehabilitation of the foundational plant, riverweed

Study Request

Virginia Tech states that the aquatic community in the bedrock-dominated bypassed reaches of the project has been lost and needs to be rehabilitated. To support this effort, Virginia Tech requests a study to define the metrics for restorable biological communities in the bypassed reaches, develop minimum instream flow requirements for the bypassed reaches, and to propagate and replant the bypassed reaches with the foundational plant, Hornleaf riverweed. Appalachian did not adopt this study because bypassed reach flows and associated aquatic habitat would be evaluated as part of its Flow Study, and rehabilitation via plantings is not planned at this time.

Discussion and Staff Recommendation

Information from the Flow Study (described above) would be used to develop minimum flow recommendations and inform the development of potential license requirements [section 5.9(b)(5)] for the project's bypassed reaches that consider agency management goals (especially for the seasonally dewatered Buck bypassed reach). Thus, requiring an additional minimum flow study would be redundant. Regarding Hornleaf riverweed plantings, the Flow Study and Wetlands, Riparian, and Littoral Habitat Characterization Study will provide sufficient information to assess the feasibility of potential mitigation measures such as Hornleaf riverweed plantings. For these reasons, we do not recommend requiring the study.

Survey of rare dragonflies and multi taxa survey

Study Request

Virginia Tech requests a study to compare the occurrence and abundance of dragonflies and other taxa (crayfish and small fishes) in the project area to upstream and downstream reference locations. Virginia Tech recommends that species occurrence of dragonflies be inferred during adult, nymph, and exuviae[24] surveys. More specifically, Virginia Tech proposes the use of several metrics[25] that can be used as indicators of dragonfly residency in an area, including: (1) finding adults during at least four surveys, (2) finding tenerals[26] on two or more surveys, and (3) counting more than 20 adults on at least one survey.

Appalachian did not adopt this study because its proposed Aquatic Resources Study (Macroinvertebrate and Crayfish Community sub-study) would include fish and macroinvertebrate sampling; and information on dragonfly habitat (wetlands and riparian habitat) would be provided by its proposed Wetlands, Riparian, and Littoral Habitat Characterization Study.

Discussion and Staff Recommendation

Virginia Tech does not establish a clear connection between project operation and the resources (namely dragonflies) to be studied or explain how the study results would inform the development of license requirements. Therefore, the study results would not inform the development of license requirements [section 5.9(b)(5)], and we do not recommend requiring the study.

---

[24] Exuviae are exoskeletons that remain intact after molting; as such can be used to document presence of dragonfly species of interest in a study area.

[25] Survey metrics defined further in: Bried, J.T., A.M. Dillon, B.J. Hager, M.A. Patten, and B. Luttbeg. 2015. Criteria to infer local species residency in standardized adult dragonfly surveys. *Freshwater Science* 34:1105-1113.

[26] A teneral insect is one that has recently molted and its exoskeleton has not hardened and is pale with little coloration.

Recreational Value and Access Development Mitigation

Study Request

Virginia Tech states that access to the New River is a principal barrier to participation in water-based recreation and requests that Appalachian determine what barriers exist that may inhibit access to the New River.

Discussion and Staff Recommendation

Appalachian proposes a Recreation Study to gather recreation-related information to describe current public use of six recreation sites that provide access to the New River.[27] The study includes a recreation facility inventory and condition assessment, a site visit with stakeholders, an online recreation visitor use survey, and recreation use documentation. These four study tasks are designed to help Appalachian gather information on recreation use, needs, and trends at the project facilities, including at both canoe portage trails. With this information, Appalachian could identify barriers affecting public access, water-based recreation in the New River, and portage use.

Appalachian recently installed trail cameras at both portages (and other locations) to begin data collection and document participant use at these facilities. The trail cameras continue taking time-stamped photos until movement at the portages is no longer detected. Images collected will show how often the portages are used and whether entrance/exits from the New River appear easy or challenging. The photos taken of each participant group will document how long it takes a person or group to enter/exit the water. This information will inform the current use of and potential need for improvements to the portages, which would satisfy Virginia Tech's study request. Therefore, we do not recommend an additional recreation access study at the project.

[27] The Byllesby Canoe Portage, the Buck Canoe Portage, and the New River Canoe Launch are owned and operated by Appalachian. The Byllesby Virginia DCR Boat Launch, New River Trail Picnic Area, and the Buck Dam Picnic Area are operated by the Virginia DCR; these facilities are outside of the project boundary but provide public access to the lands and waters near the project.

APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY™

Appalachian Power Company
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

December 12, 2019

Via Electronic Filing

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514-186)
Supplemental Information/Clarification on the Study Plan Determination

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Licensee), a unit of American Electric Power (AEP), is the Licensee, owner, and operator of the Byllesby-Buck Hydroelectric Project (Project No. 2514) (Project or Byllesby-Buck Project), located on the New River in Carroll County, Virginia. The existing license for the Project expires on February 29, 2024, and Appalachian is pursuing a new license for the Project pursuant to the Federal Energy Regulatory Commission's (FERC's or Commission's) Integrated Licensing Process. On October 18, 2019, Appalachian filed the Revised Study Plan (RSP) for the Project. On November 18, 2019 the FERC Director of the Office of Energy Projects issued a Study Plan Determination (SPD). In the SPD, the Director approved the Flow and Bypass Reach Aquatic Habitat Study proposed by Appalachian in the RSP with modifications based on Commission staff's recommendations (Appendix B of the SPD). Appalachian is in agreement with the modifications required by the SPD but notes that staff's description of aspects of this study is inconsistent with that described in the RSP and intended by the Licensee. To avoid potential confusion by Commission staff or other relicensing participants throughout and following execution of this study, Appalachian is providing this clarification.

Commission staff's description in Appendix B of the SPD of the Flow and Bypass Reach Aquatic Habitat Study included the following summary:

> *Appalachian proposes to develop and calibrate a 2-D hydraulic model that would be used in conjunction with an operations model [the Computerized Hydro Electric Operations Planning Software (CHEOPS) platform] to assess how aquatic habitat (depth and flow velocity) in each development's tailrace and bypassed reach varies across a range of flows and project operation scenarios. Hydrology data from the U.S. Geological Survey (USGS) gage (No. 03165500) at Ivanhoe, Virginia (years*

> *1996 through 2019) would be used to develop the CHEOPS model, which is capable of simulating flow releases under various gate opening scenarios. For example, Appalachian plans to use the CHEOPS model to help determine which of the 10 total (six Tainter and four Obermeyer) spillway gates at the Buck Development should be used during down-ramping 1 to ensure a safe, continuously wetted and sufficiently deep, exit route for walleye or other spring-spawning fishes that may be attracted to intermittent spill events into the 4,100-foot-long Buck bypassed reach.2 The results from the hydraulic model would be coupled with a Physical Habitat Simulation (PHABSIM) model to evaluate how aquatic habitat suitability varies as a function of flow for fish species of interest. The species and range of flows (calibration and test flows) to be evaluated at each development (Buck and Byllesby) would be determined through consultation with stakeholders and resource agencies and based on the management objectives for each bypassed reach. Appalachian would also measure leakage into each bypassed reach at the low end of the tested flow regime. Lastly, Wolman pebble counts would be conducted along at least three transects in each bypassed reach to characterize substrate type and size to aid in development of the PHABSIM model.* (p. B-2)

Additionally, the following statement was included in staff's discussion on study requests related to this study:

> *In addition to depth and velocity, substrate type is one of the main input variables for PHABSIM modeling, which Appalachian proposes to use to determine how aquatic habitat suitability varies across a range of flows for fish species of interest. As such, the sediment size data (Wolman pebble counts) proposed to be collected in each bypassed reach is appropriate to inform and develop the PHABSIM model and to characterize existing sediment conditions in the bypassed reach.* (p. B-4)

Contrary to the description provided by Commission staff in Appendix B of the SPD, in the RSP (see Section 4.6), Appalachian did not propose to develop a PHABSIM model for or as part of this study. Instead, Appalachian proposes to develop a two-dimensional (2-D) hydraulic model for each development, to include the tailwater area, bypass reach, and immediate downstream area. The 2-D models will incorporate detailed terrain obtained by topographic mapping technologies and will be capable of simulating observed hydraulic behavior for each study area. The models will be developed using software such as the USACE's HEC-RAS software (version 5.0.3), or the Innovyze ICM software (version 7.0) (or similar computational models), which are capable of simulating depth and velocities in a 2-D grid pattern over a wide range of flow conditions. Flow and water depth data collected as part of the study (as detailed in RSP Section 4.6.3) will be used to calibrate and validate the 2-D hydraulic models to allow simulation of flow conditions and gate operations other than those that were explicitly sampled during data collection efforts.

The 2-D hydraulic models will be capable of simulating reservoir inflow and rate of reservoir rise, dynamic gate operations scenarios, release travel times, and rates of rise at locations within and downstream of each bypass reach. Analyses of the results of varying spill events and spill configurations are expected to provide insights into potential adverse effects on existing fish and mussel communities or recreational fishing opportunities in the bypass reaches.

The 2-D hydraulic model results will be used to develop a flow and aquatic habitat assessment of each tailwater and bypass reach. For each flow scenario, incremental changes in depth and wetted area will be determined and associated flow patterns and hydraulic connectivity will be evaluated. In addition, substrate and mesohabitat mapping along with the 2-D model depth and velocity simulation results will be used in combination with aquatic species habitat suitability indices (i.e., using depth, velocity, and habitat preferences) to evaluate potential available habitat under each modeled flow scenario in the study reach.

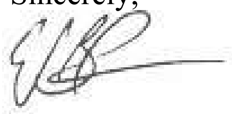
Appalachian is also herein providing the additional information below for Commission staff on the application of the CHEOPS model and why the PHABSIM methodology was not proposed for the Flow and Bypass Reach Aquatic Habitat Study:

- The CHEOPS model was developed for Appalachian to evaluate the effects of operational changes and physical modifications at the Byllesby and Buck developments on power generation. In part, the model uses historical inflows to simulate likely spillway gate operations and the resulting flows in each bypass reach. Results from the CHEOPS model will be used to inform the development of flow test scenarios and 2-D hydraulic model simulations for the Flow and Bypass Reach Aquatic Habitat Study, but will not be used to assess how aquatic habitat (i.e., depth and flow velocity) in each development's tailrace and bypassed reach varies across a range of flows and project operation scenarios. As described above, the 2-D model depth and velocity simulation results will be used in combination with aquatic species habitat suitability indices to evaluate potential available habitat under each modeled flow scenario in each study reach.

- While the PHABSIM model is commonly used for aquatic habitat modeling efforts, the complexity and extent of the Byllesby and Buck study areas are better suited to a 2-D hydraulic model, where multiple bypass flow delivery points can be simulated and hydraulic connectivity throughout the length and width of each bypass reach can be evaluated. In addition, the 2-D hydraulic model will be able to simulate depths, velocities, and flow patterns in the immediate downstream areas where the tailwater and bypass reaches rejoin.

For the reasons stated herein, Appalachian does not intend and is not planning to develop a PHABSIM model for the Flow and Bypass Reach Aquatic Habitat Study. If Commission staff have any questions regarding this clarification or require any additional information, please do not hesitate to contact me at (540) 985-2441 or via email at ebparcell@aep.com.

Sincerely,



Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

Kulpa, Sarah

From:	Elizabeth B Parcell <ebparcell@aep.com>
Sent:	Thursday, December 12, 2019 4:56 PM
To:	John Copeland (John.Copeland@dgif.virginia.gov); Norman, Janet; Bill Kittrell (Bill.Kittrell@dgif.virginia.gov); Cario, Anthony (DEQ) (Anthony.Cario@deq.virginia.gov); matthew.link@deq.virginia.gov
Cc:	Kulpa, Sarah; Jonathan M Magalski
Subject:	Byllesby-Buck Study Plan Determination Clarification Filing
Attachments:	20191212_AEP to FERC_BB SPD Clarification.pdf

All,

Please find a copy of a letter filed with the Commission today clarifying the discussion in FERC's Study Plan Determination of the Instream flow model. We're hoping to minimize any future confusion.

Please let us know if you have any questions.

Liz

ELIZABETH B PARCELL | **PROCESS SUPV**
EBPARCELL@AEP.COM | D:540.985.2441
40 FRANKLIN ROAD SW, ROANOKE, VA 24011

Appalachian Power Company
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

December 16, 2019

Via Electronic Filing

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

**Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514-186)
Response to Proposed Study Plan Additional Information Request**

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Licensee), a unit of American Electric Power (AEP) is the Licensee, owner, and operator of the Byllesby-Buck Hydroelectric Project (Project No. 2514-186) (Project or Byllesby-Buck Project), located on the New River in Carroll County, Virginia. The existing license for the Project expires on February 29, 2024, and Appalachian is pursuing a new license for the Project pursuant to the Federal Energy Regulatory Commission's (FERC's or Commission's) Integrated Licensing Process. On October 18, 2019, Appalachian filed the Revised Study Plan (RSP) for the Project. In that filing, Appalachian also provided responses to the three additional information requests included in FERC staff's September 19, 2019 comments on the Proposed Study Plan. One of the staff's additional information requests sought clarification as to whether the battery storage facility located adjacent to the Byllesby-Buck Project should be considered a project facility and included in the project boundary. In the RSP, Appalachian requested a 60-day extension of time to gather the appropriate technical information and documentation to properly respond to the additional information request, and this request was granted by the Commission by letter dated October 30, 2019. This filing provides Appalachian's response to this additional information request.

Schedule B Item No. 1 of the September 19, 2019 additional information request is provided in full as Attachment 1, for reference. In summary, Commission staff requested that Appalachian clarify (1) how and where project power currently connects to AEP's distribution system and specify the project component(s) (i.e., bus, switch, transformer, etc.,) where the connection is made; (2) whether the battery storage facility, switchyard, and its related components should be considered project facilities; and (3) how project operation is affected by the presence of the battery storage facility and what factors limit its capacity. Appalachian has responded to each of these requests in the pages that follow.

(1) How and where project power currently connects to AEP's distribution system and specify the project component(s) (i.e., bus, switch, transformer, etc.,) where the connection is made:

Project power connects to AEP's 69 kilovolt (kV) distribution system at the single generator step-up transformer (GSU) located within the Byllesby switchyard (also known as the Byllesby 69 kV substation) (Figure 1). The GSU is connected to the single 13.2 kV bus located within the Byllesby control house. Generator leads for each of the four Byllesby units are connected to this 13.2 kV bus. Generator leads for the three Buck units are connected to a common 13.2 kV bus within the Buck powerhouse, which is in turn connected to the two approximately 2-mile-long overhead 13.2 kV lines (Byllesby Buck #1 and Byllesby Buck #2) that cross the New River near the Buck spillway and extend to the Byllesby control house, where they connect to the 13.2 kV bus within. The GSU steps up the 13.2 kV generator voltage to 69 kV to match the voltage on the electrical distribution system. Consistent with the transmission facilities and equipment listed in Exhibit A (see discussion in part 2(a), below), it is Appalachian's understanding that the GSU serves as the Project's "point of junction with the distribution system" within the meaning of Section 3(11) of the Federal Power Act. [1]

Figure 1. Byllesby control house, exterior switchyard (at right), and battery system (at left).

[1] 16 U.S.C. § 796(11) (2011): "project" means complete unit of improvement or development, consisting of a power house, all water conduits, all dams and appurtenant works and structures (including navigation structures) which are a part of said unit, and all storage, diverting, or forebay reservoirs directly connected therewith, the primary line or lines transmitting power therefrom to the point of junction with the distribution system or with the interconnected primary transmission system, all miscellaneous structures used and useful in connection with said unit or any part thereof, and all water rights, rights-of- way, ditches, dams, reservoirs, lands, or interest in lands the use and occupancy of which are necessary or appropriate in the maintenance and operation of such unit.

