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

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US Department of the Interior
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Ms. Lindy Nelson
Regional Environmental Officer, Office of Environmental Policy & Compliance
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Philadelphia, PA 19106

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

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Chief, Endangered Species - Northeast Region (Region 5)
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Hadley, MA 01035

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US House of Representatives
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Byllesby/Buck Hydroelectric Project (FERC No. 2514)
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Washington, DC 20510

State Agencies

Dr. Elizabeth Moore
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Steve.Truitt@carrollcountyva.gov

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townoffries@friesva.com

Mr. C. M. Mitchell
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111 East Grayson Street
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996 Avenue of the Nations
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Elizabeth Toombs
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Byllesby/Buck Hydroelectric Project (FERC No. 2514)
Distribution List

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Chief Richard Sneed
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Chief Dean Branham
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Administration
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Mr. Steve Moyer
Vice President for Government Affairs
Trout Unlimited
1777 N. Kent Street, Suite 100
Arlington, VA 22209

BYLLESBY-BUCK HYDROELECTRIC PROJECT
FERC PROJECT NO. 2514
NOTICE OF INTENT TO FILE APPLICATION FOR NEW LICENSE

Appalachian Power Company ("Appalachian" or "Licensee"), a unit of American Electric Power (AEP) and the Licensee of the existing Byllesby-Buck Hydroelectric Project (FERC Project No. 2514), hereby notifies the Federal Energy Regulatory Commission ("FERC" or "Commission") of its intent to file an Application for New License for the Byllesby-Buck Hydroelectric Project.

Pursuant to 18 C.F.R. §5.5(b) of the Commission's regulations, Appalachian provides the following information:

(1) Licensee's Name, Address, and Phone Number:

Appalachian Power Company
40 Franklin Road SW
Roanoke, VA 24011
Phone: (540) 985-2441

(2) FERC Project Number:

FERC Project No. 2514

(3) License Expiration Date:

February 29, 2024

(4) Statement of Intent to File Application for New License:

Appalachian hereby unequivocally declares its intent to file an Application for New License for the Byllesby-Buck Hydroelectric Project on or before February 28, 2022. Appalachian will utilize the Commission's Integrated Licensing Process (ILP) in support of this relicensing.

(5) Principal Works of the Byllesby-Buck Hydroelectric Project:

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 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 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 Buck development consists of 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 crest gates, and six 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 three generating units with a total installed capacity of 8.5 MW; and (5) appurtenant facilities.

(6) Project Location:

The Byllesby-Buck Project is located on the upper New River near the City of Galax, Carroll County, Virginia.

(7) Plant Installed Capacity:

The Project's installed capacity is 30.1 MW.

(8)(i) The names and mailing addresses of every county in which any part of the project is located and in which any federal facility that is used by the project is located are:

Steve Truitt
County Administrator
Carroll County
P.O. Box 515
Hillsville, VA 24343

There are no federal lands or facilities associated with the Project.

(8)(ii)(A) The names and mailing addresses of every city, town, or similar political subdivision in which any part of the project is or is to be located and any federal facility that is or is to be used by the project is located:

Mayor
City of Galax
123 North Main Street
Galax, Virginia 24333

There are no federal lands or facilities associated with the Project.

(8)(ii)(B) The names and mailing addresses of every city, town, or similar political subdivision that has a population of 5,000 or more people and is located within 15 miles of the Project dam:

Rex Hill
Sulphur Springs District Supervisor
Carroll County Government Center
605 Pine Street
Hillsville, VA 24343

Thomas Littrell
Pipers Gap District Supervisor
Carroll County Government Center
605 Pine Street
Hillsville, VA 24343

Phil McGraw
Fancy Gap District Supervisor
Carroll County Government Center
605 Pine Street
Hillsville, VA 24343

Keith Barker
City Manager
111. East Grayson Street
Galax, VA 24333

Coy McRoberts
District No. 5 – Lead Mines Supervisor
222 Sipe Lane
Ivanhoe, VA 24350

Steven Willis
District No. 3 – East Wytheville Supervisor
35 Jackson Circle
Wytheville, VA 24382

Ranny O'Dell
Ingles District Supervisor
143 3rd Street NW
Suite 1
Pulaski, VA 24301

Dean Pratt
Draper District Supervisor
143 3rd Street NW
Suite 1
Pulaski, VA 24301

Charles Bopp
Robinson District Supervisor
143 3rd Street NW
Suite 1

Pulaski, VA 24301

(8)(iii) The names and mailing addresses of every irrigation district, drainage district, or similar special purpose political subdivision (A) in which any part of the project is located, and any federal facility that is or is proposed to be used by the project is located, or (B) that owns, operates, maintains, or uses any project facility or any federal facility that is or is proposed to be used by the project:

There are no irrigation or drainage districts or similar special purpose political subdivisions associated with or in the general area of the Project. There are no federal lands or facilities associated with the Project.

8(iv) The names and mailing addresses of every other political subdivision in the general area of the project that there is reason to believe would likely be interested in or affected by the notification:

There are no other political districts or subdivisions that are likely to be interested in or affected by the notification.

8(v) The names and mailing addresses of affected Indian Tribes:

Chief Richard Sneed
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Elizabeth Toombs
Cherokee Nation
P.O. Box 948
Tahlequah, OK 74465
elizabeth-toombs@cherokee.org

United Keetoowah Band of Cherokee Indians
Attention: Administration
P.O. Box 746
Tahlequah, OK 74465

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

Deborah Dotson, President
Delaware Nation
P.O. Box 825
Anadarko, OK 73005

Chief Dean Branham
Monacan Indian Nation
P.O. Box 1136
Madison Heights, VA 24572

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

Appalachian is filing this Notice of Intent (NOI) concurrently with a Pre-Application Document (PAD). In accordance with 18 C.F.R. §5.5(c), the Licensee is sending notification of these filings to the distribution list included in Appendix A of the PAD; the list includes applicable resource agencies, local governments, Indian Tribes, and non-government organizations.

In accordance with 18 C.F.R. §5.5(e), Appalachian is requesting designation as the non-federal representative for consultation under Section 7 of the Endangered Species Act and Section 106 of the National Historic Preservation Act.

If there are any questions concerning this NOI or the PAD, please contact the undersigned at the address or telephone number listed.

Respectfully submitted,

Robert A Gallimore

Robert A. Gallimore
Plant Manager Hydro
c/o Ms. Elizabeth Parcell
Process Supervisor
c/o American Electric Power Service Corporation
40 Franklin Road SW
Roanoke, VA 24011
(540) 985-2441
ebparcell@aep.com

PRE-APPLICATION DOCUMENT

Byllesby-Buck Hydroelectric Project
FERC NO. 2514

Appalachian Power Company

January 2019

BYLLESBY-BUCK HYDROELECTRIC PROJECT
FERC PROJECT NO. 2514
PRE-APPLICATION DOCUMENT

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LIST OF ACRONYMS

μS/cm	microsiemens per centimeter
°C	degrees Celsius
°F	degrees Fahrenheit
ac-ft	acre-feet
AEP	American Electric Power
AIR	Additional Information Request
ADA	Americans with Disabilities Act
APE	area of potential effect
CEII	Critical Energy Infrastructure Information
CRMP	Cultural Resources Management Plan
CFR	Code of Federal Regulations
cfs	cubic feet per second
CFU	colony-forming units
cm	centimeter
CWA	Clean Water Act
DO	dissolved oxygen
EA	Environmental Analysis
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EPRI	Electric Power Research Institute
EPT taxa	Ephemeroptera, Plecoptera, and Trichoptera
FERC or Commission	Federal Energy Regulatory Commission
FPA	Federal Power Act
hp	horsepower
HUC	hydrologic unit
Hz	Hertz
ILP	Integrated Licensing Process
kW	kilowatt
kV	kilovolt
mg/L	milligram per liter
mi^2	square mile

ml	milliliter
MW	megawatt
MWh	megawatt hour
NEPA	National Environmental Policy Act
NGO	non-governmental organization
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPS	National Park Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NTU	nephelometric turbidity unit
PAD	Pre-Application Document
pH	Acidity/alkalinity scale
PM&E	protection, mitigation, and enhancement
PFO	palustrine forested
PEM	palustrine emergent
PSP	Proposed Study Plan
PSD	Proportional Size Distribution
PURPA	Public Utility Regulatory Policies Act of 1978
RM	river miles
rpm	rotations per minute
RSP	Revised Study Plan
RTE	rare, threatened, and endangered
SD1	Scoping Document 1
SD2	Scoping Document 2
Section 106	Section 106 of the National Historic Preservation Act of 1966
SHPO	State Historic Preservation Office
STORET	STOrage and RETrieval (USEPA)

TCP	traditional cultural properties
TSS	total suspended solids
TMDL	Total Maximum Daily Load
umhos/cm	micromhos per centimeter
USC	United States Code
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
V	Volts
VDACS	Virginia Department of Agriculture and Consumer Services
VDEQ	Virginia Department of Environmental Quality
VDCR	Virginia Department of Conservation and Recreation
VDGIF	Virginia Department of Game and Inland Fisheries
VWPP	Virginia Water Protection Permit
WQMIRA	Water Quality Monitoring, Information, and Restoration Act (Virginia)

Section 1
Introduction and Background

Appalachian Power Company (Appalachian), a unit of American Electric Power (AEP), is the Licensee, owner, and operator of the two-development Byllesby-Buck Hydroelectric Project (Project) (Project No. 2514), located on the upper 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. Each development consists of a reservoir, concrete gravity dam and spillway, and powerhouse. The Project was constructed in 1912 and has been operated by Appalachian for hydroelectric power generation since 1926. Today the Project is operated by Appalachian in a run-of-river manner, utilizing upper New River inflows to provide up to 30.1 megawatts (MW) of renewable capacity.

The Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission) under the authority granted to FERC by Congress by the Federal Power Act (FPA), 16 United States Code (USC) §791(a), et seq., to license and oversee the operation of non-federal hydroelectric projects on jurisdictional waters. The Project underwent relicensing in the early 1990s, including conversion to run-of-river operations and incorporating additional protection, mitigation, and enhancement (PM&E) measures. The current operating license for the Project expires on February 29, 2024. In accordance with FERC's regulations at 18 Code of Federal Regulations (CFR) §16.9(b), Appalachian must file its application for a new license with FERC no later than February 28, 2022.

In support of preparing an application for a new license, Appalachian has elected to use the Commission's Integrated Licensing Process (ILP). The ILP is designed to bring efficiencies to the licensing process by integrating the applicant's pre-filing consultation activities with FERC's National Environmental Policy Act (NEPA) scoping responsibilities. The Licensee believes that the ILP will be the most effective and efficient process for this relicensing by providing a transparent and collaborative means of developing targeted, focused study plans that provide updated information where needed and, where appropriate, make use of historical or recent studies or ongoing environmental monitoring efforts. The ILP is formally initiated by Appalachian's filing with FERC this Pre-Application Document (PAD) and Notice of Intent (NOI) to relicense the Project. The PAD and NOI are distributed to federal and state resource agencies, local governments, Indian Tribes, and interested members of the public simultaneously with its filing with FERC. By regulation, Appalachian's PAD and NOI must be filed with FERC no earlier than August 29, 2018 and no later than February 28, 2019 (18 CFR §§5.5(d), 5.6(a)).

Under 18 CFR §5.8, FERC will review this PAD and associated NOI and, within 60 days of receipt, notice the commencement of the licensing proceeding, request comments on the PAD, and issue Scoping Document 1 (SD1). A public scoping meeting and site visit will then be conducted within 30 days of issuing SD1, or within 90 days of the submittal of the PAD.

Section 2
Purpose of the Pre-Application Document

The filing of this PAD and the associated NOI by Appalachian marks the formal start of the relicensing process for the Byllesby-Buck Project. The purpose of the PAD is to provide a description of the existing Project facilities and operations and to provide existing, relevant, and reasonably available information related to the Project area. Further, the PAD is intended to assist the Commission, resource agencies, Indian Tribes, non-governmental organizations (NGOs), and other interested parties to identify potential resource areas of interest and informational needs, to develop study requests, and to establish the information necessary to analyze the license application [18 CFR §5.6(b)].

2.1 Search for Existing, Relevant, and Reasonably Available Information

In support of preparing this PAD, HDR, Inc. (HDR), on behalf of and in collaboration with Appalachian, has undertaken an extensive search to identify and review information that is reasonably available and relevant to the Project. These efforts consisted of the following five primary activities:

1. A comprehensive search of Appalachian's files and documentation.
2. The distribution of a PAD information questionnaire to 55 parties requesting any information related to the Project, Project area, and the region.
3. A search and review of publicly available sources and databases.
4. Consultation with select resource agencies and other relicensing parties with potential information applicable to the Project area.
5. A review of the State of Virginia and Federal Comprehensive Plans relevant to the Project.

A copy of the PAD information questionnaire and associated distribution list is provided in Appendix A. Copies of completed questionnaires provided by Project stakeholders are included in Appendix B. Appalachian and HDR reviewed the responses and information applicable to the Project. Relevant information has been summarized in the applicable resource sections of this PAD.

2.2 Description of Consultation Process Undertaken by Appalachian Prior to the Submittal of the PAD

Appalachian performed preliminary consultation with potential stakeholders in support of preparing this PAD to obtain available information, to determine the potential relationship between stakeholders' interests and Project operations, and to identify potential information gaps and study needs in advance of the formal relicensing process.

Appalachian's preliminary consultation began with the identification of parties that may have an interest in the Byllesby-Buck Project relicensing. Based on the information obtained during this process, a stakeholder list of 55 parties was compiled and used as the distribution list for the PAD information questionnaire. Existing, relevant, and reasonably available information regarding the Project and the surrounding environment were requested. Parties were also requested to identify resource areas of interest.

Additionally, Appalachian has conducted initial consultation with (1) the Virginia Department of Conservation and Recreation's (VDCR) Natural Heritage Program and the U.S. Fish and Wildlife Service (USFWS) regarding rare, threatened, and endangered, species, (2) the Virginia Department of Environmental Quality's (VDEQ's) Federal Consistency Office to confirm that the Project is located outside the state's coastal zone, and (3) the Virginia Department of Game and Inland Fisheries (VDGIF) regarding available data to support the PAD and preliminary issues of interest or concern.

Section 3

Process Plan, Schedule, and Communication Protocol

3.1 Overall Process Plan and Schedule

Appalachian proposes to use the Commission's ILP in support of obtaining a new license for the Project. As presented in Table 3.1-1, Appalachian has prepared a Process Plan and Schedule that incorporates the overall ILP schedule for this relicensing.

Table 3.1-1
Byllesby-Buck ILP Process Plan and Schedule

Activity	Responsible Party	Timeframe	Proposed Date
File NOI and PAD (18 CFR §5.5(d))	Appalachian	As early as 5.5 years, but no later than 5 years prior to license expiration	1/7/2019
Initial Tribal Consultation Meeting (18 CFR §5.7)	FERC	No later than 30 days of filing NOI and PAD	2/6/2019
Issue notice of NOI/PAD and SD1 (18 CFR §5.8(a))	FERC	Within 60 days of filing NOI and PAD	3/8/2019
Conduct scoping meetings and site visit (18 CFR §5.8(b)(viii))	FERC	Within 30 days of NOI/PAD notice and SD1 issuance	4/4/2019 (Deadline is 4/7/2019)
Comments on PAD, SD1, and Study Requests (18 CFR §5.9(a))	Stakeholders	Within 60 days of NOI/PAD notice and issuance of SD1	5/7/2019
File Proposed Study Plan (PSP) (18 CFR §5.11)	Appalachian	Within 45 days of deadline for filing comments on PAD	6/21/2019
Issuance of Scoping Document 2 (SD2), if necessary (18 CFR §5.10)	FERC	Within 45 days of deadline for filing comments on SD1	6/21/2019
PSP Meeting (18 CFR §5.11(e))	Appalachian	To be held within 30 days of filing PSP	7/18/2019 (Deadline is 7/21/2019)
Comments on PSP (18 CFR §5.12)	Stakeholders	Within 90 days after PSP is filed	9/19/2019
File Revised Study Plan (RSP) (18 CFR §5.13(a))	Appalachian	Within 30 days of deadline for comments on PSP	10/19/2019
Comments on RSP (18 CFR §5.13(b))	Stakeholders	Within 15 days following RSP	11/3/2019
Issuance of Study Plan Determination (18 CFR §5.13(c))	FERC	Within 30 days of RSP	11/18/2019
Formal Study Dispute Resolution Process if requested (18 CFR §5.14(a))	Agencies with mandatory conditioning authority	Within 20 days of study plan determination	12/8/2019