(2) (a) Whether the switchyard and its related components should be considered project facilities:

Tables A-1 and A-2 of the approved Exhibit A[2] for the existing Project provides a list of appurtenant mechanical and electrical equipment for the Byllesby and Buck Developments, respectively. A list at the bottom of each table includes transmission equipment required for efficient operation of the Project. These lists of transmission equipment are consistent with and appear to be derived from the Commission's finding in the 1978 license order issued for the Project[3] that those facilities were subject to license as parts of a hydroelectric project in accordance with Federal Power Act Section 3(11). While these transmission facilities were listed individually in the 1978 license order, in the 1994 license order[4] they are grouped under "appurtenant facilities" in the license project description.

Historical exhibits or license orders for the Project do not, however, directly address the following:

- The Byllesby control house. Since constructed in 1911-1912, the Byllesby and Buck developments have been connected to a single transformer station located at the large "control house" building near the Byllesby powerhouse.[5] The control house is located southwest of the Byllesby auxiliary spillway and several hundred feet back from the river. It is a two-level, rectangular, steel-framed, brick-walled building, surrounded by transformers and other appurtenant equipment. The building's interior contains offices, a maintenance area, and control rooms.

- The two approximately 2-mile-long overhead 13.2 kV lines (Byllesby Buck #1 and Byllesby Buck #2) that start at the 13.2 kV bus within the Buck powerhouse, cross the New River near the Buck spillway, and extend to the 13.2 kV bus within the Byllesby control house. In the past license application and Exhibit A, these lines were referred to as the "13.2 kV Byllesby/Ivanhoe" lines and treated as part of AEP's distribution system. Appalachian believes that these lines should now be considered "primary lines" within the meaning of Section 3(11) of the Federal Power Act.

Based on the Commission's additional information request and the information provided in this transmittal, AEP proposes to revise Exhibit A for the Project to include the Byllesby control house and switchyard as part of the project works and to include the two overhead 13.2 kV lines that run from the Buck powerhouse to the Byllesby control house. If the Commission agrees with this approach, a revised (as-built) Exhibit A (strikethrough and clean versions) is provided as Attachment 2 to this transmittal for Commission approval.

---

[2] 159 FERC ¶ 62,187 (*Appalachian Power Company*, May 18, 2017)
[3] 3 FERC ¶ 61,001 (*Appalachian Power Company*, April 3, 1978)
[4] 66 FERC ¶ 62,188 (*Appalachian Power Company*, March 28, 1994)
[5] Louis Berger & Associates, Inc. 1990. Hydroelectric Power Development in Virginia, 1895-1940 (Byllesby/Buck Hydroelectric Project, No. 2514). Prepared for Appalachian Power Company.

Appalachian recognizes that these transmission-related facilities should be included in the Byllesby-Buck Project boundary (Exhibit G), and the control house should be shown in Exhibit F. Appalachian will be updating these exhibit drawings for the Project as part of the draft and final license applications to be filed with FERC in October 2021 and February 2022, respectively. Appalachian proposes to include these updates, as well as other revisions necessary to conform the drawings to current Commission requirements, at that time.

(2) (b) Whether the battery storage facility should be considered project facilities:

In 2018 Appalachian installed a 4.0-MW Lithium-ion battery system within the Byllesby switchyard. The system delivers to the PJM (Pennsylvania, Jersey, Maryland power pool) frequency regulation market one of the first new energy storage systems since the adoption of new frequency regulation signals and requirements for regulation service. The system will serve both of PJM's frequency regulation markets, including traditional regulation known as Reg A and dynamic regulation known as Reg D. The battery system and hydroelectric development are able to operate simultaneously, subject to the capacity limits described below in Item No. 3. The battery system is faster responding than the hydroelectric development, so it enables the Appalachian to bid the Byllesby facility into the PJM Reg D frequency regulation market, which requires fast and accurate response on a second-by-second basis. Without battery storage, Byllesby would not otherwise be able to participate in the Reg D market. This brings incremental revenue to the Project.

The point of junction for the battery to AEP's system is the 13.2 kV bus within the Byllesby control house. Because the battery storage facility is not required for the safe and efficient operation of the Project, does not impact Project operations or generation, and does not increase the authorized installed capacity of the Project as defined by 18 CFR § 11.1(i), Appalachian does not believe it should be considered part of the licensed project works. Appalachian notes that numerous auxiliary generating apparatuses, conversion equipment, and equipment used primarily in connection with the control and switching of electric energy produced by hydraulic power and the protection of electric circuits and equipment are installed at or in the vicinity of the Project, and other licensed hydroelectric projects. Such equipment is not typically listed in Exhibit A or the license project description, and maintenance of such facilities has historically been at licensees' discretion, so long as the project works are maintained in substantial conformity with the approved license exhibits. Adding these types of facilities and equipment, including a battery system such as that installed at Byllesby that can be isolated from rest of the system with controls and circuit breakers, to the license exhibits would in turn require Commission approval prior to the licensee performing significant maintenance of or modifications to such equipment and facilities. This is not practicable, and doing so could impair licensees', in particular utility licensees', abilities to efficiently and safely operate licensed projects for the benefit of their customers and transmission and distribution system.

Appalachian recognizes that because the battery storage facility connects to the 13.2 kV bus within the Byllesby control house, it, and associated breakers that can isolate it from the rest of the Byllesby-Buck system if needed, should be shown on the one-line diagram for the Byllesby

Development. Appalachian will be updating this drawing as part of the draft and final license applications to be filed with FERC in October 2021 and February 2022, respectively. Appalachian proposes to include this update, as well as any other revisions necessary due to other minor modifications to transmission facilities made since the last drawing revision, at that time.

(3) How project operation is affected by the presence of the battery storage facility and what factors limit its capacity:

The battery installation does not increase the capacity of the Project. In accordance with Appalachian's Interconnection Agreement with PJM, Appalachian must limit the combined output of the Byllesby and Buck developments to the existing 30.1-MW maximum facility output authorized by PJM. The operation of the Byllesby-Buck Project and Byllesby battery are controlled by the AEP Generation Market Control System (GMCS), which can be used to limit a facility or an operating group of units to a specific maximum output, called the "Capacity Limit." In GMCS, the generation at the Byllesby-Buck Project and Byllesby battery are modeled as an operating group (the "Buck and Byllesby Operating Group"). The GMCS Capacity Limit for the Buck and Byllesby Operating Group (30.0 MW) restricts all other limits such that GMCS would immediately and automatically send a drop signal to the Buck and Byllesby Operating Group if the Capacity Limit is exceeded.

A system of breakers and associated control equipment is in place to isolate the batteries from the rest of the Byllesby system, if needed. Battery malfunction, operation, or decommissioning would, therefore, have no effect on Project operation or generation.

Appalachian trusts that the information provided above and in Attachment 2 satisfactorily addresses this additional information request of Commission staff. If there are any questions regarding this transmittal, please do not hesitate to contact me at (540) 985-2441 or via email at ebparcell@aep.com.

Sincerely,

Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

Attachments

Attachment 1

FERC's September 19, 2019 Additional Information Request (Item No. 1)

SCHEDULE B

Additional Information Requests

1. In section 4.3 of the PAD, Appalachian Power Company (Appalachian) states that American Electric Power completed installation of a 4-megawatt (MW) energy storage system at the project in partnership with Greensmith Energy (a Wärtsilä Company) in 2018. The storage system is composed of a lithium-ion battery and a software system that operates simultaneously with the powerhouses and provides ancillary services to PJM. In the PAD, Appalachian states that the storage system is outside the scope of the FERC license. However, Appalachian did not explain in the PAD why the battery storage facility was not considered to be a project facility.

At the April 10, 2019 environmental site review and daytime scoping meeting on April 11, 2019, Appalachian explained that the storage facility's batteries did not increase the capacity of the project, but are not sustainable without the hydropower project; electricity generated at the Byllesby-Buck Project provides, in part, the power to maintain charge in the batteries for use at a later time (e.g., to provide a more steady base load to the grid when river flows are low and below the maximum hydraulic capacity of the project during the summer). Therefore, it appears to staff that the battery storage facility may serve a project purpose and may need to be considered a project facility enclosed within the project boundary. In addition, although Appalachian stated that the battery storage facility does not increase the capacity of the project, Appalachian did not explain why this is the case.

Based on the single line diagram included in PJM's combined feasibility and impact study (feasibility study) for the interconnection request[10] the interconnection point with the grid is shown at the location where project power (either from the Byllesby Development, Buck Development, or battery storage facility) is stepped up from 13.2-kilovolts (kV) to 69-kV. The feasibility study describes this location as the 13.2-kV bus. It is not clear to staff whether the switchyard, buildings, and related components at the Byllesby Development that provide project power to AEP's distribution system would exist were it not for the Byllesby and Buck Project.

Therefore, please clarify how and where project power currently connects to AEP's distribution system and specify the project component(s) (i.e., bus, switch, transformer, etc.,) where the connection is made; whether the battery storage facility, switchyard, and its related components should be considered project facilities; and how project operation is affected by the presence of the battery storage facility and what factors limit its capacity.

---

[10] Generation Interconnection Combined Feasibility/System Impact Study Report for PJM Generation Interconnection Request Queue Position AD2-205 Buck-Byllesby 69-kV, October 2018. ftp://www.pjm.com/planning/project-queues/impact_studies/ad2205_imp.pdf

Attachment 2

Exhibit A Revisions (Strikethrough and Final Versions)

Redline Version

BYLLESBY/BUCK HYDROELECTRIC PROJECT
(FERC NO. 2514)

EXHIBIT A
PROJECT DESCRIPTION

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

BYLLESBY/BUCK HYDROELECTRIC PROJECT
(FERC NO. 2514)

EXHIBIT A - SUMMARY

1. Project Description – Byllesby Development

   A. Composition, Dimensions and Configuration of Major Structures

   1. Main Spillway

a. Size:	Approximately 528’ long and 44’ high from toe to crest. Eight wooden and one inflatable Obermeyer flashboard sections approximately 31’ -4” wide and containing boards with a total height of about 9’, supported by piers. Six tainter gate bays approximately 31’ -4” wide containing tainter gates of radius 11’ - 3”, supported by piers.
b. Material:	Spillway – concrete Flashboards – wood Inflatable Gate – rubber and steel Tainter Gates – steel Piers – reinforced concrete

   2. Powerhouse

a. Size:	Approximately 166’ -6” by 50’ -9”. Four inlet bays each a 14’ -6” by 23’ headgate. Intake screen about 143’ wide with 2-9/32” cleared spacing of bars.
b. Material:	Powerhouse – Steel-framed brick housing area, concrete volute turbine casings, concrete draft tubes. Gates – steel Intake Screen – 3/8” by 3-1/2” steel bars

   3. Emergency Spillway

a. Size:	Approximately 198’ long and 6’ -6” from toe to crest. Six flashboard sections of total height approximately 9’ supported by piers.
b. Material:	Spillway – concrete Flashboards – wood Piers – Reinforced concrete

B. Reservoir

1. Surface area: 239 acres
2. Surface elevation: 2079.2 ft. N.G.V.D.
3. Gross storage capacity: 2,000 acre-feet
4. Usable storage capacity: 1,153 acre-feet

C. Turbines and Generators

1. Turbines

a. Number: 4
b. Type: Vertical Francis, K.P. Morris co.
c. Rated capacity: 6,000 horsepower (each unit)

2. Generators

a. Number: 4
b. Type: Vertical configuration, General Electric Co. Type ATB 62-6000 M-116, Form V.
c. Rating: 5,400 kW, 6,000 kVa, 0.9 PF, 13,200 volts, 3-phase, 60 cycles, 116 rpm (each unit).

D. Estimated Average Head on Plant: 56 feet

E. Control House
a. Size: Approximately 92’ -0” by 47’ -10”.
b. Material: Steel-framed, brick-walled

2. Project Description – Buck Development

A. Composition, Dimensions and Configuration of Major Structures

1. Main Dam and Powerhouse

a. Size: Main dam approximately 352’ long and 44’ high at the upstream side. Powerhouse approximately 130’ by 50’ located at the dam. Three inlet bays in the powerhouse, each containing a 14’ -6” by 23’ headgate. Intake screen about 104’ wide and 2-9/32” cleared spacing of bars.

b. Material: Dam – concrete
Powerhouse – steel-framed brick housing area, concrete volute turbine casings, concrete draft tubes.
Gates – Steel
Intake Screen – 3/8” by 3-1/2” steel bars

2. Spillway

   a. Size: Approximately 1,005' long by 19' high from base to crest at upstream size (typical section). Six tainter gate bays approximately 31' -4" wide containing tainter gates of radius 11' -3", supported on piers. Twenty-two flashboard sections approximately 31' -4" wide and containing boards with a total height of approximately 9', supported by piers. Two additional flashboard sections at northwest end of spillway (approximate widths of 31' -10" and 32' -10") containing boards with a total height of approximately 9', supported by piers.

   b. Material: Spillway – concrete
   Tainter Gates – steel
   Flashboards – wood
   Piers – reinforced concrete

B. Reservoir

1. Surface area: 66 acres.
2. Surface elevation: 2,003.4 ft. N.G.V.D.
3. Gross storage capacity: 661 acre-feet
4. Usable storage capacity: 579 acre-feet

C. Turbines and Generators

1. Turbines

a. Number: 3
b. Type: Vertical Francis, I.P. Morris Co.
c. Rated capacity: 3,500 horsepower (each unit)

2. Generators

a. Number: 3
b. Type: Vertical configuration, General Electric Co., Type ATB-74
c. Rating: 2,835 kW, 3,150 kVa, 0.9 PF, 13,200 volts, 3-phase, 60 cycles, 97 rpm (each unit)

D. Estimated Average Head on the Plant: 41 feet

1.0 PROJECT DESCRIPTION

The Byllesby/Buck Hydroelectric Project is a two impoundment project consisting of the Byllesby and Buck dams, and their respective pools and powerhouses.

The Byllesby development is located about nine miles north of the city of Galax, in Carroll County, Virginia, on the New River. The primary facilities, including the powerhouse and spillway, are located within the Austinville, Virginia Quadrangle at approximately N. 36 deg., 47 min., 9 sec. and W. 80 deg., 56 min., 1 sec.

The Buck development is also located in Carroll County, Virginia about 3 miles downstream from the Byllesby dam. The primary facilities are located within the Austinville, Virginia Quadrangle at approximately N. 36 deg., 48 min., 20 sec. and W. 80 deg., 56 min., 4 sec. A general location map for the Byllesby/Buck project is shown in Figure A-1.

1.1 PHYSICAL COMPOSITION, DIMENSIONS AND GENERAL CONFIGURATION OF MAJOR PROJECT STRUCTURES

1.1.1 BYLLESBY DEVELOPMENT

Existing

The Byllesby facilities consist of a main dam/spillway topped with tainter gates and flashboard sections, a powerhouse, a control house and switchyard, and an emergency spillway surmounted by flashboards. Extending across the New River perpendicular to the flow is the main spillway for the project. The spillway is a solid, concrete, gravity-type structure approximately 528' long by 44' high from toe to crest. The crest of the spillway is at elevation 2,071 ft. NGVD. Topping the main spillway, beginning at the eastern end, are nine flashboard sections. Section 1-3 and 9 are timber and Sections 4-8 are inflatable Obermeyer Gate. Each section is supported by reinforced concrete piers and is approximately 31' -4" wide. The flashboards have a total height of approximately 9'. Each Obermeyer Gate is approximately 31' -4" wide and approximately 9' high.

Adjacent to the flashboard sections are six tainter gate bays. Each bay is approximately 31' -4" wide and contains a steel gate of radius 11' -3" supported by reinforced concrete piers. The gates rotate on a pin and are opened and closed by means of a hoist powered by an electric motor. A

Deleted: 7

Deleted: 8

Deleted: is an

Moved (insertion) [1]

Deleted: The Licensee intends to replace four wooden flashboard sections (Sections 4 through 7) with four inflatable Obermeyer Gates. Two sections (Nos. 6 & 7) will be replaced in 2016 and two (Nos. 4 & 5) will be replaced in 2018. The gates will be propane-powered auxiliary generator is available in case of the electric outage. A steel grated foot bridge supported by steel beams on the concrete piers runs the length of the main spillway.

West of the main spillway is the Byllesby powerhouse. The powerhouse is of a steel frame and brick construction on a concrete substructure. The upper level is approximately 166’ -6” by 50’ -9” with a built-up roof topped by a modified bitumen membrane. Four AC generators, and their respective governors and exciters, pumps, a gantry crane and miscellaneous accessory equipment necessary for operation are housed in the upper level of the powerhouse. When the project was originally constructed in 1912, two mud sluice gates were installed between the Byllesby powerhouse and the main spillway. These mud gates have since been taken out of service. A steel plate vertical drop gate approximately 6’ -10 1/4” wide by 5’ -0” high has since been installed in the slots of the western-most mud sluice. This gate is lowered and raised by an electric motor powered hoist.

The intake section, located immediately upstream of the powerhouse, consists of four inlet bays. Each bay has a 14’ -6” high by 23’ wide headgate, which is used during maintenance periods. A 3’ wide reinforced concrete pier is set vertically in the middle of each inlet bay to support the headgate. Each headgate is closed and opened by a gear and screw lift shaft assembly powered by an electric motor. Each bay admits water to a concrete volute casing, which channels flow to a vertical-shaft Francis hydraulic turbine direct-connected to a generator on the upper level. Flow through the four turbines passes to concrete draft tubes and into the New River.

The intake section at Byllesby is faced with an intake screen approximately 143 feet wide and consisting of 3/8” by 3-1/2” steel bars. The bars are 47’ – 6-3/8” long and are inclined toward the powerhouse at approximately 15 degrees to the vertical. The bars are spaced 2-21/32” center-to-center and have a cleared space of 2-9/32”. A logboom consisting of interconnected floating platforms diverts large objects carried by the current away from the powerhouse intakes. The logboom, which is approximately 140 feet long, is anchored on land at one end and adjacent to the vertical drop gate on the other end.

Upstream and to the west of the powerhouse is the emergency spillway. It is connected to the powerhouse by an angled bulkhead. The emergency spillway is a concrete structure approximately 198’ long and 6’ -6” high from toe to crest. It is topped by 6 spans of flashboards approximately 9' high. Reinforced concrete piers support the flashboard sections and an access bridge. The existing access bridge is of metal grating grouted with concrete atop steel beams.

Transmission equipment necessary for operation of the Byllesby Development (Table A-1) and connection of the Project to AEP's system is located within the control house and the adjacent switchyard. The control house is located southwest of the Byllesby auxiliary spillway and several hundred feet back from the river. It is a rectangular, steel-framed, brick-walled building, the exterior of which is arranged in the same manner as the powerhouse. On the interior, the eastern two-thirds, with two levels, contains offices, maintenance area, and control rooms.

1.1.2 BUCK DEVELOPMENT

Deleted: Proposed¶

Moved up [1]: The Licensee intends to replace four wooden flashboard sections (Sections 4 through 7) with four inflatable Obermeyer Gates. Two sections (Nos. 6 & 7) will be replaced in 2016 and two (Nos. 4 & 5) will be replaced in 2018. The gates will be approximately 31' -4" wide and approximately 9' high.¶

The Buck facilities consist of a spillway topped with tainter gates and flashboard sections, and a powerhouse, located at the main dam. The main dam is the furthermost downstream facility within the site and contains a sluice gate and the powerhouse. It is a solid, concrete, gravity-type structure approximately 44 feet high and 352 feet long and extends across the channel north of Mountain Island. The powerhouse located at the main dam has two levels. The upper level is of steel frame and brick construction. It is approximately 130 feet long and 50 feet wide with a built-up roof topped by a modified bitumen membrane. Three AC generators, and their respective governors and exciters, switchboards, switching equipment, pumps, a gantry crane and miscellaneous accessory equipment necessary for project operation are housed in the upper level of the powerhouse.

At the time the project was constructed in 1912, two mud sluices and a vertical lift gate were installed in the main dam, immediately adjacent to the north end of the powerhouse. The mud sluices are inoperable. The vertical lift gate is still operable and is of timber construction with a steel beam frame. The gate opening is approximately 6' wide by 14' high.

The intake section, which is immediately upstream of the powerhouse, is of concrete construction and consists of three inlet bays. Each bay has a 14' -6" high by 23' wide headgate which is used during maintenance periods. A 3' wide reinforced concrete pier is set vertically in the middle of each inlet bay to support the headgate. Each gate is operated by a gear and threaded lift shaft assembly powered by an electric motor. The bays admit water to a concrete volute casing, which channels flow to a vertical-shaft Francis hydraulic turbine, direct-connected to a generator on the upper level. Flow through the three turbines passes to concrete draft tubes and into the New River.

The intake section at Buck is faced with an intake screen approximately 104 feet wide and consisting of 3/8” by 3-1/2” steel bars. The screen is 39’ – 2-1/16” high and is inclined toward the powerhouse at approximately 15 degrees to the vertical. The bars are spaced 2-21/32” center-to-center and have a cleared space of 2-9/32”.

A logboom consisting of interconnected floating platforms diverts large objects carried by the current away from the powerhouse intakes. The logboom is anchored at one end to the north shore of Mountain Island, approximately 580 feet upstream of the main dam. The logboom spans approximately 620 feet and anchors at the other end, adjacent to the vertical lift gate.

Approximately 1,400 feet upstream of the Buck powerhouse is the spillway. This spillway, like the Byllesby spillway, is a solid, concrete, gravity-type structure approximately 1,005’ long by 19’ high from base to crest. The crest of the spillway is at elevation 1995 ft. NGVD. During 1988, work was performed on the spillway to replace the access bridge, support piers and flashboard sections. This bridge, constructed of precast, prestressed concrete beams, is supported atop the flashboard and tainter gate piers.

Topping the spillway, beginning at the northwestern end are two timber flashboard sections, supported on reinforced concrete piers, and of widths 31’ -10” and 32’ -10”, respectively. Adjacent to the flashboard sections are six tainter gate bays. Each bay is approximately 31” -4” wide and contains a steel gate of radius 11” -3” supported by reinforced concrete piers. The gates rotate on a pin and are opened and closed by means of a hoist powered by an electric motor. A propane-fueled auxiliary generator is available in case of an electric outrage.

Timber flashboard and Obermeyer gate sections are located adjacent to the tainter gate piers. Sections 1-2 and 7-22 are timber flashboard sections. Each section is supported by reinforced concrete piers and is approximately 31’ -4” wide. The flashboards have a total height of approximately 9 feet. Sections 3-6 have been converted to inflatable Obermeyer Gates. Each Obermeyer Gate is approximately 31’ -4” wide and approximately 9’ high.

Deleted: A

Deleted: are

Moved (insertion) [2]

Deleted: The Licensee intends to replace four wooden flashboard sections (

Deleted: through

Deleted:)

Deleted: with four

Deleted: . Two sections (Nos. 3 & 4) will be replaced in 2017 and two (Nos. 5 & 6) will be replaced in 2019.

Deleted: The gates will be

2.0 PROJECT IMPOUNDMENTS

Deleted: Proposed¶

Moved up [2]: The Licensee intends to replace four wooden flashboard sections (Sections 3 through 6) with four inflatable Obermeyer Gates. Two sections (Nos. 3 & 4) will be replaced in 2017 and two (Nos. 5 & 6) will be replaced in 2019. The gates will be approximately 31' -4" wide and approximately 9' high.¶

During 1989 and 1990, surface and underwater mapping of the impoundments formed by the Byllesby/Buck Hydroelectric Project was developed. The following is based on data obtained from the mapping.

2.1 BYLLESBY DEVELOPMENT

The normal maximum surface area of the pool formed by the Byllesby impoundment structures in 239 acres at a normal maximum surface elevation of 2079.2 ft. NGVD. The corresponding gross storage capacity of the Byllesby pool is 2,000 acre-feet, and the usable storage capacity in the upper 5.2 feet of the pool is 1,153 acre-feet.

2.2 BUCK DEVELOPMENT

The normal maximum surface area of the pool formed by the Buck impoundment structures is 66 acres at ta normal maximum surface elevation of 2003.4 ft. NGVD. The corresponding gross storage capacity of the Buck pool is 661 acre-feet, and the usable storage capacity in the upper 8.4 feet of the pool is 579 acre-feet.

3.0 TURBINES AND GENERATORS

3.1 BYLLESBY DEVELOPMENT

Within the substructure of the Byllesby powerhouse are housed four vertical-shaft Francis hydraulic turbines, each direct-connected to a generator on the upper level. The turbine units were manufactures by I.P. Morris Company in 1912 and contain 16 buckets per runner. The edge-to-edge diameter of the runners is 8' -9" measured at the bottom of the runner, inside the band. There are 20 cast iron wicket gates at each hydraulic turbine with heights of 2' -11-15/16" each. The wicket gates are placed in a circular pattern at a radial dimension of 4' -11" from the centerline of the turbine shaft to the pivot point of each gate. By adjusting the openings between the wicket gates, flow to the turbine is controlled.

Outside of the wicket gates are ten stay vanes arranged in a circular pattern at a radial distance of 7' from the centerline of the turbine shaft to the leading edge of the stay vane. The stay vanes are stationary, and are used to control the direction of flow and to support the structure overhead.

Each Byllesby turbine is rated at 6,000 horsepower at a 49 ft. design head and has a rated speed of 116 rpm. Based on design curves, one unit can pass 1,467 cfs at 5,265 kW turbine-generator output and a 56 ft. net head.

The four AC generators, located in the upper level of the Byllesby powerhouse, are identical and were manufactured by the General Electric Company. These generators have been in service since 1912. They are rated at 5,400 kW at 90 percent power factor, 3 phase, 60 cycles and 13,200 volts. Each 62 pole generator has a rotor speed of 116 rpm at 60 Hz.

Each generator stator has an inside diameter of 13’ -4” and contains 93 coils. Each coil slot is 42 -1/8” high by 1.45” wide by 2.93” deep.

3.2 BUCK DEVELOPMENT

Within the substructure of the Buck powerhouse are housed three vertical-shaft Francis hydraulic turbines, each direct-connected to a generator on the upper level. The three turbine unites at Buck were manufactured by I.P. Morris Company in 1912. The dimensions and configuration of each turbine’s runner, wicket gates and stay vanes are identical to those of the Byllesby turbine units. Each of the three turbines at buck is rated at 3,500 horsepower at a 34 ft. design head and has a rated speed of 97 rpm. Based on design curves, one unit can pass 1,180 cfs at 3,158 kW turbine-generator output and a 40 ft. net head.

The three AC generators, located in the upper level of the Buck Powerhouse, are identical and were manufactured by the General Electric Company. These generators have been in service since 1912. They are rated at 2,835 kW at 90 percent power factor, 3 phase, 60 cycles and 13,200 volts. Each 74 pole generator has a rotor speed of 97 rpm at 60 Hz.

Each generator stator has an inside diameter of 15’ -10” and contains 222 coils. Each coil slot is 23 -7/8” high by 1.312’ wide by 3.75” deep.

4.0 PRIMARY TRANSMISSION LINES

Primary transmission lines at the Project are limited to two approximately 2-mile long overhead 13.2-kV transmission lines (Byllesby Buck #1 and Byllesby Buck #2), which extend from the 13.2 kV bus within the Buck powerhouse to the 13.2 kV bus within the Byllesby control house.

Deleted: ¶
There are no primary transmission lines, either existing or proposed, to be included as part of the licensed Byllesby/Buck Hydroelectric Project

5.0 APPURTENANT MECHANICAL AND ELECTRICAL EQUIPMENT

Specifications of additional mechanical and electrical equipment appurtenant to the Byllesby/Buck Hydroelectric Project are contained in Table A-1 andTable A-2.

Deleted: A-2

6.0 LANDS OF THE UNITED STATES

There are no lands of the United States enclosed within the Byllesby/Buck Hydroelectric Project's boundaries.

TABLE A-1 APPURTENANT MECHANICAL AND ELECTRICAL EQUIPMENT – BYLLESBY DEVELOPMENT

EQUIPMENT		MANUFACTURER	DESCRIPTION
1)	Exciters	Allis-Chalmers Mfg. Co.	4-Type G Statex, Solid State, 75, kW, 250 V DC, 300 AMP.
2)	Automatic Circuit Breaker	General Electric Company	Type C, Form K. 2,000 amps, 250 volt
3)	Powerhouse Gantry Crane	Alliance	57/5 Tom capacity
4)	Actuators	Woodward Governor Co.	Type A
5)	Trash Rakes	Allis-Chalmers Mfg. Co.	
6)	Motor Hoist & Controls	Harnischfeger Corporation	Gear and screw lift shaft assembly

7) and other mechanical and electrical equipment required for efficient operation of the project, including the following transmission equipment:

a) The 13.2 kV generator leads to the 13.2 kV bus;

b) The 13.2 kV bus (located within the Byllesby control house);

c) The 13.2 kV line from the bus to the 13.2/69 kV transformer;

d) The 13.2/69 kV transformer (located within the switchyard adjacent to the Byllesby control house);

e) The 69 kV connection from the transformer to the 69 kV transformer bus (located within the switchyard adjacent to the Byllesby control house).

TABLE A-2 APPURTENANT MECHANICAL AND ELECTRICAL EQUIPMENT - BUCK DEVELOPMENT

EQUIPMENT	MANUFACTURER	DESCRIPTION
1) Motor Generator Exciter	Westinghouse Electric	1 – Type SK. DC Gen. 150 kW, 250 volts, 600 amps, 1,180 rpm speed, shunt wound, style 6G6959
2) Powerhouse Gantry Crane	Alliance	44/5 Ton Capacity
3) Actuators	Woodward Governor Co.	Type A
4) Trash Rake	Allis Chalmers Mfg. Co.	
5) Motor Hoist & Controls	Harnischfeger Corp.	Gear and threaded lift shaft assembly

6) and other mechanical and electrical equipment required for efficient operation of the project, including the following transmission equipment:

a) The 13.2 kV generator leads to the 13.2 kV bus;

b) The common 13.2 kV bus (located within the Buck powerhouse);

c) The 13.2 kV line from the bus to the 13.2 kV Byllesby-Buck #1 and #2 transmission lines.

Deleted: Byllesby/Ivanhoe lines.