Activity	Responsible Party	Timeframe	Proposed Date
Dispute Resolution Panel Convenes (18 CFR §5.14(d))	Dispute Resolution Panel	Within 20 days of notice of study dispute	12/28/2019
Comments on Study Plan Disputes (18 CFR §5.14(i))	Appalachian	Within 25 days of notice of study dispute	1/2/2020
Third Panel Member Selection Due (18 CFR §5.14(d)(3))	Dispute Resolution Panel	Within 15 days of when Dispute Resolution Panel convenes	1/12/2020
Dispute Resolution Panel Technical Conference (18 CFR §5.14(j))	Dispute Resolution Panel, Appalachian, Stakeholders	Prior to engaging in deliberative meetings	-
Dispute Resolution Panel Findings and Recommendations (18 CFR §5.14(k))	Dispute Resolution Panel	No later than 50 days after notice of dispute	1/27/2020
Study Dispute Determination (18 CFR §5.14(1))	FERC	No later than 70 days after notice of dispute	2/16/2020
Conduct First Season of Studies (18 CFR §5.15)	Appalachian	--	March to September 2020
Study Progress Reports (18 CFR §5.15(b))	Appalachian	Appalachian will provide summary updates every 3 months	June 2020 to September 2021
Initial Study Report (18 CFR §5.15(c))	Appalachian	Pursuant to the Commission-approved study plan and schedule provided in § 5.13 or no later than 1 year after Commission approval of the study plan	11/17/2020
Initial Study Report Meeting (18 CFR §5.15(c)(2))	Appalachian and Stakeholders	Within 15 days of filing the initial study report	12/2/2020
File Initial Study Report Meeting Summary (18 CFR §5.15(c)(3))	Appalachian	Within 15 days of study results meeting	12/17/2020
File Meeting Summary Disagreements (18 CFR §5.15(c)(4))	Stakeholders	Within 30 days of study results meeting summary	1/16/2021
File Responses to Meeting Summary Disagreements (18 CFR §5.15(c)(5))	Appalachian	Within 30 days of filing meeting summary disagreements	2/15/2021
Resolution of Disagreements (18 CFR §5.15(c)(6))	FERC	Within 30 days of filing responses to disagreements	3/17/2021
Conduct Second Season of Studies (if necessary)	Appalachian	--	March to September 2021

Activity	Responsible Party	Timeframe	Proposed Date
File Updated Study Report (18 CFR §5.15(f)) (if necessary)	Appalachian	Pursuant to the Commission-approved study plan and schedule provided in § 5.13 or no later than 2 years after Commission approval	11/17/2021
Updated Study Report Meeting (18 CFR §5.15(f)) (if necessary)	Appalachian and Stakeholders	Within 15 days of updated study report	12/2/2021
File Updated Study Report Meeting Summary (18 CFR §5.15(f)) (if necessary)	Appalachian	Within 15 days of updated study report meeting	12/17/2021
File Meeting Summary Disagreements (18 CFR §5.15(f))	Stakeholders	Within 30 days of study results meeting summary	1/16/2022
File Responses to Meeting Summary Disagreements (18 CFR §5.15(f)(5))	Appalachian	Within 30 days of filing meeting summary disagreements	2/15/2022
Resolution of Disagreements (18 CFR §5.15(f))	FERC	Within 30 days of filing responses to disagreements	3/17/2022
File Draft License Application (18 CFR §5.16(a))	Appalachian	No later than 150 days prior to the deadline for filing a new or subsequent license application	10/1/2021
Comments on Draft License Application (18 CFR §5.16(a))	Stakeholders	Within 90 days of filing Preliminary License Proposal or Draft License Application	12/30/2021
File License Application (18 CFR §5.17)	Appalachian	No later than 24 months before the existing license expires	2/28/2022
Tendering Notice (18 CFR §5.19)	FERC	Within 14 days of filing of License Application	3/14/2022
Commission Decision on Any Outstanding Pre-filing Additional Information Requests (AIRs) (18 CFR §5.19)	FERC	Within 30 days of filing of License Application	3/30/2022
Notice of Acceptance and Notice of Ready for Environmental Analysis (18 CFR §5.22)	FERC	Within 60 days of issuance of Tendering Notice	5/13/2022
File 401 Water Quality Certification Application with Virginia Department of Environmental Quality and proof of application with FERC (18 CFR §5.23)	Appalachian	Within 60 days of issuance of Notice of Ready for Environmental Analysis	7/12/2022

Activity	Responsible Party	Timeframe	Proposed Date
Comments, Interventions, Preliminary Terms and Conditions (18 CFR §5.23)	Stakeholders	Within 60 days of issuance of Notice of Acceptance and Ready for Environmental Analysis	7/12/2022
Parties Submit Alternatives	Stakeholders and Appalachian	Within 30 days of Comments, Interventions, Preliminary Terms and Conditions	8/11/2022
Parties Request Trial-Type Hearing	Stakeholders and Appalachian	Within 30 days of Comments, Interventions, Preliminary Terms and Conditions	8/11/2022
Reply Comments	Stakeholders and Appalachian	Within 45 days of Comments, Interventions, Preliminary Terms and Conditions	8/26/2022
Interventions and Responses	Stakeholders	Within 15 days of Parties Requesting Trial-Type Hearing	8/26/2022
Agency Response to Trial-Type Hearing	Mandatory Conditioning Agency	Within 30 days of Interventions and Responses	9/25/2022
Agency Hearing Referral	Mandatory Conditioning Agency	Within 5 days of agency response to trial-type hearing	9/30/2022
Trial-Type Hearing Decision	Mandatory Conditioning Agency	Within 90 days of agency hearing referral	12/29/2022
Commission issues Non-Draft Environmental Assessment (18 CFR §5.24)	FERC	Within 75 days of reply comments deadline	11/9/2022
Comments on Non-Draft EA (18 CFR §5.24)	Stakeholders	Within 30-45 days of Commission issuance of Non-Draft EA or Environmental Impact Statement (EIS)	12/24/2022
Modified Terms and Conditions Based on Any Hearing Decision, Comments, and Proposed Alternatives (18 CFR §5.24)	Stakeholders	Within 60 days of filing of comments on Draft EA or EIS	2/22/2023
Commission issues License Order (18 CFR §5.25)	FERC	--	2/28/2024

1. If the due date falls on a weekend or holiday, the deadline is the following business day.
2. All Director's determinations are subject to request for rehearing to FERC pursuant to 18 CFR § 375.301(a) and 385.713. Any request for rehearing must be filed within 30 days of determination.
3. Shaded actions are not necessary if there are no study disputes.
4. This schedule is based upon FERC's issuance of a Non-Draft EA. FERC can also issue a Draft EA, which would modify the schedule slightly.

3.2 Scoping Meeting and Site Visit

Pursuant to 18 CFR §5.8(b), FERC will hold a Scoping Meeting and Site Visit to the Project within 30 days of issuing notice of the PAD and NOI (estimated to be on or before April 7, 2019) in accordance with its responsibilities under NEPA. The Scoping Meeting will be held at a location to be selected by FERC in the general vicinity of the Project. FERC will issue a public notice regarding the Scoping Meeting and Site Visit that will include the meeting date, meeting location, and additional instructions for attending the meeting.

3.3 ILP Participation

Appalachian has provided this PAD to representatives of relevant agencies, local governments, Indian Tribes, NGOs, and members of the public included on the distribution list attached to the cover letter transmitting this PAD. Any party that desires to be added or removed from the distribution list should send a request to either of the individuals listed below:

Ms. Elizabeth Parcell
Process Supervisor
c/o Appalachian Power Company
40 Franklin Road SW
Roanoke, VA 24011
(540) 985-2441
ebparcell@aep.com

Mr. Jonathan Magalski
Environmental Specialist Consultant
c/o Appalachian Power Company
1 Riverside Plaza
Columbus, OH 43215
(614) 716-2240
jmmagalski@aep.com

3.4 Communication Protocol

During the course of the Project relicensing process, communication will take place through public meetings, conference calls, and written correspondence. In order to establish the formal consultation record, all phases of formal correspondence require adequate documentation. The intent of the Communication Protocol is to provide a flexible framework for the dissemination of information and for documenting consultation among the participants throughout the relicensing proceeding. The Communication Protocol will remain in effect until issuance of the Project's New License by the Commission.

3.4.1 Distribution of Relicensing Materials

Appalachian will distribute relicensing materials via email and/or by mailing notifications (to the established mailing list) of the availability of formal relicensing filings and documents online. If Appalachian has not been provided with a stakeholder's email address, Appalachian will mail notification of the availability of documents via regular mail. Documents filed with the Commission will be available on Appalachian's public relicensing website (www.aephydro.com) or from FERC's eLibrary at www.ferc.gov/docs-filing/elibrary.asp by searching under Docket P-2514.

Requests for hard copies of relicensing documents should be sent to Ms. Elizabeth Parcell using the contact information provided in Section 3.3 and should clearly indicate the document name, publication date (if known), and FERC Project No. 2514. A reproduction charge and postage costs may be assessed for hard copies requested by the public. Federal, state, and tribal entities will not be subject to document processing or postage fees.

Certain documents are restricted from general distribution. These documents include: (1) those covered under the FERC's regulations protecting Critical Energy Infrastructure Information (CEII) (18 CFR §388.113); (2) archaeological survey reports or other information identifying the locations of historic properties; and (3) reports that contain information regarding the locations of rare, threatened, or endangered (RTE) species.

3.4.2 FERC Communication

FERC has not yet designated a member of its staff to serve as the relicensing coordinator in support of this relicensing process. The role of the FERC relicensing coordinators will be in accordance with the rules and regulations for the ILP.

All communications to FERC regarding Project relicensing must reference the **Byllesby-Buck Hydroelectric Project FERC No. P-2514 - Application for New License**.