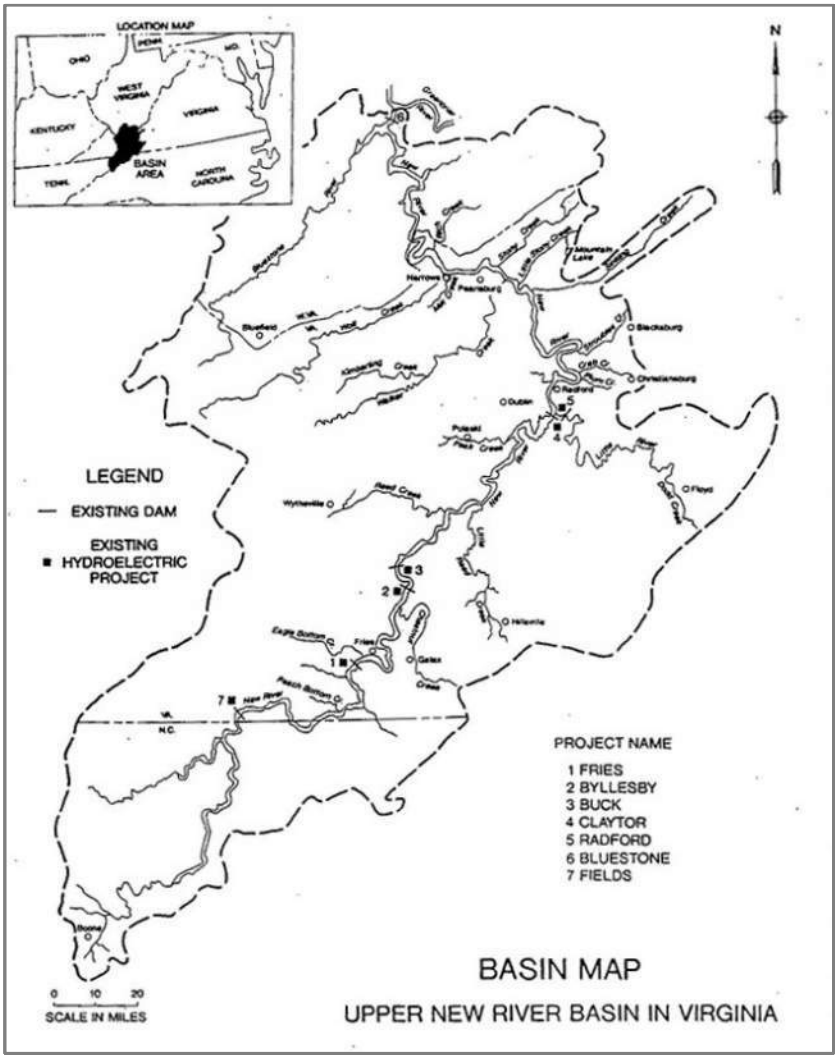


FIGURE A-1 PROJECT LOCATION – BASIN MAP, UPPER NEW RIVER BASIN IN VIRGINIA

Final Version

BYLLESBY/BUCK HYDROELECTRIC PROJECT
(FERC NO. 2514)

EXHIBIT A
PROJECT DESCRIPTION

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

BYLLESBY/BUCK HYDROELECTRIC PROJECT
(FERC NO. 2514)

EXHIBIT A - SUMMARY

1. Project Description – Byllesby Development

A. Composition, Dimensions and Configuration of Major Structures

1. Main Spillway

a. Size:	Approximately 528' long and 44' high from toe to crest. Eight wooden and one inflatable Obermeyer flashboard sections approximately 31' -4" wide and containing boards with a total height of about 9', supported by piers. Six tainter gate bays approximately 31' -4" wide containing tainter gates of radius 11' -3", supported by piers.
b. Material:	Spillway – concrete Flashboards – wood Inflatable Gate – rubber and steel Tainter Gates – steel Piers – reinforced concrete

2. Powerhouse

a. Size:	Approximately 166' -6" by 50' -9". Four inlet bays each a 14' -6" by 23' headgate. Intake screen about 143' wide with 2-9/32" cleared spacing of bars.
b. Material:	Powerhouse – Steel-framed brick housing area, concrete volute turbine casings, concrete draft tubes. Gates – steel Intake Screen – 3/8" by 3-1/2" steel bars

3. Emergency Spillway

a. Size:	Approximately 198' long and 6' -6" from toe to crest. Six flashboard sections of total height approximately 9' supported by piers.
b. Material:	Spillway – concrete Flashboards – wood Piers – Reinforced concrete

B. Reservoir

1. Surface area: 239 acres
2. Surface elevation: 2079.2 ft. N.G.V.D.
3. Gross storage capacity: 2,000 acre-feet
4. Usable storage capacity: 1,153 acre-feet

C. Turbines and Generators

1. Turbines

a. Number: 4
b. Type: Vertical Francis, K.P. Morris co.
c. Rated capacity: 6,000 horsepower (each unit)

2. Generators

a. Number: 4
b. Type: Vertical configuration, General Electric Co. Type ATB 62-6000 M-116, Form V.
c. Rating: 5,400 kW, 6,000 kVa, 0.9 PF, 13,200 volts, 3-phase, 60 cycles, 116 rpm (each unit).

D. Estimated Average Head on Plant: 56 feet

E. Control House
a. Size: Approximately 92' -0" by 47' -10".
b. Material: Steel-framed, brick-walled

2. Project Description – Buck Development

A. Composition, Dimensions and Configuration of Major Structures

1. Main Dam and Powerhouse

a. Size: Main dam approximately 352' long and 44' high at the upstream side. Powerhouse approximately 130' by 50' located at the dam. Three inlet bays in the powerhouse, each containing a 14' -6" by 23' headgate. Intake screen about 104' wide and 2-9/32" cleared spacing of bars.

b. Material: Dam – concrete
Powerhouse – steel-framed brick housing area, concrete volute turbine casings, concrete draft tubes.
Gates – Steel
Intake Screen – 3/8" by 3-1/2" steel bars

2. Spillway

   a. Size: Approximately 1,005' long by 19' high from base to crest at upstream size (typical section). Six tainter gate bays approximately 31' -4" wide containing tainter gates of radius 11' -3", supported on piers. Twenty-two flashboard sections approximately 31' -4" wide and containing boards with a total height of approximately 9', supported by piers. Two additional flashboard sections at northwest end of spillway (approximate widths of 31' -10" and 32' -10") containing boards with a total height of approximately 9', supported by piers.

   b. Material: Spillway – concrete
   Tainter Gates – steel
   Flashboards – wood
   Piers – reinforced concrete

B. Reservoir

1. Surface area: 66 acres.
2. Surface elevation: 2,003.4 ft. N.G.V.D.
3. Gross storage capacity: 661 acre-feet
4. Usable storage capacity: 579 acre-feet

C. Turbines and Generators

1. Turbines

   a. Number: 3
   b. Type: Vertical Francis, I.P. Morris Co.
   c. Rated capacity: 3,500 horsepower (each unit)

2. Generators

   a. Number: 3
   b. Type: Vertical configuration, General Electric Co., Type ATB-74
   c. Rating: 2,835 kW, 3,150 kVa, 0.9 PF, 13,200 volts, 3-phase, 60 cycles, 97 rpm (each unit)

D. Estimated Average Head on the Plant: 41 feet

1.0 PROJECT DESCRIPTION

The Byllesby/Buck Hydroelectric Project is a two impoundment project consisting of the Byllesby and Buck dams, and their respective pools and powerhouses.

The Byllesby development is located about nine miles north of the city of Galax, in Carroll County, Virginia, on the New River. The primary facilities, including the powerhouse and spillway, are located within the Austinville, Virginia Quadrangle at approximately N. 36 deg., 47 min., 9 sec. and W. 80 deg., 56 min., 1 sec.

The Buck development is also located in Carroll County, Virginia about 3 miles downstream from the Byllesby dam. The primary facilities are located within the Austinville, Virginia Quadrangle at approximately N. 36 deg., 48 min., 20 sec. and W. 80 deg., 56 min., 4 sec. A general location map for the Byllesby/Buck project is shown in Figure A-1.

1.1 PHYSICAL COMPOSITION, DIMENSIONS AND GENERAL CONFIGURATION OF MAJOR PROJECT STRUCTURES

1.1.1 BYLLESBY DEVELOPMENT

Existing

The Byllesby facilities consist of a main dam/spillway topped with tainter gates and flashboard sections, a powerhouse, a control house and switchyard, and an emergency spillway surmounted by flashboards. Extending across the New River perpendicular to the flow is the main spillway for the project. The spillway is a solid, concrete, gravity-type structure approximately 528’ long by 44’ high from toe to crest. The crest of the spillway is at elevation 2,071 ft. NGVD. Topping the main spillway, beginning at the eastern end, are nine flashboard sections. Section 1-3 and 9 are timber and Sections 4-8 are inflatable Obermeyer Gate. Each section is supported by reinforced concrete piers and is approximately 31’ -4” wide. The flashboards have a total height of approximately 9’. Each Obermeyer Gate is approximately 31’ -4” wide and approximately 9’ high.

Adjacent to the flashboard sections are six tainter gate bays. Each bay is approximately 31’ -4” wide and contains a steel gate of radius 11’ -3” supported by reinforced concrete piers. The gates rotate on a pin and are opened and closed by means of a hoist powered by an electric motor. A propane-powered auxiliary generator is available in case of the electric outage. A steel grated foot bridge supported by steel beams on the concrete piers runs the length of the main spillway.

West of the main spillway is the Byllesby powerhouse. The powerhouse is of a steel frame and brick construction on a concrete substructure. The upper level is approximately 166’ -6” by 50’ -9” with a built-up roof topped by a modified bitumen membrane. Four AC generators, and their respective governors and exciters, pumps, a gantry crane and miscellaneous accessory equipment necessary for operation are housed in the upper level of the powerhouse. When the project was originally constructed in 1912, two mud sluice gates were installed between the Byllesby powerhouse and the main spillway. These mud gates have since been taken out of service. A steel plate vertical drop gate approximately 6’ -10 1/4” wide by 5’ -0” high has since been installed in the slots of the western-most mud sluice. This gate is lowered and raised by an electric motor powered hoist.

The intake section, located immediately upstream of the powerhouse, consists of four inlet bays. Each bay has a 14’ -6” high by 23’ wide headgate, which is used during maintenance periods. A 3’ wide reinforced concrete pier is set vertically in the middle of each inlet bay to support the headgate. Each headgate is closed and opened by a gear and screw lift shaft assembly powered by an electric motor. Each bay admits water to a concrete volute casing, which channels flow to a vertical-shaft Francis hydraulic turbine direct-connected to a generator on the upper level. Flow through the four turbines passes to concrete draft tubes and into the New River.

The intake section at Byllesby is faced with an intake screen approximately 143 feet wide and consisting of 3/8” by 3-1/2” steel bars. The bars are 47’ – 6-3/8” long and are inclined toward the powerhouse at approximately 15 degrees to the vertical. The bars are spaced 2-21/32” center-to-center and have a cleared space of 2-9/32”. A logboom consisting of interconnected floating platforms diverts large objects carried by the current away from the powerhouse intakes. The logboom, which is approximately 140 feet long, is anchored on land at one end and adjacent to the vertical drop gate on the other end.

Upstream and to the west of the powerhouse is the emergency spillway. It is connected to the powerhouse by an angled bulkhead. The emergency spillway is a concrete structure approximately 198’ long and 6’ -6” high from toe to crest. It is topped by 6 spans of flashboards approximately 9' high. Reinforced concrete piers support the flashboard sections and an access bridge. The existing access bridge is of metal grating grouted with concrete atop steel beams.

Transmission equipment necessary for operation of the Byllesby Development (Table A-1) and connection of the Project to AEP's system is located within the control house and the adjacent switchyard. The control house is located southwest of the Byllesby auxiliary spillway and several hundred feet back from the river. It is a rectangular, steel-framed, brick-walled building, the exterior of which is arranged in the same manner as the powerhouse. On the interior, the eastern two-thirds, with two levels, contains offices, maintenance area, and control rooms.

1.1.2 Buck Development

The Buck facilities consist of a spillway topped with tainter gates and flashboard sections, and a powerhouse, located at the main dam. The main dam is the furthermost downstream facility within the site and contains a sluice gate and the powerhouse. It is a solid, concrete, gravity-type structure approximately 44 feet high and 352 feet long and extends across the channel north of Mountain Island. The powerhouse located at the main dam has two levels. The upper level is of steel frame and brick construction. It is approximately 130 feet long and 50 feet wide with a built-up roof topped by a modified bitumen membrane. Three AC generators, and their respective governors and exciters, switchboards, switching equipment, pumps, a gantry crane and miscellaneous accessory equipment necessary for project operation are housed in the upper level of the powerhouse.

At the time the project was constructed in 1912, two mud sluices and a vertical lift gate were installed in the main dam, immediately adjacent to the north end of the powerhouse. The mud sluices are inoperable. The vertical lift gate is still operable and is of timber construction with a steel beam frame. The gate opening is approximately 6' wide by 14' high.

The intake section, which is immediately upstream of the powerhouse, is of concrete construction and consists of three inlet bays. Each bay has a 14' -6" high by 23' wide headgate which is used during maintenance periods. A 3' wide reinforced concrete pier is set vertically in the middle of each inlet bay to support the headgate. Each gate is operated by a gear and threaded lift shaft assembly powered by an electric motor. The bays admit water to a concrete volute casing, which channels flow to a vertical-shaft Francis hydraulic turbine, direct-connected to a generator on the upper level. Flow through the three turbines passes to concrete draft tubes and into the New River.

The intake section at Buck is faced with an intake screen approximately 104 feet wide and consisting of 3/8” by 3-1/2” steel bars. The screen is 39’ – 2-1/16” high and is inclined toward the powerhouse at approximately 15 degrees to the vertical. The bars are spaced 2-21/32” center-to-center and have a cleared space of 2-9/32”.

A logboom consisting of interconnected floating platforms diverts large objects carried by the current away from the powerhouse intakes. The logboom is anchored at one end to the north shore of Mountain Island, approximately 580 feet upstream of the main dam. The logboom spans approximately 620 feet and anchors at the other end, adjacent to the vertical lift gate.

Approximately 1,400 feet upstream of the Buck powerhouse is the spillway. This spillway, like the Byllesby spillway, is a solid, concrete, gravity-type structure approximately 1,005’ long by 19’ high from base to crest. The crest of the spillway is at elevation 1995 ft. NGVD. During 1988, work was performed on the spillway to replace the access bridge, support piers and flashboard sections. This bridge, constructed of precast, prestressed concrete beams, is supported atop the flashboard and tainter gate piers.

Topping the spillway, beginning at the northwestern end are two timber flashboard sections, supported on reinforced concrete piers, and of widths 31’ -10” and 32’ -10”, respectively. Adjacent to the flashboard sections are six tainter gate bays. Each bay is approximately 31” -4” wide and contains a steel gate of radius 11” -3” supported by reinforced concrete piers. The gates rotate on a pin and are opened and closed by means of a hoist powered by an electric motor. A propane-fueled auxiliary generator is available in case of an electric outrage.

Timber flashboard and Obermeyer gate sections are located adjacent to the tainter gate piers. Sections 1-2 and 7-22 are timber flashboard sections. Each section is supported by reinforced concrete piers and is approximately 31’ -4” wide. The flashboards have a total height of approximately 9 feet. Sections 3-6 have been converted to inflatable Obermeyer Gates. Each Obermeyer Gate is approximately 31’ -4” wide and approximately 9’ high.

2.0 PROJECT IMPOUNDMENTS

During 1989 and 1990, surface and underwater mapping of the impoundments formed by the Byllesby/Buck Hydroelectric Project was developed. The following is based on data obtained from the mapping.

2.1 BYLLESBY DEVELOPMENT

The normal maximum surface area of the pool formed by the Byllesby impoundment structures in 239 acres at a normal maximum surface elevation of 2079.2 ft. NGVD. The corresponding gross storage capacity of the Byllesby pool is 2,000 acre-feet, and the usable storage capacity in the upper 5.2 feet of the pool is 1,153 acre-feet.

2.2 BUCK DEVELOPMENT

The normal maximum surface area of the pool formed by the Buck impoundment structures is 66 acres at ta normal maximum surface elevation of 2003.4 ft. NGVD. The corresponding gross storage capacity of the Buck pool is 661 acre-feet, and the usable storage capacity in the upper 8.4 feet of the pool is 579 acre-feet.

3.0 TURBINES AND GENERATORS

3.1 BYLLESBY DEVELOPMENT

Within the substructure of the Byllesby powerhouse are housed four vertical-shaft Francis hydraulic turbines, each direct-connected to a generator on the upper level. The turbine units were manufactures by I.P. Morris Company in 1912 and contain 16 buckets per runner. The edge-to-edge diameter of the runners is 8’ -9” measured at the bottom of the runner, inside the band. There are 20 cast iron wicket gates at each hydraulic turbine with heights of 2’ -11-15/16” each. The wicket gates are placed in a circular pattern at a radial dimension of 4’ -11” from the centerline of the turbine shaft to the pivot point of each gate. By adjusting the openings between the wicket gates, flow to the turbine is controlled.

Outside of the wicket gates are ten stay vanes arranged in a circular pattern at a radial distance of 7’ from the centerline of the turbine shaft to the leading edge of the stay vane. The stay vanes are stationary, and are used to control the direction of flow and to support the structure overhead.