FERC strongly encourages paperless electronic filing of comments and interventions through its eFiling or eComment systems. Information and links to these systems can be found at the FERC webpage http://www.ferc.gov/docs-filing/ferconline.asp. In order to eFile comments and/or interventions, interested parties must have an eRegistration account. After preparing the comment or motion to intervene go to www.ferc.gov and select the eFiling link. Select the new user option and follow the prompts. Users are required to validate their account by accessing the site through a hyperlink sent to the registered email account.

An additional method to eFile comments is through the "Quick Comment" system available via a hyperlink on the FERC homepage. "Quick Comments" do not require the users to have a subscription; the comments are limited to 6,000 characters and all information must be public. Commenters are required to enter their names and email addresses. They will then receive an email with detailed instructions on how to submit "Quick Comments."

Stakeholders without internet access may submit comments to FERC at the address below via hard copy, but should be aware that documents sent to FERC by regular mail can be subject to docket-posting delays:

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

Section 4
Project Location, Facilities, and Operations

4.1 Authorized Agent

The exact name, business address, telephone number, and email address of each person authorized to act as an agent for Appalachian is listed below.

Mr. Robert A. Gallimore,
Plant Manager Hydro
c/o Ms. Elizabeth Parcell
Process Supervisor
c/o Appalachian Power Company
40 Franklin Road SW
Roanoke, VA 24011
(540) 985-2441
ebparcell@aep.com

4.2 Project Location

The Project is located on upper New River in Carroll County, Virginia, approximately 60 miles south-southwest of the city of Roanoke. The Byllesby development is located about 9 miles north of the City of Galax, and the Buck development is located approximately 3 RM downstream of Byllesby and 43.5 RM upstream of Claytor Dam. Figure 4.2-1 depicts the Project location and existing FERC Project boundary, which is also shown on the Exhibit G drawings included in Appendix C. Aerial views of the Project facilities, described in Section 4.3, are provided in Figure 4.2-2 and Figure 4.2-3.