Each Byllesby turbine is rated at 6,000 horsepower at a 49 ft. design head and has a rated speed of 116 rpm. Based on design curves, one unit can pass 1,467 cfs at 5,265 kW turbine-generator output and a 56 ft. net head.

The four AC generators, located in the upper level of the Byllesby powerhouse, are identical and were manufactured by the General Electric Company. These generators have been in service since 1912. They are rated at 5,400 kW at 90 percent power factor, 3 phase, 60 cycles and 13,200 volts. Each 62 pole generator has a rotor speed of 116 rpm at 60 Hz.

Each generator stator has an inside diameter of 13' -4" and contains 93 coils. Each coil slot is 42 -1/8" high by 1.45" wide by 2.93" deep.

3.2 BUCK DEVELOPMENT

Within the substructure of the Buck powerhouse are housed three vertical-shaft Francis hydraulic turbines, each direct-connected to a generator on the upper level. The three turbine unites at Buck were manufactured by I.P. Morris Company in 1912. The dimensions and configuration of each turbine's runner, wicket gates and stay vanes are identical to those of the Byllesby turbine units. Each of the three turbines at buck is rated at 3,500 horsepower at a 34 ft. design head and has a rated speed of 97 rpm. Based on design curves, one unit can pass 1,180 cfs at 3,158 kW turbine-generator output and a 40 ft. net head.

The three AC generators, located in the upper level of the Buck Powerhouse, are identical and were manufactured by the General Electric Company. These generators have been in service since 1912. They are rated at 2,835 kW at 90 percent power factor, 3 phase, 60 cycles and 13,200 volts. Each 74 pole generator has a rotor speed of 97 rpm at 60 Hz.

Each generator stator has an inside diameter of 15' -10" and contains 222 coils. Each coil slot is 23 -7/8" high by 1.312' wide by 3.75" deep.

4.0 PRIMARY TRANSMISSION LINES

Primary transmission lines at the Project are limited to two approximately 2-mile long overhead 13.2-kV transmission lines (Byllesby Buck #1 and Byllesby Buck #2), which extend from the 13.2 kV bus within the Buck powerhouse to the 13.2 kV bus within the Byllesby control house.

5.0 APPURTENANT MECHANICAL AND ELECTRICAL EQUIPMENT

Specifications of additional mechanical and electrical equipment appurtenant to the Byllesby/Buck Hydroelectric Project are contained in Table A-1 andTable A-2.

6.0 LANDS OF THE UNITED STATES

There are no lands of the United States enclosed within the Byllesby/Buck Hydroelectric Project's boundaries.

TABLE A-1 APPURTENANT MECHANICAL AND ELECTRICAL EQUIPMENT – BYLLESBY DEVELOPMENT

	EQUIPMENT	MANUFACTURER	DESCRIPTION
1)	Exciters	Allis-Chalmers Mfg. Co.	4-Type G Statex, Solid State, 75, kW, 250 V DC, 300 AMP.
2)	Automatic Circuit Breaker	General Electric Company	Type C, Form K. 2,000 amps, 250 volt
3)	Powerhouse Gantry Crane	Alliance	57/5 Tom capacity
4)	Actuators	Woodward Governor Co.	Type A
5)	Trash Rakes	Allis-Chalmers Mfg. Co.	
6)	Motor Hoist & Controls	Harnischfeger Corporation	Gear and screw lift shaft assembly

7) and other mechanical and electrical equipment required for efficient operation of the project, including the following transmission equipment:

a) The 13.2 kV generator leads to the 13.2 kV bus;

b) The 13.2 kV bus (located within the Byllesby control house);

c) The 13.2 kV line from the bus to the 13.2/69 kV transformer;

d) The 13.2/69 kV transformer (located within the switchyard adjacent to the Byllesby control house);

e) The 69 kV connection from the transformer to the 69 kV transformer bus (located within the switchyard adjacent to the Byllesby control house).

TABLE A-2 APPURTENANT MECHANICAL AND ELECTRICAL EQUIPMENT - BUCK DEVELOPMENT

EQUIPMENT	MANUFACTURER	DESCRIPTION
1) Motor Generator Exciter	Westinghouse Electric	1 – Type SK. DC Gen. 150 kW, 250 volts, 600 amps, 1,180 rpm speed, shunt wound, style 6G6959
2) Powerhouse Gantry Crane	Alliance	44/5 Ton Capacity
3) Actuators	Woodward Governor Co.	Type A
4) Trash Rake	Allis Chalmers Mfg. Co.	
5) Motor Hoist & Controls	Harnischfeger Corp.	Gear and threaded lift shaft assembly

6) and other mechanical and electrical equipment required for efficient operation of the project, including the following transmission equipment:
   a) The 13.2 kV generator leads to the 13.2 kV bus;
   b) The common 13.2 kV bus (located within the Buck powerhouse);
   c) The 13.2 kV line from the bus to the 13.2 kV Byllesby-Buck #1 and #2 transmission lines.

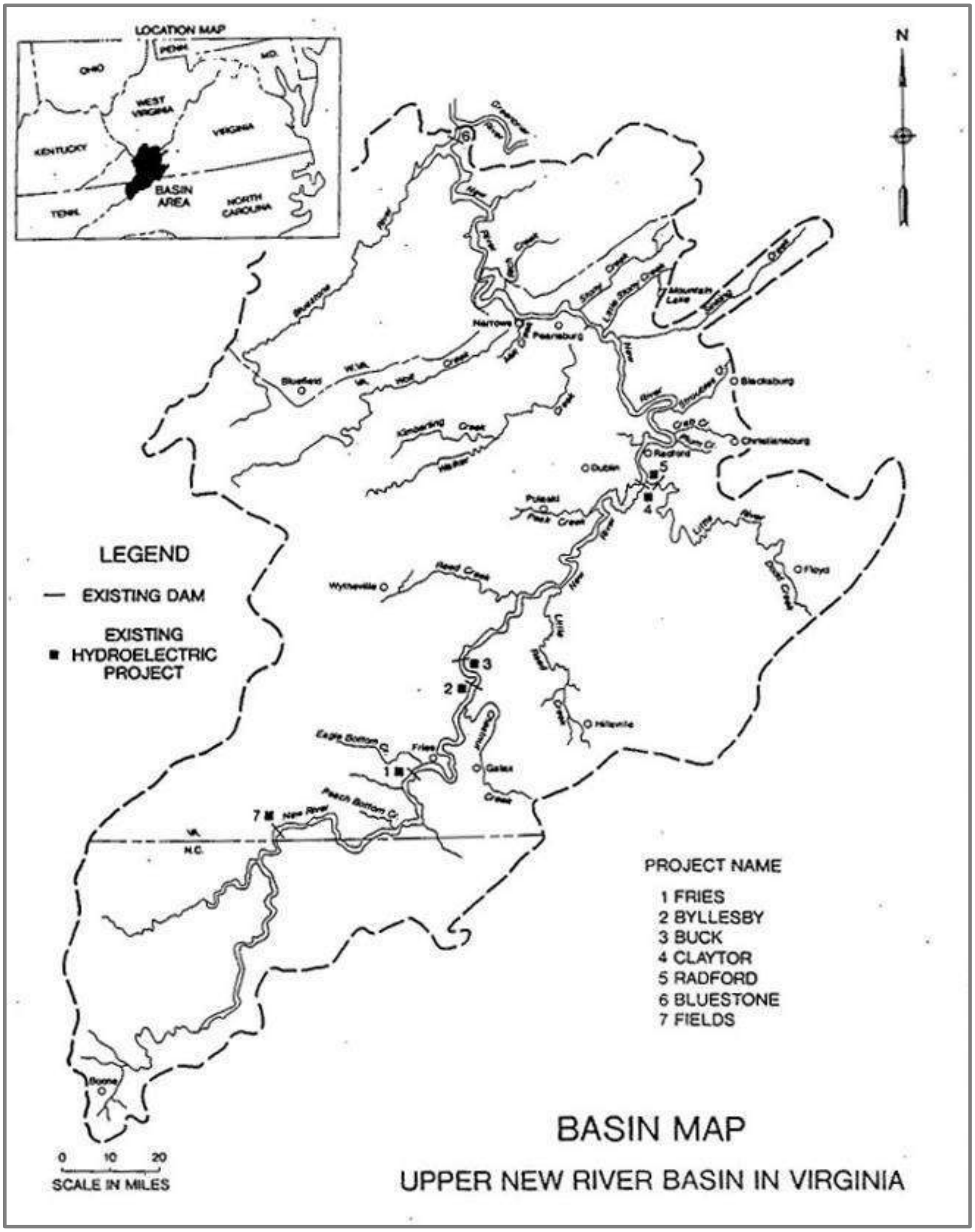


FIGURE A-1 PROJECT LOCATION – BASIN MAP, UPPER NEW RIVER BASIN IN VIRGINIA

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Appalachian Power Company) Project No. 2514-186

REQUEST FOR REHEARING OF
OF STUDY PLAN DETERMINATION

Pursuant to Section 313(a) of the Federal Power Act[1] and Rule 713 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission ("FERC" or "Commission"),[2] Appalachian Power Company ("Appalachian"), licensee and potential applicant for new license for the Byllesby-Buck Hydroelectric Project No. 2514 ("Project"), hereby requests rehearing of the Study Plan Determination ("SPD") issued by the Commission's Director of the Office of Energy Projects ("Director") on November 18, 2019.[3] Specifically, Appalachian requests rehearing of the Director's determination that Appalachian's Water Quality Study must be expanded to include *continuous* turbidity monitoring during the study period.

As discussed herein, the Director's determination is in error, is arbitrary and capricious, and is not supported by substantial evidence in the record. While several agencies mentioned turbidity in passing, no agency, including FERC, filed a study or information request supported by the Commission's study criteria set forth in 18 C.F.R. § 5.9(b) for a turbidity monitoring component of the Water Quality Study. The Director also did not provide any additional information or evidence to support the need for a costly and unnecessary expansion of Appalachian's turbidity monitoring proposal. Further, the Director failed to explain why

---

[1] 16 U.S.C. § 825*l*(a).

[2] 18 C.F.R. § 385.713 (2019).

[3] Letter Order, Terry L. Turpin, Director, Office of Energy Projects, Study Plan Determination for the Byllesby-Buck Hydroelectric Project, Project No. 2514-186 (issued November 18, 2019), at pgs. B-7 to B-8.

Appalachian's proposed level of effort described in its revised Water Quality Study would not be sufficient to meet the purported information needs, failed to address the additional level of effort and cost to implement its determination, and made assertions regarding the purported purpose of the turbidity monitoring, the causes of turbidity, and the potential effects of turbidity that are unsupported by the record.

Accordingly, Appalachian respectfully requests the Commission to grant rehearing and remove from the SPD the requirement to conduct *continuous* turbidity monitoring. In the alternative, Appalachian requests the Commission to approve the revised Water Quality Study attached hereto as Appendix A, which includes redline additions to the revised Water Quality Study intended to provide further detail regarding Appalachian's monthly, multi-parameter data collection efforts. Appalachian's proposal set forth in Appendix A would gather sufficient information regarding potential turbidity effects as it relates to Project operations and would cost significantly less to implement than the *continuous* monitoring required by the Director in the SPD. Because the Director raised the issue of continuous turbidity monitoring *sua sponte*, and such a request was not made by any agency or by Commission staff previously, it is appropriate for Appalachian to offer Appendix A as an alternative to the Director's SPD in this request for rehearing.

I. STATEMENT OF ISSUES AND SPECIFICATIONS OF ERRORS

Pursuant to Rule 713(c)(2) of the Commission's Rules of Practice and Procedure,[4] Appalachian states that the matter raised herein presents the following issue:

> Whether the Director's modifications in the SPD to the turbidity monitoring component of the Water Quality Study are in error, unsupported by substantial evidence, arbitrary and capricious, and inconsistent with the Commission's regulations. 16 U.S.C. § 825*l*;

[4] 18 C.F.R. § 385.713(c)(2).

18 C.F.R. § 5.9(b)(1)-(7); *City of Centralia v. FERC*, 213 F.3d 742, 748 (D.C. Cir. 2000).

II. BACKGROUND

The Project is located on the New River in Carroll County, Virginia, and consists of two riverine developments: Byllesby and Buck. Each development includes a dam, powerhouse, forebay, tailrace, and bypassed reach. Appalachian is the owner and licensee of the Project, and the existing license expires on February 29, 2024.

A. Pre-Application Document

On January 7, 2019, Appalachian initiated the Integrated Licensing Process ("ILP"), pursuant to Part 5 of the Commission's regulations,[5] by submitting to FERC a Notice of Intent to seek a new license for the Project and a Pre-Application Document ("PAD"). The PAD included a brief description of Appalachian's proposed studies for the Project, which were based on the issues identified during consultation with resource agencies, tribes, and other stakeholders, and included a proposal to conduct a Water Quality Study to monitor dissolved oxygen ("DO"), water temperature, and water level at a location upstream of the Byllesby reservoir and at a location downstream of each powerhouse tailrace.[6] In addition, Appalachian proposed that the Water Quality Study would include depth profile measurements once per calendar month to measure temperature, DO, acidity ("pH"), and specific conductance using a portable Hydrolab or similar data sonde at three locations spaced evenly across the forebay of each development.[7]

On May 7, 2019, Virginia Department of Game and Inland Fisheries ("VDGIF") and U.S. Department of the Interior, Fish and Wildlife Service ("FWS") filed comments on the PAD and

---

[5] 18 C.F.R. Part 5.

[6] Pre-Application Document for the Byllesby-Buck Hydroelectric Project, FERC Project No. 2514, at pgs. 6-3 to 6-4 (filed January 7, 2019).

[7] *Id.*

the proposed studies described therein. With respect to their comments on the proposed Water Quality Study, the full extent of VDGIF's and FWS's comments related to turbidity is the following:[8]

> In addition, the [water quality] study needs to examine turbidity effects of project operations.

Neither agency accompanied this information request with the study criteria itemized in 18 C.F.R. § 5.9(b), which are factors that Commission staff must consider *before* requiring a potential license applicant to develop any information or study requests.[9] Commission staff did not file comments on the PAD and did not inform Appalachian of the need for any information or study requests related to water quality.[10]

A. Proposed Study Plan

On June 21, 2019, Appalachian filed with FERC a Proposed Study Plan ("PSP") that included eight studies, including a Water Quality Study.[11] Appalachian's proposed Water Quality Study included two components, identified as "Tasks." Task 1 proposed continuous water

---

[8] VDGIF Comments on Pre-Application Document, Scoping Document 1, and Study Requests (filed May 7, 2019); FWS Review of Pre-Application Document, Scoping Document 1, and Request for Studies (filed May 7, 2019).

[9] 18 C.F.R. § 5.9(b) states as follows (emphasis added): "Any information or study request *must*:
(1) Describe the goals and objectives of each study proposal and the information to be obtained;
(2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
(3) If the requester Is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
(4) Describe existing information concerning the subject of the study proposal, and the need for additional information;
(5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
(6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
(7) Describe consideration of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs."

[10] 18 C.F.R. § 5.9(a) states that comments on the PAD, "*including those by Commission staff*, must be accompanied by any information gathering and study requests." (emphasis added).

[11] Proposed Study Plan, at pgs. 40-46 (filed June 21, 2019).

temperature and DO monitoring for a five-month period (from May 1 to September 30, 2020) using multi-parameter water quality instrumentation (*i.e.*, sondes) at eight locations that encompassed the upper reaches of the Byllesby reservoir, locations near the Byllesby and Buck dams, locations in each tailrace below the Byllesby and Buck powerhouses, and two locations in each of the bypassed reaches.[12] Although Appalachian did not specify which model sonde it would use, Appalachian's consultant developed the Water Quality Study and associated cost estimate assuming the use of Onset HOBO Dissolved Oxygen Loggers ("HOBO logger") (or equivalent) at each monitoring location. The HOBO logger is the industry-standard for measuring water temperature and dissolved oxygen, and each unit has a list price of $1,250.[13] The HOBO logger is small and ranges in size from 1.56 inches to 10.5 inches, and therefore is capable of being placed *in situ* for the purpose of continuous monitoring, even if the logger must be collocated with a permanent structure (where feasible) or weighted to provide protection during high-flow events.