Figure 4.2-1
Project Location Map

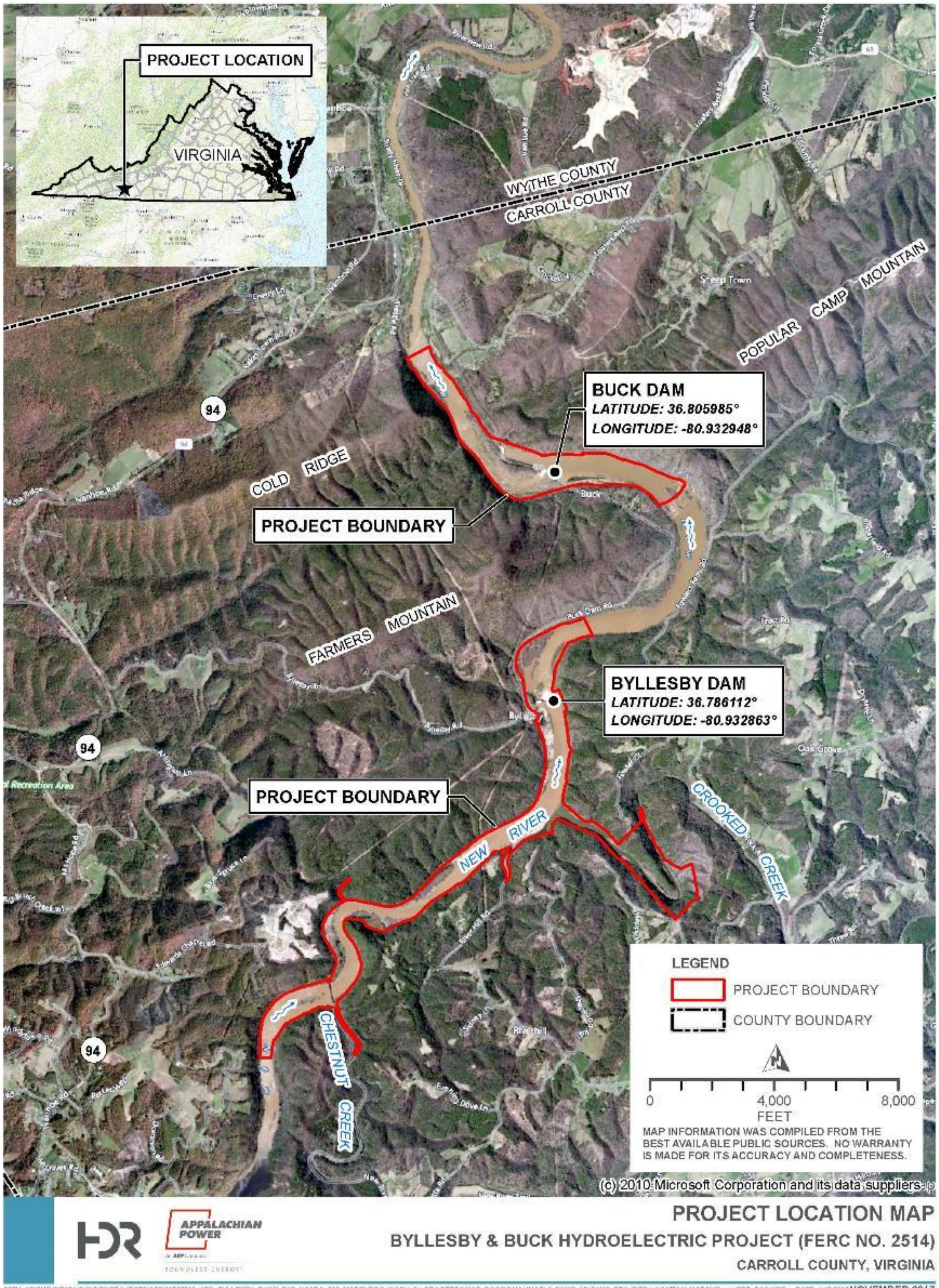


Figure 4.2-2
Byllesby Project Facilities

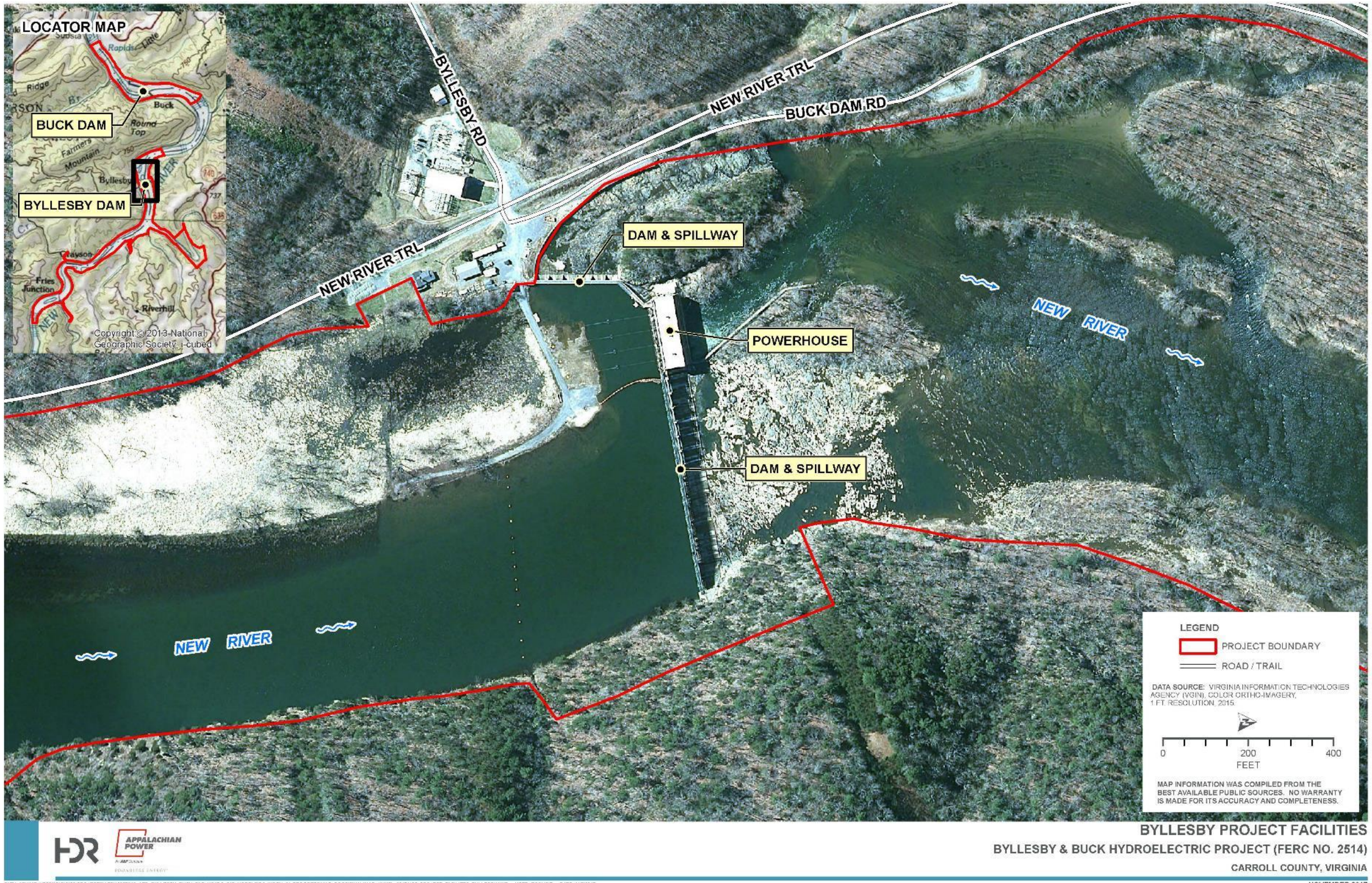
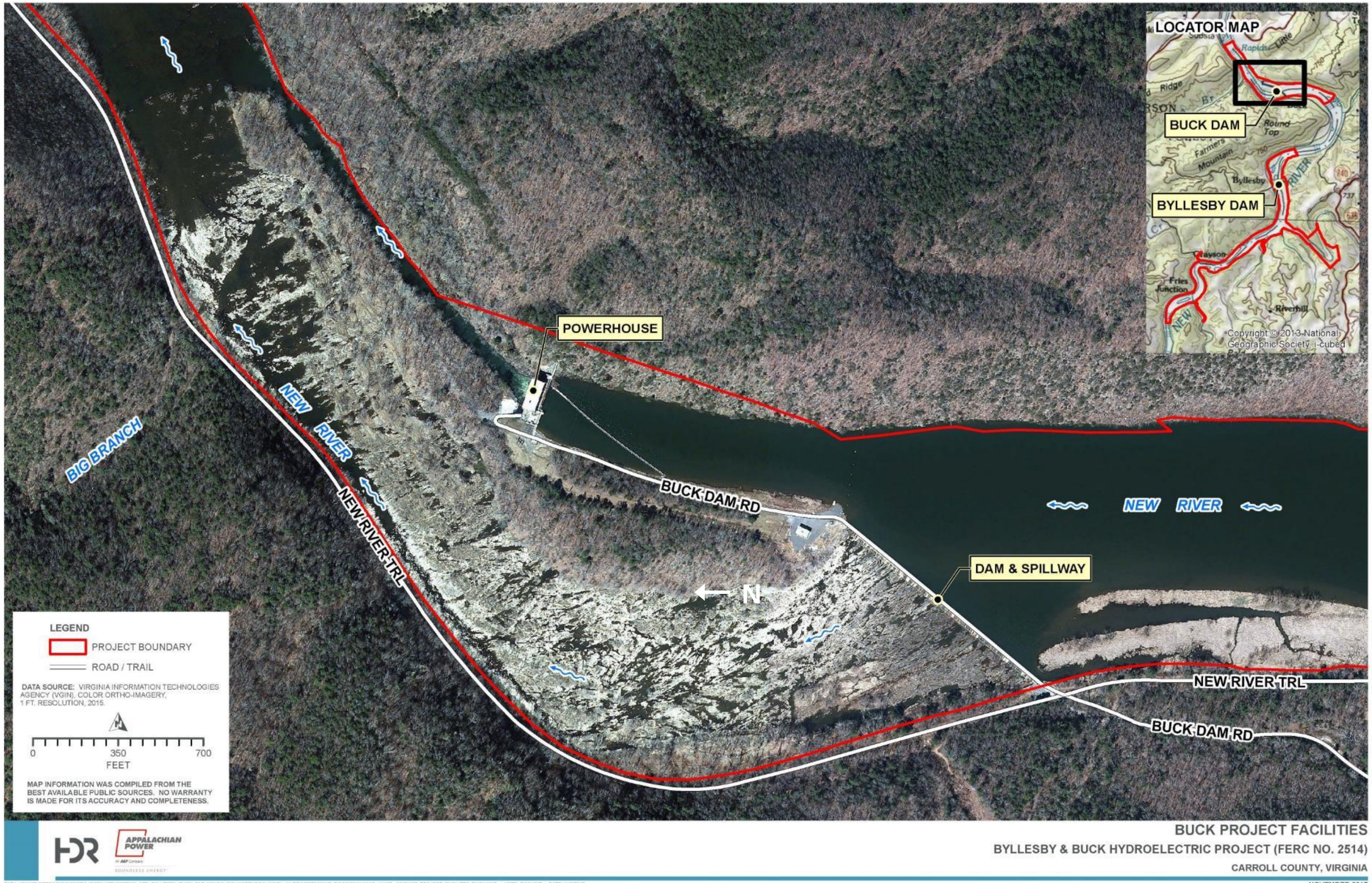


Figure 4.2-3
Buck Project Facilities



4.3 Project Facilities

As presently licensed, the Byllesby development consists of (1) a 64-ft-high, 528-ft-long concrete dam and main spillway section topped with four sections of 9-ft-high flashboards, five sections of 9-ft-high inflatable Obermeyer crest gates, and six bays of 10-ft-high Tainter gates; (2) an auxiliary spillway including six sections of 9-ft-high flashboards; (3) a 239-acre reservoir with a gross storage capacity of 2,000 acre-feet (ac-ft); (4) a powerhouse containing four generating units with a total authorized installed capacity of 21.6 MW; and (5) appurtenant facilities (FERC 2017).

As presently licensed, the Buck development consists of (1) a 42-ft-high, 353-ft-long concrete dam; (2) a 1,005-ft-long, 19-ft-high spillway section topped with 20 sections of 9-ft-high flashboards, four sections of 9-ft-high inflatable Obermeyer crest gates, and six bays of 10-ft-high Tainter gates; (3) a 66-acre reservoir with a gross storage capacity of 661 ac-ft; (4) a powerhouse containing three generating units with a total authorized installed capacity of 8.5 MW; and (5) appurtenant facilities (FERC 2017).

Each development is undergoing modification, as approved by an order amending license issued by FERC on May 18, 2017, 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 operations by reducing reservoir water level fluctuations and instances of inadvertent flow to the bypass reaches and reducing the frequency of maintenance drawdowns associated with wooden flashboard failure and replacement.[1]

The facilities and structures listed above are detailed further below, are depicted in Figure 4.2-2 and Figure 4.2-3, and are also depicted in the project drawings included in Appendix D, which is filed as CEII in accordance with 18 CFR §388.112. The median annual production for the Byllesby and Buck developments over the past 10 years is 41,752 megawatt hours (MWh) and 36,980 MWh, respectively.

While outside the scope of the FERC license, as additional information, in 2018, AEP, in partnership with Greensmith Energy (a Wärtsilä Company), completed installation of a 4-MW energy storage system integrated with the Byllesby and Buck developments. The storage system, which is composed of a lithium-ion battery and a software system that operates simultaneously with the powerhouses,

[1] Appalachian notes that in comments filed with Appalachian by VDGIF in February 2018 in response to Appalachian's request for comments on the then-proposed license amendment associated with these modifications, VDGIF stated, "Improved ability to manage water levels will benefit minimum flow management downstream, minimize potential water level fluctuations and associated shoreline erosion effects, and reduce inadvertent flow into the spillway (potentially attracting and exposing fish to stranding), thereby addressing resource agency concerns raised during the development of Article 401 of [the] current FERC operating license."

provides ancillary services to the PJM Interconnection and is the world's first hybridized system of its kind.

4.3.1 Reservoirs

4.3.1.1 Byllesby Development

The normal maximum surface area of the reservoir formed by the Byllesby dam is 239 acres at a normal maximum surface elevation of 2,079.2 feet (ft) National Geodetic Vertical Datum (NGVD), 1929. The corresponding gross storage capacity of the Byllesby reservoir is 2,000 ac-ft, and the usable storage capacity in the upper 5.2 ft of the pool is 1,153 ac-ft. Table 4.3-1 contains Byllesby development reservoir data. Since the formation of the reservoir in 1912, storage volume has decreased significantly, but the rate of sediment deposition appears to have decreased over time. As described in Appalachian (1991a), surveys made in 1990 indicate that usable storage volume had decreased approximately 20 percent since the reservoir was created. Also according to Appalachian (1991a), comparing a similar survey taken in 1986, sediment deposition over the period between the two surveys appeared minimal. Appalachian expects that sediment deposition and transport into, within, and out of the reservoir continues during high flow events, such that periodic dredging will continue to be required in specific, localized, areas for the benefit of Project operation. (Dredging projects in the forebay of the Byllesby reservoir were most recently completed by AEP in 1997 and 2014.) Refer to Section 5.2.7 for additional information.