Task 2 proposed monthly monitoring during the same five-month period of temperature, DO, pH, and specific conductance using a single, portable, multi-parameter data sonde, such as an OTT HydroMet Hydrolab MS5 Multiparameter Mini Sonde ("Hydrolab MS5"), at three locations spaced evenly across the forebay of each reservoir above Byllesby and Buck dams.[14] In addition, to accommodate the agencies' one-sentence information requests regarding turbidity monitoring as part of the Water Quality Study, Appalachian added to Task 2 the measurement of chlorophyll a and turbidity in the forebay of each development.[15] A multi-parameter data sonde equivalent to the Hydrolab MS5 is the industry-standard for measuring water quality parameters beyond water

[12] *Id.* at pgs. 42-43.
[13] Specifications and price information for the HOBO logger is provided in Appendix B hereto.
[14] Proposed Study Plan, at pg. 46 (filed June 21, 2019).
[15] *Id.*

temperature and dissolved oxygen.[16] Each Hydrolab unit costs approximately $10,000 to purchase, or a unit can be rented for approximately $1,500 per month.[17]

Although the Hydrolab MS5 is an excellent tool for multi-parameter water quality monitoring, it is undesirable for monitoring only water temperature and dissolved oxygen levels because it is significantly more expensive than other instruments (*e.g.*, the HOBO logger) that are capable of monitoring water temperature and dissolved oxygen levels. The Hydrolab unit is also much larger and more conspicuous than other instruments (at 30 inches long), and thus may be visible to members of the public, making it vulnerable to vandalism or theft. The size also makes the Hydrolab unit vulnerable to damage or displacement due to debris or high river flows. These factors are particularly concerning given the higher cost of replacing each unit.

In the PSP, Appalachian estimated that its level of effort to complete the Water Quality Study, inclusive of Tasks 1 and 2, would be approximately 400 hours and would cost approximately $60,000.[18]

On September 18, 2019, VDGIF filed comments on the PSP pursuant to 18 C.F.R. § 5.12, which requires that "[a]ny proposed modifications to the potential applicant's proposed study plan *must* address the criteria in § 5.9(b)." (emphasis added). VDGIF's comments on the PSP state *in full* with respect to comments on the Water Quality Study and the turbidity component thereof:[19]

> Finally, VDGIF staff mentioned concerns about downstream turbidity effects of the Project in our May 7 comments, but this study fails to provide a plan for assessing turbidity effects.

---

[16] Specifications for the Hydrolab MS5 data sonde are included in Appendix B hereto.

[17] While price information for this multi-parameter logger is not listed online, Appalachian's estimates are based on past experiences of Appalachian personnel and consultants.

[18] Proposed Study Plan, at pg. 46 (filed June 21, 2019).

[19] VDGIF Comments on Proposed Study Plans, at pg. 2 (filed Sept. 18, 2019).

This comment was VDGIF's first reference to its desire to modify the Water Quality Study to gather information related to *downstream* turbidity effects. As with its prior comments, VDGIF did not provide supporting information based on the criteria set forth in 18 C.F.R. § 5.9 to support its new request for information related to *downstream* turbidity effects of Project operations. Neither FWS' nor FERC staff's comments on the PSP mention Appalachian's proposal to measure turbidity monthly as part of the Water Quality Study, nor did either request modifications to the Water Quality Study related to turbidity.[20]

B. Revised Study Plan

On October 18, 2019, Appalachian filed its Revised Study Plan ("RSP") with the Commission.[21] The revised Water Quality Study provided additional detail regarding Task 1 and Task 2, and expanded to ten the number of locations where sondes would be located for continuous temperature and DO monitoring (Task 1) and for monthly monitoring of other parameters, including turbidity (Task 2).[22] In the RSP, Appalachian provided a refined estimate for the level of effort to complete the revised Water Quality Study, including the expanded scope to conduct turbidity (and other) measurements monthly at all ten locations with a single, portable multi-parameter measuring device (*e.g.*, Hydrolab MS5), of approximately 500 hours and at an estimated cost of $110,000.

In response to the RSP, VDGIF's *only* comment on the revised Water Quality Study related to turbidity is the following statement:[23]

---

[20] *See* FWS Review of Proposed Study Plans (filed Sept. 18, 2019); FERC Staff Comments on the Proposed Study Plan and Additional Information Requests for the Byllesby-Buck Hydroelectric Project (issued Sept. 19, 2019).

[21] Revised Study Plan for the Byllesby-Buck Hydroelectric Project (No. 2514), Project No. 2514-186 (filed October 18, 2019).

[22] *Id.* at 63-67. Notably, the two additional locations did not include the downstream tailraces for the developments because those locations were already proposed as part of the original eight sampling locations.

[23] VDGIF Comments on Revised Study Plans, at pg. 3 (filed Nov. 4, 2019).

> Finally, we appreciate the inclusion of data collection on both turbidity and chlorphyll a at the Project reservoirs.

Similarly, FWS' only comment on the revised Water Quality Study related to turbidity is the following statement:[24]

> Data collection for both turbidity and chlorophyll a at the Project reservoirs are important improvements that have been made for the RSP.

C. Director's Study Plan Determination

On November 18, 2019, the Director issued the SPD. With respect to the Water Quality Study, the Director characterized the agencies' comments on the RSP as noting "improvement," but further explained that the agencies' "concern remains regarding the mobilization of impoundment sediment deposits during project operation, which could result in increased turbidity in downstream reaches that disrupts ecological processes and negatively affects angling and recreation use."[25] As recounted above, the topics encompassed by this quote are found in none of the agencies' comments on the Water Quality Study.

Based on this mischaracterization, the Director significantly expanded the scope and cost of the turbidity monitoring component of the revised Water Quality Study to require *continuous*, instead of monthly, monitoring of turbidity and to require Appalachian to maintain a log of daily drag rake operations to "facilitate an evaluation of the relative role of (natural) high-flow events versus drag rake operations in causing turbidity spikes."[26] The Director further states that the "results of this study could inform the development of potential license requirements (e.g., the optimal timing of drag rake operation in terms of maintaining desirable turbidity levels during

[24] FWS Review of Revised Study Plans, at pg. 3 (filed Nov. 4, 2019).
[25] SPD at pg. B-7.
[26] *Id.* at pgs. B-7, B-8.

prime angling periods)," and cites 18 C.F.R. § 5.9(b)(5), which requires an *agency* to explain the nexus between an information request or a study request and project operations.[27]

Finally, the Director concludes that the cost to conduct continuous turbidity monitoring at ten locations for the study period would be "minimal" and field efforts related to turbidity monitoring would be "minimal because the turbidity sensors would be added to the same sondes that would be used for continuous monitoring of temperature and DO."[28]

As explained below, the Director's conclusions regarding the informational value of continuous turbidity monitoring have no support in the record, fundamentally misunderstand the proposal and the technology necessary to conduct the study, and underestimates the level of effort and cost to conduct continuous turbidity monitoring.

III. REQUEST FOR REHEARING

Appalachian respectfully requests rehearing of the Director's SPD.[29] Actions of the Commission, including the Director's SPD, must be supported by substantial evidence and may not be arbitrary and capricious.[30] The Director's determination that Appalachian's revised Water Quality Study must be expanded to include *continuous* turbidity monitoring at ten sampling sites is in error, is arbitrary and capricious, and is not supported by substantial evidence.

[27] *Id.*
[28] *Id.*
[29] Order No. 2002-A clarified that once the Director makes a study plan determination pursuant to 18 C.F.R. § 5.13(c), that determination may then be appealed to the Commission in a request for rehearing pursuant to Rule 713 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.713). *Hydroelectric Licensing Under the Federal Power Act*, Order No. 2002-A, 106 FERC ¶ 61,037, at P 17 (2004). See *also Duke Power*, 117 FERC ¶ 61,303, at P 12 (2006).
[30] 16 U.S.C. § 825*l*(b); *City of Centralia v. FERC*, 213 F.3d 742, 748 (D.C. Cir. 2000); *Bangor Hydro-Electric Co. v. FERC*, 78 F.3d 659,663 (D.C. Cir. 1996).

A. The Record Does Not Include a Single Request to Include Continuous Turbidity Monitoring as an Element of the Water Quality Study

The record fails to support the basis for continuous turbidity monitoring because no agency, including FERC, requested continuous turbidity monitoring (and therefore no agency filed support for such a request based on the study criteria in 18 C.F.R. § 5.9). The Director's *sua sponte* inclusion of this requirement in the SPD is the first time that this element has been raised as a desired component of the Water Quality Study.

The Director also failed to provide adequate justification in accordance with the study plan criteria, as required by 18 C.F.R. § 5.9, to support the need for the information for which it seeks. The Director points to 18 C.F.R. § 5.9(b)(5) when explaining that the results of continuous monitoring of turbidity at ten locations (most of which are nowhere near the drag rakes) could be used to inform potential license conditions, including the timing of the operation of the drag rake.[31] However, the requirement in the regulations is for the Commission (or any agency that requests information or a study) to address *all* of the study criteria listed in 18 C.F.R. § 5.9(b). Since no agency had previously filed this information, and the SPD is the first time this issue is being raised, the Director was obligated to provide support for its new information or study request. Because it failed to do so, the turbidity monitoring requirement described in the SPD should be rejected on rehearing.

The Director also erred in its reliance on a number of assertions that are not supported by the record. First, the Director states that, while the agencies acknowledge the revised Water Quality Study is an "improvement," "concern remains regarding the mobilization of impoundment sediment deposits during the project operations."[32] This assertion has no support in the record.

[31] SPD at pg. B-8.
[32] *Id.* at pg. B-7

The *full extent* of VDGIF's and FWS' comments on the turbidity component of the Water Quality Study presented in the PAD, PSP, and RSP are as follows:

> VDGIF and FWS (PAD): "In addition, the [water quality] study needs to examine turbidity effects of project operations."
>
> VDGIF (PSP): "Finally, VDGIF staff mentioned concerns about downstream turbidity effects of the Project in our May 7 comments, but this study fails to provide a plan for assessing turbidity effects."
>
> VDGIF (RSP): "Finally, we appreciate the inclusion of data collection on both turbidity and chlorphyll a at the Project reservoirs."
>
> FWS (RSP): "Data collection for both turbidity and chlorophyll a at the Project reservoirs are important improvements that have been made for the RSP."

It is an extraordinary leap for the Director to deduce from the above quotes in the record that (1) "concern remains regarding the mobilization of impoundment sediment deposits during project operation," (2) "[t]he results of this study could inform the development of potential license requirements (e.g., the optimal timing of drag rake operation in terms of maintaining desirable turbidity levels during prime angling periods), (3) the cost of turbidity monitoring would be "minimal," and (4) the level of effort would be "minimal because the turbidity sensors would be added to the same sondes that would be used for continuous monitoring of temperature and DO."[33]

These assertions by the Director must be found to be arbitrary and capricious. As demonstrated by the agencies' above-quoted comments on Appalachian's Water Quality Study, the agencies never once mentioned the drag rake,[34] angling, turbidity spikes, continuous versus monthly monitoring, the number of locations to be monitored (other than a reference to "downstream"), the cost of the study, or the types of sensors to be used. While Appalachian

[33] *Id.* at pgs. B-7, B-8.
[34] Appalachian notes that the Director's references to filings that describe the Project's drag rakes are not part of the record of the current proceeding.

mentioned the general types of sensors it anticipated using, it made clear that the sensor used for temperature and DO is different and less costly than the sensor that is required for other parameters, including turbidity.

Moreover, in each iteration of the ILP study development process, Appalachian tried to respond to the agencies' one-sentence information requests on the Water Quality Study. In response to the agencies' comments on the PAD, Appalachian added monthly monitoring of turbidity to the forebays. In response to VDGIF's comments on the PSP, Appalachian added monthly monitoring of turbidity to all ten sampling sites, which included the previously identified downstream tailrace locations. In each case, Appalachian attempted to respond to the information provided in the agencies' comments on the Water Quality Study; however, because information and study criteria have never been submitted to support the request for turbidity monitoring as part of the Water Quality Study, Appalachian could only guess at what the agencies (and now the Director) is trying to understand by adding turbidity monitoring to the Water Quality Study.

For these reasons, the Director's unsupported requirement that Appalachian conduct continuous turbidity monitoring should be rejected on rehearing.

B. The Cost and Level of Effort Associated with the Continuous Turbidity Monitoring is Not "Minimal."

The Director also erred when it concluded that the cost and level of effort to conduct continuous turbidity monitoring would be minimal. As discussed above, to accomplish the goals of its Water Quality Study, Appalachian planned to deploy different monitoring instruments for different purposes. The less expensive HOBO loggers would be deployed at each of ten monitoring sites to record water temperature and dissolved oxygen levels, and a more expensive Hydrolab sonde would be moved from site to site to record additional water quality parameters, including turbidity, on a monthly basis. Thus, Appalachian's equipment needs for the revised Water Quality Study would be ten HOBO-type loggers and one Hydrolab sonde.

The SPD radically changed the instrument requirements for the Water Quality Study. Appalachian will no longer be able to use HOBO loggers at the ten monitoring sites, as those instruments can only measure water temperature and DO levels. Instead, to continuously monitor turbidity, Appalachian will be required to rent or purchase Hydrolab MS5 sondes for each of the ten sites. In addition, Appalachian has concerns that placing large sondes *in situ*, like the Hydrolab MS5, in a flashy river like the New River will result in higher rates of damage and other problems with the probes. Appalachian's additional cost to rent nine additional Hydrolab MS5 units for five months would be a cost of about $67,500, which is much more than the Director's estimate of $10,000 to $15,000.[35]

Moreover, these estimates do not address the additional level of effort and labor that will be required by Appalachian and its consultants to maintain these larger sondes *in situ* at various river levels, do not include the cost of lost or damaged sondes, and do not include the additional level of effort to address data gaps as a result of such issues. For these reasons, it was error for the Director to conclude that the added cost and level of effort to conduct continuous turbidity monitoring would be "minimal."

C. The Commission Should Adopt the Revised Water Quality Study Set Forth in Appendix A In Lieu of the Turbidity Monitoring Described in the SPD

Appendix A hereto is a redline version of Appalachian's revised Water Quality Study that includes additional detail regarding Appalachian's proposal to conduct monthly temperature monitoring. This additional detail addresses some of the topics mentioned by the Director, such as coordinating the operation of drag rakes with the monthly monitoring effort in order to capture

[35] SPD at B-8.

a representative range of powerhouse operations. However, as described herein, because neither Commission staff nor agencies have submitted a study or information request supported by the criteria set forth in 18 C.F.R. § 5.9(b), Appalachian's revisions are its best guess as to the study elements that address the Commission's and agencies' information needs. Appalachian is confident that its proposal would *more precisely* meet the information needs of FERC and the agencies.

IV. CONCLUSION

For the reasons set forth herein, the Director's significant expansion of Appalachian's proposed Water Quality Study to require *continuous* turbidity monitoring is in error, is arbitrary and capricious, and is not supported by the record. Therefore, the Commission should grant rehearing and reject this component of the SPD. In lieu of the Director's turbidity monitoring requirement, the Commission should accept the revised Water Quality Study set forth in Appendix A hereto.

Respectfully submitted,

/s/ Kimberly Ognisty
Kimberly Ognisty
Zachary B. Cohen
Winston & Strawn LLP
1700 K St., NW
Washington, DC 20006-3817
Email: kognisty@winston.com
zcohen@winston.com

Counsel to Appalachian Power Company

Dated: December 18, 2019

APPENDIX A

Revised Water Quality Study
(with redline)

5 Water Quality Study

5.1 Study Requests

The Commission's March 8, 2019 SD1 identified the following environmental resource issues to be analyzed in the EA for the Project relicensing.