Table 4.3-1
Byllesby Development Reservoir Data

Drainage area	1,310 square miles (mi^2)
Shoreline length	16.8 miles
Typical surface area	239 acres
Maximum Depth	35 ft
Permanent crest of dam elevation	2,071 ft NGVD
Typical normal surface water elevation	2,079.2 ft NGVD
Operations	Run-of-river
Gross Storage capacity	2,000 ac-ft

4.3.1.2 Buck Development

The normal maximum surface area of the reservoir formed by the Buck dam is 66 acres at normal maximum surface elevation of 2,003.4 ft NGVD. The corresponding gross storage capacity of the Buck reservoir is 661 ac-ft, and the usable storage capacity in the upper 8.4 ft of the pool is 579 ac-ft. Table 4.3-2 contains Buck development reservoir data. As noted above, while loss of reservoir storage due to sediment deposition has occurred since Project construction, the rate of sediment deposition appears to have stabilized over recent decades. According to Appalachian (1991a), total available storage between 1912 and 1990 decreased by approximately 20 percent at the Buck development. However, usable volume had not effectively changed. Appalachian (1991a) concluded that based on comparison of surveys conducted in 1986 and 1990, the rate of sediment accumulation within Buck reservoir had apparently stabilized. Refer to Section 5.2.7 for additional information.

Table 4.3-2
Buck Development Reservoir Data

Drainage area	1,320 mi^2
Shoreline length	5.8 miles
Typical surface area	66 acres
Maximum Depth	20 ft
Permanent crest of dam elevation	1995 ft NGVD
Typical normal surface water elevation	2,003.4 ft NGVD
Operations	Run-of-river
Gross Storage capacity	661 ac-ft

4.3.2 Dam and Spillway

4.3.2.1 Byllesby Development

The Byllesby facilities consist of a main dam/spillway topped with Tainter gates and flashboard sections, a powerhouse, and an emergency spillway surmounted by flashboards.

The main spillway extends across the New River perpendicular to the flow. The spillway is a solid, concrete, gravity-type structure approximately 528 ft long by 44 ft 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. Sections 1 through 5 and 9 are timber, and Sections 6 through 8 are inflatable Obermeyer crest gates (Photo 4.3-1). Each section is supported by reinforced-concrete piers and is approximately 31 ft, 4 inches wide. The flashboards have a total height of approximately 9 ft. As noted above, Appalachian is currently in the process of replacing additional wooden flashboards (Sections 4 and 5) with inflatable Obermeyer crest gates, each approximately 31 ft, 4 inches wide and approximately 9 ft high. Installation of the new gates/replacement of the flashboard sections is scheduled for completion in 2018. Installations of additional Obermeyer crest gates are not planned once Sections 4 and 5 are installed.

Photo 4.3-1
Obermeyer crest gates at Byllesby spillway

Adjacent to the flashboard sections are six Tainter gate bays (Photo 4.3-2). Each bay is approximately 31 ft, 4 inches wide and contains a steel gate of radius 11 ft, 3 inches 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 and can be remotely monitored and operated from AEP’s 24-hour control center located in Columbus, Ohio (Appalachian 2016). A propane-powered auxiliary generator is available in case of an electric outage. A steel-grated foot bridge supported by steel beams on the concrete piers runs the length of the main spillway.

Photo 4.3-2
Gated section of Byllesby spillway

The emergency spillway (Photo 4.3-3) is located upstream and to the west of the powerhouse, located to the west of the main spillway. The emergency spillway is connected to the powerhouse by an angled 77-ft-long non-overflow bulkhead (or “wingwall”) with a crest elevation of 2,085.0 ft and a structural height that varies from 24 ft to 43 ft. The emergency spillway is a concrete structure approximately 198 ft long and 6.5 ft high from toe to crest. It is topped by six spans of flashboards approximately 9 ft 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.

The emergency spillway discharges into a 600-ft-long channel, excavated from rock, which curves around and empties into the New River further downstream (Photo 4.3-4).

Photo 4.3-3
Byllesby emergency spillway dam

Photo 4.3-4
Flows through Byllesby emergency spillway channel during operation in March 2014

4.3.2.2 Buck Development

The Buck reservoir is impounded by the main dam and a gated spillway 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 ft high and 352 ft long and extends across the channel north of Mountain Island. The powerhouse is centered between the north and south sections of the main dam.

Photo 4.3-5
Buck powerhouse, log boom, and main dam,
as viewed looking downstream from reservoir

The gated spillway dam is located on the east upstream end of Mountain Island. This spillway, similar to the Byllesby spillway, is a solid, concrete, gravity-type structure approximately 1,005 ft long by 19 ft high from base to crest. The crest of the spillway is at elevation 1,995 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, pre-stressed 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, with widths of 31 ft, 10 inches and 32 ft, 10 inches, respectively. Adjacent to the flashboard sections are six Tainter gate bays. Each bay is approximately 31 ft, 4 inches wide and contains a steel gate of radius 11 ft, 3 inches 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 and can be remotely monitored and operated from AEP's 24-hour control center located in Columbus, Ohio (Appalachian 2016). A propane-fueled auxiliary generator is available in case of an electric outrage.

Photo 4.3-6
Buck spillway gates

Adjacent to the Tainter gate piers are 22 timber flashboard sections. Each section is supported by reinforced-concrete piers and is approximately 31 ft, 4 inches wide. The flashboards have a total height of approximately 9 ft. Appalachian plans to replace four wooden flashboard sections (Sections 3 through 6) with four inflatable Obermeyer crest gates, each 31 ft, 4 inches wide and approximately 9 ft high. Two sections (Nos. 3 and 4) were replaced in 2017, and two (Nos. 5 and 6) will be replaced in 2019.

4.3.3 Low-Level Outlets

4.3.3.1 Byllesby Development

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 ft, 10-1/4 inches wide by 5 ft high has since been installed in the slots of the western-most mud sluice, but this gate is not used.

4.3.3.2 Buck Development

At the time the project was constructed in 1912, two mud sluices and a vertical lift gate (of timber and steel beam construction, with an opening approximately 6 ft wide by 14 ft high.) were installed in the main dam, immediately adjacent to the north end of the powerhouse. The mud sluices are inoperable, and the vertical lift gate is not used.

4.3.4 Forebay and Intake

4.3.4.1 Byllesby Development

The intake section, located immediately upstream of the powerhouse, consists of four inlet bays. Each bay has a 14.5-ft-high by 23-ft-wide headgate, which is used during maintenance periods. A 3-ft-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 of the powerhouse. 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 ft wide and consisting of 3/8-inch by 3-1/2-inch steel bars. The bars are 47 ft, 6-3/8 inches long and are inclined toward the powerhouse at approximately 15 degrees to the vertical. The bars are spaced 2-21/32 inches center-to-center and have a cleared space of 2-9/32 inches.

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 ft long, is anchored on land at one end and adjacent to the vertical drop gate on the other end.

4.3.4.2 Buck Development

The Buck intake section, which is immediately upstream of the powerhouse, is of concrete construction and consists of three inlet bays. Each bay has a 14.5-ft-high by 23-ft-wide headgate which is used during maintenance periods. A 3-ft-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 of the powerhouse. 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 ft wide and consisting of 3/8-inch by 3-1/2-inch steel bars (Photo 4.3-7). The screen is 39 ft, 2-1/16 inches high and is inclined toward the powerhouse at approximately 15 degrees to the vertical. The bars are spaced 2-21/32 inches center-to-center and have a cleared space of 2-9/32 inches.

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 ft upstream of the main dam. The logboom spans approximately 620 ft and anchors at the other end, adjacent to the vertical lift gate.

Photo 4.3-7
Buck intakes and trashracks

4.3.5 Bypass Reach

4.3.5.1 Byllesby Development

The Byllesby development includes a short, 475-ft-long bypass reach consisting primarily of exposed bedrock and rock outcroppings. This reach normally receives only leakage flow, unless flows are being spilled at the dam or the flashboards are breached.

4.3.5.2 Buck Development

The Buck development has a 4,100-ft-long, steep bypass reach consisting of exposed bedrock (Photo 4.3-8). This reach normally receives only leakage flow, unless flows are being spilled at the dam or the flashboards are breached.

Photo 4.3-8
Buck bypass reach, as viewed looking downstream from the gated spillway

4.3.6 Powerhouse

4.3.6.1 Byllesby Development

The Byllesby powerhouse, west of the main spillway, is of a steel frame and brick construction on a concrete substructure. The upper level is approximately 166.5 ft by 50 ft, 9 inches 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.

The turbines discharge into a 250-ft-long, 100-ft-wide tailrace channel, which flows into the New River (Photo 4.3-9). Depth of the channel is fairly uniform downstream of the immediate vicinity of the powerhouse, averaging 6.5 to 10 ft.

Photo 4.3-9
Byllesby powerhouse tailrace, as viewed looking upstream from powerhouse tailrace

4.3.6.2 Buck Development

The Buck powerhouse is located at the main dam. The upper level is of steel frame and brick construction. It is approximately 130 ft long and 50 ft 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 (main) level of the powerhouse, with the turbine pits in the lower level.

The turbines discharge into a tailrace channel (Photo 4.3-10) that is approximately 1,700 ft long and 70 ft wide. The depth of the channel is fairly uniform downstream of the immediate vicinity of the powerhouse, averaging 6.5 to 10 ft at a point 160 ft downstream of the powerhouse.

Photo 4.3-10
Buck powerhouse and tailrace

4.3.7 Turbines and Generators

4.3.7.1 Byllesby Development

The Byllesby development includes four vertical Francis units. The turbine units were manufactured in 1912. As presently licensed, the Byllesby development has a total authorized installed capacity of 21.6 MW. However, this value is based on the capacity of the generators, which were the basis for installed capacity at the time of the last relicensing. Based on the installed nameplate ratings and the method now used by FERC to calculate authorized installed capacity (18 CFR §11.1(i)), the installed capacity for the Byllesby Development should be considered 18 MW.[2]

Table 4.3-3
Byllesby Development Turbine and Generator Nameplate Data

Turbines	
Number of Units	4
Type	Vertical Francis, K.P. Morris Co.
Design Head	49 ft
Rated Capacity	6,000 horsepower (hp) (4,500 kW) (each unit)
Minimum Discharge	73 cubic ft per second (cfs) (per unit)
Maximum Discharge	1,467 cfs (per unit)
Operating Speed	116 rotations per minutes (rpm)
Generators	
Type	Vertical configuration, General Electric Co.
Rated Capacity	5,400 kW (per unit)
Power Factor	0.9
Phase	3 PH (per unit)
Voltage	13,200 Volts (V) (per unit)
Frequency	60 Hertz (Hz) (per unit)
Synchronous Speed	116 rpm (per unit)

4.3.7.2 Buck Development

The Buck development includes three vertical Francis units. The original three turbine units were manufactured in 1912. Unit 2 was replaced in 2006. As presently licensed, the Buck development has a total authorized installed capacity of 8.5 MW. However, this value is based on the capacity of the generators, which were the basis for installed capacity at the time of the last relicensing. Based on the installed nameplate ratings and the method now used by FERC to calculate authorized installed

[2] Computations of installed capacity for the Byllesby and Buck developments described in this PAD are consistent with the August 7, 2018, Environmental Inspection Report issued by the FERC Atlanta Regional Office.

capacity (18 CFR §11.1(i)), the installed capacity for the Buck development should be considered 7.875 MW.

Table 4.3-4
Buck Development Turbine and Generator Nameplate Data

Turbines	
Number of Units	3
Type	Vertical Francis, I.P. Morris Co. (2) and American Hydro (1)
Design Head	34 ft
Rated Capacity	3,500 hp (2,625 kW) (each unit)
Minimum Discharge	60 cfs (per unit)
Maximum Discharge	1,180 cfs (per unit)
Operating Speed	97 rpm
Generators	
Type	Vertical configuration, General Electric Co.
Rated Capacity	2,835 kW (per unit)
Power Factor	0.9
Phase	3 PH (per unit)
Voltage	13,200 V (per unit)
Frequency	60 Hz (per unit)
Synchronous Speed	97 rpm (per unit)

The Project's single-line electrical diagram is included as Appendix D (CEII).

4.3.8 Transmission

4.3.8.1 Byllesby Development

There are no primary transmission lines associated with the Byllesby development. Appurtenant mechanical and electrical equipment required for efficient operation of the powerhouse includes 13.2-kilovolt (kV) generator leads to a 13.2-kV bus, the 13.2-kV bus, a 13.2-kV line from the bus to a 13.2/69 kV transformer, the 13.2/69 kV transformer, and the 69-kV connection from the transformer to the 69-kV transformer bus.

4.3.8.2 Buck Development

There are no primary transmission lines associated with the Buck development. Appurtenant mechanical and electrical equipment required for efficient operation of the powerhouse includes 13.2-kV generator leads to a 13.2-kV bus, the common 13.2-kV bus, and 13.2-kV lines from the bus to the 13.2-kV Byllesby/Ivanhoe lines.

4.4 Project Operations

4.4.1 Current 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, maintaining the elevation of the Byllesby reservoir between 2,078.2 ft and 2,079.2 ft NGVD and the Buck reservoir between 2,002.4 ft and 2,003.4 ft NGVD. 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. The frequency of spills to the bypass reaches during the period of record, as well as dry (2002) and wet (2013) years, is presented in Table 4.4-1. The values in the table below indicate the percentage of time in a given period where Project flows did not exceed the hydraulic capacity of the powerhouse, which is the same as the percentage of time where there would have been no spills to the bypass reach.

Table 4.4-1
Non-Exceedance Probability of Discharge to the Bypass Reaches at Byllesby and Buck Dams

	Byllesby (5,868 cfs)			Buck (3,540 cfs)		
	1986-2016	**2002**	**2013**	**1986-2016**	**2002**	**2013**
Annual	95.9%	99.2%	87.6%	87.1%	97.8%	64.5%
Jan	94.7%	100.0%	83.9%	81.9%	92.0%	67.6%
Feb	94.1%	100.0%	94.3%	81.1%	100.0%	83.1%
Mar	91.9%	94.0%	100.0%	74.6%	89.2%	74.1%
Apr	93.5%	100.0%	92.6%	75.2%	100.0%	36.6%
May	97.2%	100.0%	68.9%	84.9%	100.0%	33.7%
Jun	96.7%	100.0%	88.9%	90.2%	100.0%	58.5%
Jul	96.9%	100.0%	40.7%	94.0%	100.0%	2.0%
Aug	98.7%	100.0%	90.2%	95.6%	100.0%	26.2%

	Byllesby (5,868 cfs)			Buck (3,540 cfs)		
	1986-2016	2002	2013	1986-2016	2002	2013
Sep	97.7%	99.1%	100.0%	94.7%	95.7%	100.0%
Oct	97.5%	100.0%	100.0%	94.2%	100.0%	97.7%
Nov	96.9%	100.0%	100.0%	91.2%	100.0%	100.0%
Dec	96.2%	100.0%	100.0%	87.4%	100.0%	95.4%

Note: 2002 was the driest average year of the 30-year record. 2013 was the wettest average year of the 30-year record.

When inflow to either development exceeds the discharge capacity of the powerhouse (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 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 reservoir 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 emergency 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 license for the protection of fish resources downstream of the Buck spillway. The gradual reduction of flow allows fish to progressively leave the area, versus possible stranding at sudden flow discontinuation. Following periods of spill from the Buck spillway when a spillway gate has been opened 2 ft or more, Appalachian is required to discharge flows through a 2-ft-wide gate opening for at least three hours. Appalachian is then required to reduce the opening to 1 ft for at least an additional 3 hours, after which Appalachian may close the gate.

Tainter gate operation and generation at both Byllesby and Buck is remotely controlled from AEP's 24-hour control center located in Columbus, Ohio. Operators are stationed at the control center twenty-four hours per day, seven 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.

4.4.2 Proposed Operations

Appalachian is presently evaluating the feasibility and benefits of, and may propose within the license application to operate the developments with 1-foot-lower reservoir levels (i.e., still a 1-foot operating band, but with a 1-foot lower normal maximum and minimum reservoir elevations) during the winter months (e.g., December through March). The purpose of the lower winter reservoir 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 which occurred at the Project in January 2010. This proposed modification is not expected to significantly affect Project generation. No other changes to Project operations or facilities are proposed at this time.

4.4.3 Generation and Outflow Records

The Project operates in a run-of-river mode, and inflows to the Project are controlled by upstream flows. Table 4.4-2 provides a summary of monthly and annual average flows through the Byllesby-Buck Project (based on Byllesby development outflows) in cfs for the years 2012 to 2016. This period is considered to be representative of normal Project operations.

Table 4.4-2
Byllesby and Buck Monthly and Annual Average Project Outflows (cfs) (2012-2016)

Period	2012	2013	2014	2015	2016	Monthly Average
January	3,356	5,015	2,593	1,657	3,686	**3,261**
February	2,562	3,415	2,871	1,424	6,890	**3,432**
March	2,792	3,292	2,085	2,496	3,421	**2,817**
April	3,140	4,049	2,118	4,238	2,149	**3,139**
May	2,963	5,878	2,064	1,764	2,416	**3,017**
June	1,412	3,907	1,287	1,409	1,771	**1,957**
July	1,375	8,645	1,083	1,399	1,249	**2,750**
August	1,027	4,468	1,094	947	1,735	**1,854**
September	1,446	2,262	1,368	1,769	971	**1,563**
October	1,386	1,722	2,092	3,593	990	**1,957**
November	997	1,643	1,635	4,331	720	**1,865**
December	1,418	3,417	1,916	5,108	1,323	**2,636**
Annual Average	**1,990**	**3,976**	**1,851**	**2,511**	**2,277**	**2,521**

Table 4.4-3 provides a summary of monthly and annual Byllesby development generation in gross MWh for the past 5 years (2012 to 2016), and

Table 4.4-4 provides the same information for the Buck development. As shown in Table 4.4-3, the Byllesby development was offline from February 2013 until August 2014. Not including this period of time, average annual generation at the Byllesby development for this period was 36,906 MWh. Average annual generation at the Buck development for this period was 30,874 MWh.