- Effects of continued Project operation and maintenance on water quality, including dissolved oxygen (DO) and water temperature, upstream and downstream of each development, including the Buck bypass reach.
- Whether there is a need for an increase in minimum flow release requirements.

In Section 6.2.2 of the PAD, Appalachian proposed to conduct a Water Quality Study within the Study Area. More specifically, depending on sampling location, Appalachian proposed to monitor temperature, DO, water level, depth profiles, pH, and specific conductance. No formal study requests were received regarding water quality; however comments were received from VGDIF, USFWS, Virginia Tech, and NRC, which are summarized as follows:

- USFWS, VDGIF, and NRC recommended that this study include a thermal aspect that considers how the Project affects the thermal regime of the New River and potential effects on coolwater endemic fishes.
- USFWS, VDGIF, and NRC recommended that this study also consider turbidity and chlorophyll a.
- VDEQ and Virginia Tech recommended that PCB concentrations in sediment deposits behind the dams be investigated.
- Virginia Tech recommended that water level loggers be installed at several locations in the Project boundary (including above and below the powerhouses and in the bypass reaches) for continuous monitoring over a minimum one year period.

  Additional comments related to this study were received from USFWS and VDGIF in response to Appalachian's filing of the PSP. These comment are summarized as follows:

- The USFWS and VDGIF noted that vertical temperature and DO profiles may need to be completed bi-weekly and that one season of sampling within the tailrace may not adequately capture the highs and lows over the license terms, especially the dry years.

  In addition to the formal comments filed, the following points relevant to this study plan were discussed at the PSP meeting on July 18, 2019:

- VDGIF noted they would prefer that the level loggers are installed in the fall of 2019 to ensure the best data is gathered in case 2020 is too dry or too wet. Appalachian noted if

Deleted: Octo

2020 is not a suitable year for collecting water quality data, the 2021 field season would be used.

- FERC noted importance of annotating water quality results using summaries and graphs in study report to note project operations and inflow conditions.
- Discussion of drag rake operation relative to sediment disturbance/release. Clarify that the rake is not intended to clear sediment, but that some sediments are incidentally scraped/mobilized during operation.

On November 18, 2019, the Commission issued a Study Plan Determination for the Project, requiring modification of the Water Quality Study proposed by Appalachian in the RSP (October 18, 2019 version) as follows:

- In each forebay, data sondes are to be placed as close to the surface and bottom of the water column as poss ble, and their locations are to remain fixed to ensure the data collected is representative of the maximal degree of stratification that occurs in the forebays.
- Appalachian is to perform additional turbidity monitoring and logging of drag rake operations during any turbidity monitoring period, to assess the effects of drag rake operation on downstream turbidity at each development.

5.2 Goals and Objectives

Appalachian's proposed study employs standard methodologies that are consistent with the scope and level of effort of water quality monitoring conducted at hydropower projects in the region. Appalachian believes that this study will provide sufficient information to support an analysis of the potential Project-related effects on water quality. The goals and objectives of this study are to:

- Gather baseline water quality data sufficient to determine consistency of existing Project operations with applicable Virginia state water quality standards and designated uses.
- Provide data to determine if the Byllesby and Buck impoundments undergo thermal and/or DO stratification and, if so, determine the presence and location of the metalimnion.
- Provide data to support a Virginia Water Protection Permit application (Clean Water Act Section 401 Certification).
- Provide information to support the evaluation of whether additional or modified protection, mitigation, and enhancement measures may be appropriate for the protection of water quality at the Project's developments.

5.3 Study Area

The Study Area for the Water Quality Study is shown on Figure 1-4, and includes the reservoirs, bypass reaches, and tailwaters downstream of Byllesby and Buck dams.

5.4 Background and Existing Information

Existing relevant and reasonably available information regarding water quality in the Project vicinity was presented in Section 5.3 of the PAD (Appalachian 2019). The PAD included historical water quality data collected in support of the existing license and recent water quality data collected during mussel salvage and relocation efforts, and other data collection efforts. These data indicate that temperatures and DO concentrations did not differ between impoundments and tailraces, and no evidence of thermal stratification was observed in either impoundment. Data from the historical studies also demonstrated that the Project waters meet the state water quality standards, including temperature maximums and DO minimums.

On August 29, 2019, a site visit was conducted by HDR for Appalachian to attempt to collect pre-relicensing study season water quality data and evaluate field logistics associated with potential water quality monitoring locations for the Byllesby and Buck developments. During the site visit, a calibrated multiparameter water quality data sonde was used to collect depth profiles in each development's forebay and also spot measurements in each development's tailwater. These data are summarized on Figure 5-1 for Byllesby and Figure 5-2 for Buck. Flow during the site visit was approximately 1,500 cfs measured at the New River at Ivanhoe, Virginia USGS gage (03165500) which is typical of average flow conditions in August at this location (mean monthly discharge for August as shown in Table 4-2 is 1,495 cfs; 1929 – 2019).

During the site visit, the Byllesby forebay elevation was in the normal operating range,[3] however, the Buck forebay elevation was approximately 9 feet lower than the normal operating range[4] to facilitate construction activities associated with installation of the new Obermeyer gates.

All water quality measurements during the site visit were within applicable Virginia state water quality standards. As Figure 5-1 and Figure 5-2 indicate, the depth profiles in each forebay did not show any significant difference in water quality from top to bottom, or from side-to-side. Given that these depth profiles were collected during peak summer conditions and under a relatively low flow, it is not expected that there would be differences in water quality from side-to-side in the forebay areas during the summer months. The tailwater measurements were reflective of the water quality in each forebay.

[3] Normal operating range for he Byllesby impoundment is between 2,078.2 – 2,079.2 feet above mean sea level.

[4] Normal operating range for he Buck impoundment is between 2,002.4 – 2,003.4 feet above mean sea level. During the August 29, 2019 water quality sampling site visit, he forebay elevation was approximately 1994 feet above mean sea level; or approximately 9 feet below the normal operating range.

Deleted: Octo

Figure 5-1. Water Quality Parameters for Byllesby

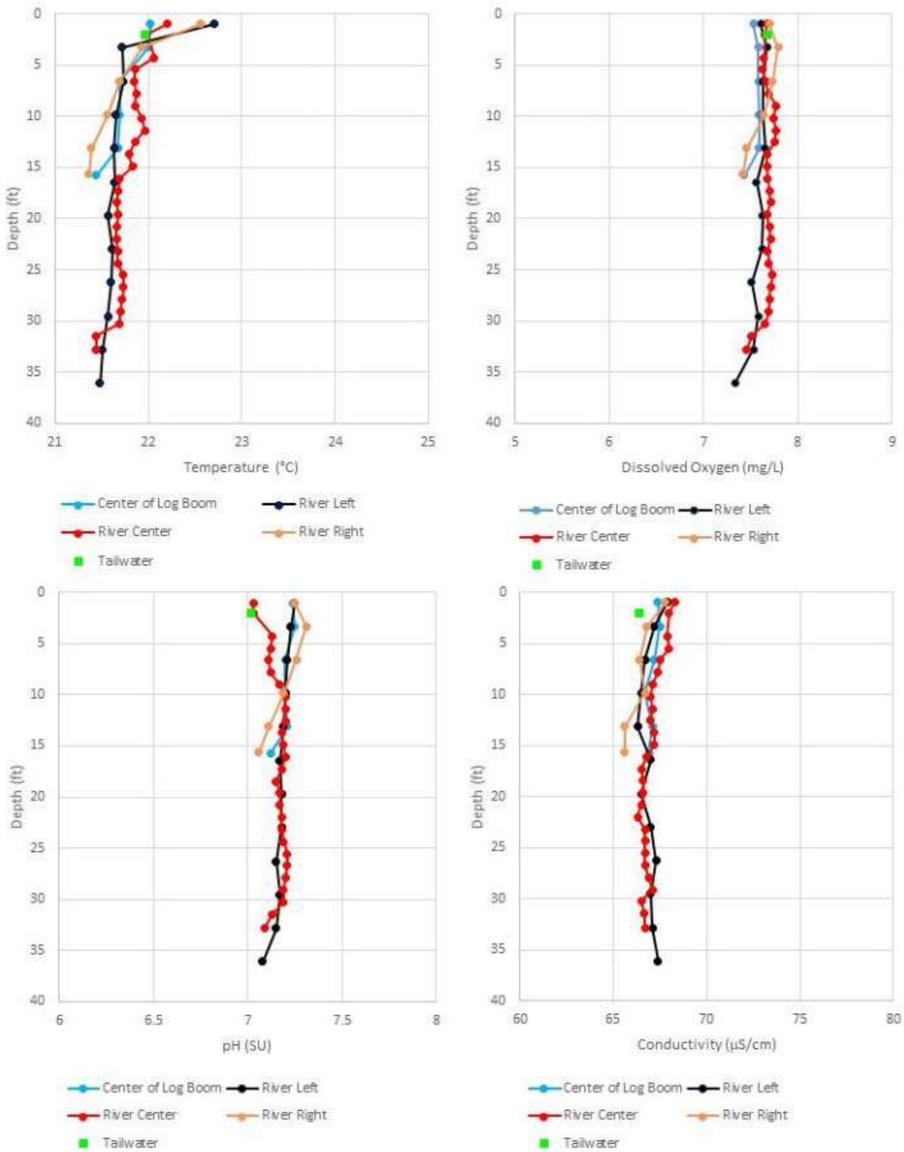
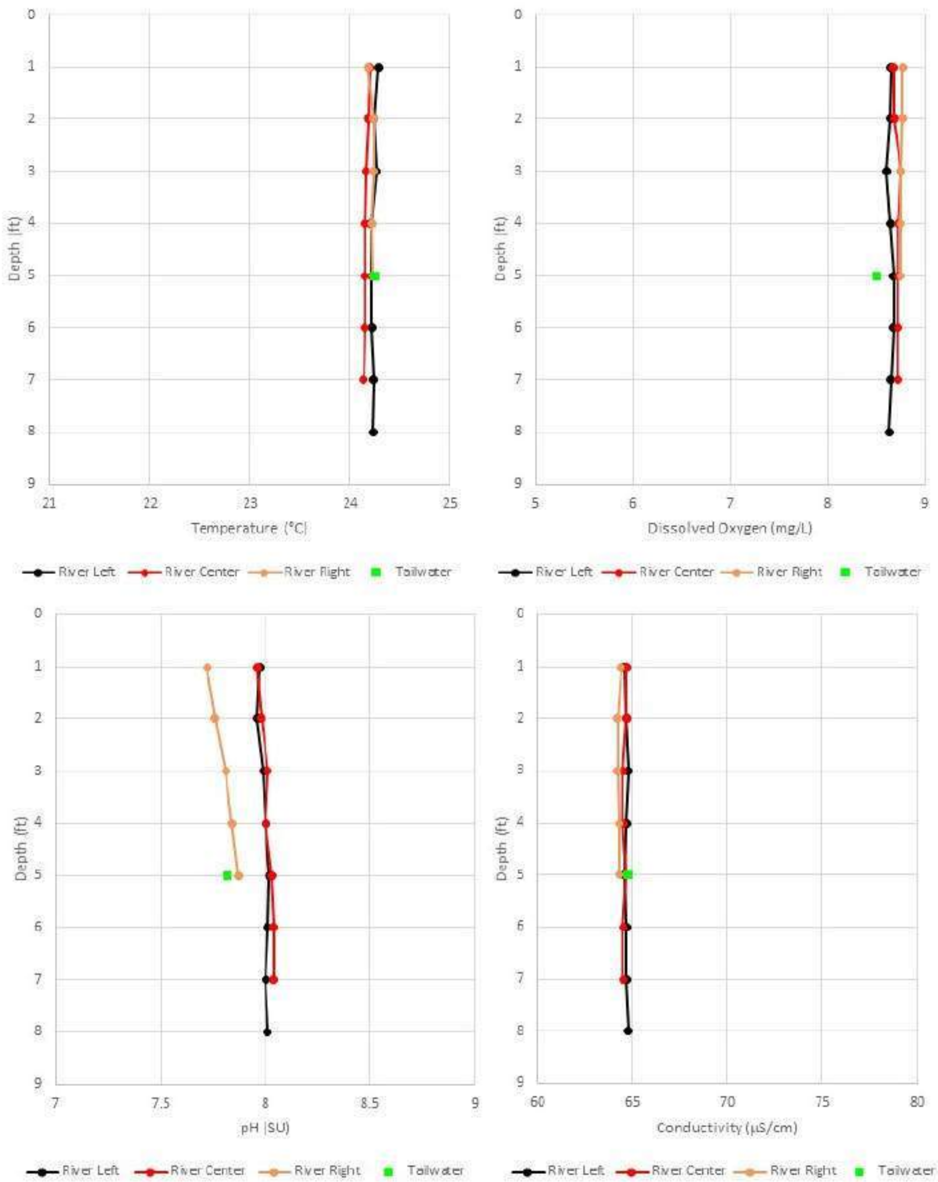


Figure 5-2. Water Quality Parameters for Buck



Deleted: Octo

Multiple segments of the New River are listed as impaired for aquatic life or recreation uses due to *E. coli* concentrations. However, the source of *E. coli* is not associated with the Project and it is expected that continued operation of the Project will have no effect on *E. coli* concentrations in the New River.

From 2003 to 2006, VDEQ collected 209 samples to evaluate organic chemicals in sediment (VDEQ 2018). A low percentage of stream miles had concentrations above the Probable Effects Concentration and sampling has since been suspended due to low concentrations and high sampling costs.

A TMDL study for PCBs was performed for VDEQ by Virginia Tech in the New River watershed and a draft TMDL was developed and last updated in September 2018. According to results of the TMDL study, the PCB impaired segment of the New River in Virginia is located downstream of the Project, beginning where U.S. Interstate 77 crosses the river, and continuing downstream to where the river crosses the Virginia/West Virginia state line (Virginia Tech 2018).

No dredging of reservoir sediment is proposed by Appalachian at this time, nor does Appalachian propose any construction or maintenance activities that could cause the mobilization of reservoir sediments. It is noted that prior dredging activities (1997 and 2014) and associated constituent testing received approval for placement of dredged sediments which were then used for the creation of an emergent wetland upstream of Byllesby and for offsite beneficial reuse.

FERC staff requested that Appalachian provide the results of any PCB testing conducted in support of previous sediment removal projects at the Project (1997 and 2014) in the RSP. Appalachian has reviewed available files and documentation for the Project and provides the following additional information.

Extensive sediment core sampling and testing was conducted during the 1997 dredging at Byllesby. Appalachian is unable to locate the original report or data for this testing; however, the Clean Water Act Section 404 permit issued by USACE for this project includes several agency letters and references to the 1997 toxicity testing, including VDEQ concurrence that the tested material was essentially clean. Documentation of agency consultation in this permit also notes that Appalachian was certain no dredging had been done within the 30 years prior to this effort. A copy of this permit and associated documentation was filed with FERC on October 21, 1997 and is available on FERC's eLibrary.[5]

Permits issued for the dredging conducted at Byllesby in 2014 did not include specific requirements to test the material. Appalachian did, however, perform testing according to the U.S. Environmental Protection Agency (USEPA) SW-846 Test Method 1311: Toxicity Characteristic Leaching Procedure on composite samples from within the forebay. While not specifically tested for PCBs, these tests resulted in no actionable levels for heavy

[5] Accession number 19971021-0377

metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). Furthermore, based on the material composition removed (sand, gravel, etc.), Appalachian does not believe PCB's would be present in the dredged material as PCB's do not have an affinity to bind to such coarse-grained material.

As stated in the PAD, any necessary future dredging and disposal would be coordinated with the U.S. Army Corps of Engineers and VDEQ pursuant to license Article 12 to obtain any required permits and approval. Although prior testing indicated the material was safe for other uses, Appalachian understands that proposed new dredging authorization may require additional testing for constituents of concern in the sediments being proposed for dredging prior to, and depending on the results of such testing, determining the appropriate fate of the material.

5.5 Project Nexus

The Byllesby and Buck developments are operated in a run-of-river mode under all flow conditions, with operation of the two developments closely coordinated. Due to the small size and short retention time of the Project reservoirs, the lack of thermal stratification demonstrated by past studies, and the mode of operation, Appalachian does not expect that operation of the Project affects ambient water quality in the New River above or below the Project.

The Project impounds water at the Buck and Byllesby dams. Meteorological and hydrological conditions (flow) and operation of the Project, including diversion of flows to the powerhouse for generation and resultant reduction of flows to the bypass reaches, may combine to impact water quality parameters such as temperature and DO in the Project reservoirs, powerhouse tailraces, and bypass reaches.

5.6 Methodology

5.6.1 Task 1 – Continuous Water Temperature and DO Monitoring

Appalachian proposes to monitor temperature and DO using multiparameter water quality instrumentation (i.e. sondes, e.g., Onset® HOBO® Dissolved Oxygen Logger (or equivalent)) at the following locations:

- One location in the upstream extent of the Byllesby reservoir
- Two locations in the Byllesby forebay (upper and lower portion of the water column)
- One location in the Byllesby tailrace below the powerhouse
- One location in the Byllesby bypass reach (approximate mid-point)
- Two locations in the Buck forebay (upper and lower portion of the water column)
- One location in the Buck tailrace below the powerhouse
- Two locations in the Buck bypass reach (one upstream area and one downstream area)

Deleted: Octo

The approximate locations are depicted on Figure 5-3 and Figure 5-4. Appalachian expects to verify these locations during the initial field deployment and will communicate any substantive changes to the VDEQ and other interested relicensing participants.

All water quality monitoring locations will be geo-referenced using GPS. GPS locations will be included in a GIS database layer to support the documentation and reporting of collected data and to facilitate comparisons with future monitoring efforts.

Water temperature and DO data sondes will be deployed for a single season, from May 1, 2020 through September 30, 2020 and will collect data at 15 minute intervals. Each of the data sondes will be cleaned and calibrated prior to deployment and checked each month during data retrieval. As necessary, protective measures may be employed, such as weighting the data sondes or attaching them to permanent structures (where feasible) to maintain position during high flow events. Note the data sondes deployed in the tailwater and bypass reach locations will also collect temperature and DO data during the flow test events described in the Flow and Bypass Reach Aquatic Habitat Study (Section 4). If a data sonde is lost due to vandalism or a high flow event, Appalachian will replace the instrumentation one time only.

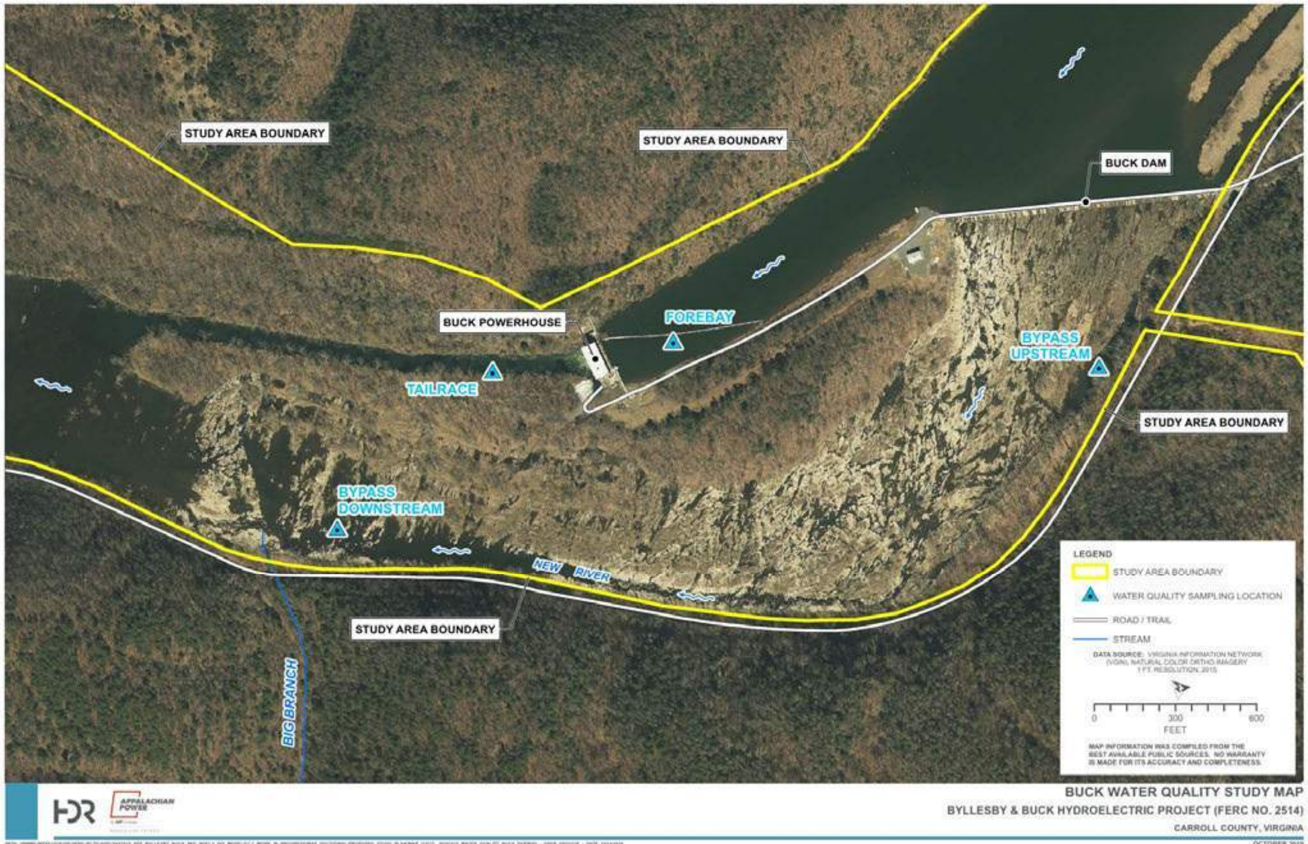
Data sondes deployed in the Byllesby and Buck forebays will be set at two discrete depths to determine the existence and extent, if any, of thermal and DO stratification. The upper data sonde will be placed approximately 3 feet below the surface of the reservoir and the lower data sonde will be placed approximately 3 feet above the bottom of the reservoir at each forebay monitoring location.

Deleted: Based on the August 29, 2019 site visit described above, the depth of the Byllesby forebay at approximately the mid-point of the spillway structure is approximately 35 feet. As a result, the upper data sonde will be placed approximately 12 feet below the surface and the lower data sonde will be placed approximately 24 feet below the surface. The depth of the Buck forebay near the center of the intake channel is approximately 17 feet.[6] As a result, the upper and lower data sondes will be placed at approximately 6 feet and 12 feet below the surface, respectively.

Figure 5-3. Byllesby Water Quality Study Locations

Deleted: Octo

Figure 5-4. Buck Water Quality Study Locations



5.6.2 Task 2 – Monthly Water Quality Monitoring

In addition to continuous monitoring, once per calendar month (May through September), in situ water quality measurements of temperature, DO, pH, and specific conductance will be collected at each of the locations descr bed above with a Hydrolab (e.g., OTT HydroMet® Hydrolab® MS5 Multiparameter Mini Sonde, or equivalent) or similar data sonde. At the forebay monitoring locations, depth profiles will be collected each month. If it appears that brief periods of stratification may be occurring, collection of forebay depth profiles may be increased to bi-weekly.

Chlorophyll a will also be measured in the forebay of each development during the monthly sampling events. Chlorophyll a will be collected via grab samples at a single depth of approximately one meter and samples will be subsequently analyzed at an off-site laboratory.

Individual water quality measurements (temperature, DO, pH, conductivity) will also be collected during fisheries and macroinvertebrate field sampling events.

5.6.3 Task 3 – Turbidity Monitoring

Appalachian will conduct a study to evaluate the potential impact that Project operations, in particular drag rake operations, may have on turbidity concentrations in the Project tailraces. The study will be conducted over a two-day period under relatively low flow conditions. During this study period, a Hydrolab or similar data sonde equipped with a turbidity sensor will be installed at each of the locations listed below (which coincide with the continuous monitoring locations shown in Figures 5-3 and 5-4) to continuously record turbidity concentrations (in Nephelometric turbidity units) at 5-minute intervals.

- One location in the upstream extent of the Byllesby reservoir (to characterize background turbidity levels)
- One location in the Byllesby forebay (approximate mid-depth)
- One location in the Byllesby tailrace below the powerhouse
- One location in the Buck forebay (approximate mid-depth)
- One location in the Buck tailrace below the powerhouse

During this study period, Appalachian will operate the generating units and trash (drag) rakes at each Project under a pre-determined range of normal operating regimes. The timing of these operations will be recorded. Turbidity data collected will be evaluated against trash rake operation and powerhouse generation in an effort to help determine any differences in downstream turbidity concentrations resulting from station operations versus naturally occurring background conditions.

Deleted: Note the depths of the data sondes (used for continuous monitoring) may be adjusted, if necessary, during the study based on a comparison of the continuous temperature and DO results with the monthly depth profile measurements. In addition,

Deleted: i

Deleted: Turbidity will also be measured at a single depth of approximately one meter using a portable turbidity meter at each of the continuous water quality monitoring locations. Turbidity measurements will be recorded in Nephelometric turbidity units.¶

Deleted: Octo

5.7 Analysis and Reporting

Results of this study will be summarized in a final study report. Appalachian anticipates that the Water Quality Study report will include Project information and background, a depiction and descriptive narrative of the Study Area, methodology, results, analysis, and discussion. In addition, stakeholder correspondence and/or consultation will be included, as well as any literature cited. Raw data will be provided in appendices to the study report.

5.8 Schedule and Level of Effort

The preliminary schedule for this study is outlined in Table 5-1. The estimated level of effort for this study is approximately 500 hours. Appalachian estimates that the Water Quality Study will cost approximately $130,000 to complete. If the proposed study period is deemed anomalous due to abnormally wet and/or cool weather conditions, a second study year may be necessary to capture water quality conditions representative of typical summer conditions. Additionally, if the water quality data collected during the proposed study period does not meet the goals and objectives described in Section 5.2, a second year of data collection may be necessary.

Deleted: 110

Table 5-1. Proposed Water Quality Study Schedule

Task	Proposed Timeframe for Completion
Study Planning and Existing Data Review	January – March 2020
Continuous and Monthly Water Quality Monitoring (DO and temperature)	May – September 2020
Distribute Draft Study Report with the ISR	November 2020

APPENDIX B

Water Quality Monitoring Equipment Specifications

ONSET®

HOBO Dissolved Oxygen Data Logger

Part # U26-001

$1250 USD

This item ships FREE!

This logger requires HOBOware Pro software and either a U-DTW-1 Waterproof Shuttle or the Base-U-4 Optic USB Base Station for configuration and data offload. Please see compatible items below.

Overview

Measure oxygen concentrations in lakes, streams, rivers, estuaries, and coastal waters with the HOBO U26 Dissolved Oxygen Data Logger. This affordable and precise data logger is recommended for aquatic biology and hydrology research projects. The HOBO U26 uses RDO® Basic (Rugged Dissolved Oxygen) optical DO sensor technology and is easy to maintain.

Includes:

- U26-001 data logger
- DO sensor cap
- Protective Guard
- Calibration Boot with sponge

Our HOBO U26 Dissolved Oxygen logger has been part of a multi-year evaluation of DO loggers and sensors by the Alliance for Coastal Technologies (ACT), and the results have been published online. This provides an un-biased report of how our U26 performs in lab and field conditions. Note that our response letter with our added recommendations is attached at the end of this report on pages 58 and 59.

Click here to read.

Highlighted Features

- Affordable, high performance dissolved oxygen (DO) monitoring with 0.2 mg/L accuracy

- Optical DO sensor technology for long-lasting calibration with less maintenance
- HOBOware Pro's Dissolved Oxygen Assistant software corrects for measurement drift from fouling; provides salinity-adjusted DO concentrations and percent saturation
- Optical USB interface for high-speed, reliable data offload
- Easy-to-replace DO sensor cap lasts six months

NOTE: For DO measurements in saltwater, an adjustment for salinity is required. For waters with small changes in salinity (<2 ppt), a salinity meter reading typically provides enough accuracy. For environments with greater salinity changes, we generally recommend the HOBO U24-002-C conductivity logger . If you need DO in Percent Saturation, barometric pressure data is required, which can be logged with a HOBO Water Level Data Logger (U20-001-04).

In what environment does this data logger operate?

This data logger operates in an underwater environment.

What measurements does this data logger support?

The U26-001 data logger supports the following measurements: Dissolved Oxygen and Temperature

Detailed Specifications

HOBO Dissolved Oxygen Data Logger

Dissolved Oxygen	
Sensor Type:	Optical
Measurement Range:	0 to 30 mg/L
Calibrated Range:	0 to 20 mg/L; 0 to 35°C (32 to 95°F)
Accuracy:	± 0.2 mg/L up to 8 mg/L; ± 0.5 mg/L from 8 to 20 mg/L
Resolution:	0.02 mg/L
Response Time:	To 90% in less than 2 minutes
DO Sensor Cap Life:	6 months, cap expires 7 months after initialization
Temperature	
Temperature Measurement/Operating Range:	-5 to 40°C (23 to 104°F); non-Freezing
Temperature Accuracy:	0.2°C (0.36°F)
Temperature Resolution:	0.02°C (0.04°F)
Response Time:	To 90% in less than 30 minutes
Logger	
Memory:	21,700 sets of DO and temperature measurements (64 KB total memory)
Logging Rate:	1 minute to 18 hours
Time Accuracy:	±1 minute per month at 0 to 50°C (32 to 122°F)
Battery:	3.6 V lithium battery; factory replaceable
Battery Life:	3 years (at 5 minute logging)
Download Type:	Optical

Depth Rating:	100 m (328 ft)
Wetted Materials:	Black Delrin®, PVC, EPDM o-rings, silicone bronze screws; rated for saltwater use
Size:	39.6 mm diameter x 266.7 mm length (1.56 x 10.5 inches)
Weight:	464 g (16.37 oz)
Environmental Rating:	IP68
CE	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).

www.onsetcomp.com • 1-800-LOGGERS (564-4377)

Hydrolab MS5 - Mulitparameter Mini Sonde

Lightweight multi-probe with four ports available for water quality sensors

The Hydrolab MS5 multiparamete
selection of Hydrolab sensors on
multiprobe designed for either prc
monitoring. Its compact housing f
space applications.

Product type:	Attended
Parameters measured:	Tempera Dissolvec Turbidity, Rhodami Chloride
Product highlights:	The Hydr sensor pc well
Interface:	SDI-12, R!

Request a quote or advice

Advantages | Resources | Sensors | Accessories | Technical Data

Download PDF

Sensors	**Measures up to 10 parameters simultaneously**
Electrical	
Internal	8 AA batteries (with available internal battery pack option)
Communications	RS-232, SDI-12, RS-485
Memory	Up to 120,000 measurements
User Interface	
PC Software	Hydras3 LT
Pocket PC Software	(Optional) TDS Recon with Hydras 3 LT Pocket
General	
Sonde Depth Rating	200 m (656 ft)
Diameter	4.4 cm (1.75 in.)

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list in this proceeding in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure.

Dated at Washington, D.C. this 18th day of December, 2019.

/s/ Carlos L. Sisco
Carlos L. Sisco
Senior Paralegal
Winston & Strawn LLP
1700 K Street, N.W.
Washington, DC 20006-3817
202-282-5000