Table 4.4-3
Byllesby Monthly and Annual Generation (MWh)
(2012-2016)

Period	2012	2013	2014	2015	2016	Monthly Average
January	6,251	3,374	0	3,778	6,757	4,032
February	5,237	0	0	3,026	3,976	2,448
March	5,876	0	0	5,457	7,270	3,721
April	6,425	0	0	3,866	4,324	2,923
May	5,476	0	0	3,847	5,649	2,994
June	3,005	0	0	2,887	3,215	1,821
July	2,755	0	0	2,897	1,822	1,495
August	1,983	0	460	1,980	2,662	1,417
September	2,536	0	1,833	2,282	1,129	1,556
October	2,792	0	2,106	4,166	1,400	5,967
November	2,088	0	2,431	3,742	1,046	7,088
December	2,458	0	3,927	5,114	2,849	9,649
Gross Annual Generated	**46,882**	**3,374**	**10,757**	**43,042**	**42,099**	**29,231**

Table 4.4-4
Buck Monthly and Annual Generation (MWh)
(2012-2016)

Period	2012	2013	2014	2015	2016	Monthly Average
January	4,864	3,817	2,248	3,006	5,366	3,860
February	3,961	1	3,771	2,226	4,563	2,904
March	4,531	410	4,155	4,545	5,941	3,916
April	4,307	810	4,100	3,317	3,937	3,294
May	5,025	641	3762	2,114	4,394	3,187
June	2,568	556	2063	2,255	2,986	2,086
July	2,518	451	1980	2,490	2,113	1,910

August	1,732	450	2077	1,531	2,609	1,680
September	2,114	449	1,276	2,001	583	1,285
October	2,219	1,872	0	4,081	1,170	1,868
November	1,451	1,788	0	5,265	1,056	1,912
December	2,280	3,633	2,062	4,618	2,261	2,971
Gross Annual Generated	**37,570**	**14,878**	**27,495**	**37,449**	**36,980**	**30,874**

4.4.4 Dependable Capacity

The estimated winter season dependable capacity for the Byllesby development is 8 MW, while the estimated summer season dependable capacity for the development is 5 MW. The estimated winter season dependable capacity for the Buck development is 5 MW, while the estimated summer season dependable capacity for the development is 3 MW. These estimates are based on the monthly project flow duration curves for the months of January (winter season) and August (summer season) and manufacturer’s data relative to equipment performance. Flow duration curves for January and August were chosen because peak demands for energy on the AEP system typically occur during these months (Appalachian 1991a).

4.5 Current License Requirements and Compliance History

4.5.1 Current License Requirements

The Project’s current license was issued by FERC on March 28, 1994, and most recently amended on May 18, 2017 (for the installation of the Obermeyer crest gates, as described above). The license is subject to the articles set forth in Form L-3 (October 1975), entitled “Terms and Conditions of License for Constructed Major Project Affecting Navigable Waters of the United States,” and the following additional articles summarized below:

- Article 401: Operate project in a run-of-river mode maintaining elevation of the Byllesby reservoir between 2,078.2 ft and 2,079.2 ft NGVD and the elevation of the Buck reservoir between 2,002.4 ft and 2,003.4 NGVD.
- Article 402: File a plan to monitor run-of-river operation under Article 401. (Plan approved by FERC order dated February 10, 1995.)
- Article 403: Minimum flow requirement of 360 cfs or inflow to the Project, whichever is less, to protect aquatic resources downstream of the Byllesby and Buck powerhouses.

- Article 404: Monitor minimum flows required by Article 403 until the plan required by Article 405 is in effect.
- Article 405: File a plan to monitor minimum flows required under Article 403. (Plan approved by FERC order dated February 10, 1995.)
- Article 406: File a plan to determine rate of change in spillway flows to protect the fishery resources of the New River downstream of the Buck spillway. (Ramping Rate Assessment Plan approved by FERC order dated February 27, 1995.)
- Article 407: Reservation of authority by FERC to prescribe fishway.
- Article 408: Implement Wildlife Management Plan filed on May 24, 1993, including provisions to annually inspect undeveloped land within the Project boundary for evidence of increased human disturbance, consult with VDGIF about activities that affect these lands and notify VDGIF of any unanticipated impacts within these lands, and monitor bank erosion. (Most recent Wildlife Management Plan 5-Year Report filed on November 12, 2015.)
- Article 409: Develop and implement a Cultural Resources Management Plan. (Final plan approved by FERC order dated July 18, 1996.)
- Article 410: Implement Cultural Resources Management Plan if historic or archaeological sites discovered.
- Article 411: File Recreation Plan. (Plan approved by FERC on July 3, 1995 and most recently amended by FERC order dated November 12, 2010.)
- Article 412: Monitor recreation use at the Project to determine the adequacy of existing recreation facilities and public safety measures and file a report on recreation monitoring in conjunction with the filing of FERC Licensed Hydropower Development Recreation Reports (Form 80s) for the Project every six years. (Note: this article was deleted by FERC order dated July 30, 2002.)

4.5.2 Compliance History

To the best of Appalachian’s knowledge and based on a review of historical records, Appalachian has been and continues to be in compliance with the applicable terms and conditions of the FERC license, and there have been no license violations or recurring situations of non-compliance over the license term.

Due to the licensed mode of operation, reservoir elevation limits, and the methods for spillway releases at the Project, Appalachian must periodically operate the Project in a manner that temporarily modifies normal reservoir operations, as allowed for by License Article 401.[3] Examples of such periods of modification, and in turn notification to FERC, include drawdown of the reservoirs for forecasted high inflows or Project maintenance. Such occurrences are reported to FERC and, in turn, determined by the Commission not to be violation of Article 401 of the license.

4.6 Current Net Investment

The current net investment in the Byllesby-Buck Project (as of 2018) is approximately $12.9 million. This value should not be interpreted as the fair market value of the Project.

4.7 Potential for New Project Facilities

While Appalachian does not presently propose any new Project facilities or upgrades, Appalachian continually evaluates the potential for such improvements. If Appalachian intends to propose any new Project facilities or upgrades in the final license application that would affect the scope of relicensing studies, Appalachian will inform the FERC and licensing participants of this proposal at a time early enough in the pre-filing consultation process to ensure that the effects of any new facilities or upgrades are appropriately evaluated as part of the relicensing process.

4.8 PURPA Benefits

Appalachian will not be seeking benefits under Section 210 of the Public Utility Regulatory Policies Act (PURPA) of 1978 for qualifying hydroelectric small power production facilities in §292.203 of this chapter.

[3] See *Appalachian Power Company*, 70 FERC ¶ 62,078 (1995).

Section 5
Description of Existing Environment and Resource Impacts

5.1 Description of the River Basin

The Byllesby and Buck developments lie within the upper New River Basin which extends from the Bluestone Dam near Hinton, West Virginia, to the headwaters of the New River's north and south forks in northwestern North Carolina near Blowing Rock. The drainage area is 1,310 mi^2 for the Byllesby development and 1,320 mi^2 for the Buck development and (Appalachian Power Company [Appalachian] 1991a). The New River Basin is divided into two USGS hydrologic units (HUCs). The Project is located in HUC 0505001 – Upper New (VDEQ 2015).

5.1.1 Stream Description

The New River originates in North Carolina at the confluence of the North Fork New River and the South Fork New River. It then flows northward for 320 miles through Virginia before entering West Virginia and flowing to the confluence of the Gauley River forming the Kanawha River, a tributary to the Ohio River. The New River flows through valleys ranging in width from 200 to 1,000 ft and has banks with precipitous bluffs and steep side slopes. This terrain and the steep gradient of the river produce a fast runoff and high flow velocities.

5.1.2 Major Land and Water Uses

The New River Basin is the least densely populated of Virginia's major river basins. The higher elevations in the basin have steep slopes and thick forests, while the lowlands are mostly used for agriculture. The land in the New River Basin is primarily forested (59 percent), with areas of cropland and pasture (35 percent) (VDEQ 2015). The general Project area consists primarily of deciduous forest with relatively small amounts of evergreen forest, pasture/hay fields, and other land covers (Figure 5.1-1). For the most part, the surrounding hillsides are heavily forested. The forest cover is of the oak-chestnut type with a noteworthy percentage of pine and other types such as hickory, hemlock, maple, ash, birch, rhododendron, locust and basswood (Appalachian 1991a).

A majority of the land to the west of the Project is owned by the U.S. Forest Service (USFS) and consists of the George Washington and Jefferson National Forest. The Mount Rogers National Recreation Area, a unit within the Jefferson National Forest and created in 1966, borders the Project to the west. There are no federal lands within the Project boundary. A map of federally-owned lands in the vicinity the Project (depicted in light green) is provided in Figure 5.1-2. These lands include approximately 100 acres of former Project lands that were transferred by Appalachian to the U.S. Forest Service in 1984, and subsequently removed from the Project boundary, as authorized by FERC order dated December 18, 1984.

Figure 5.1-1
Land Use and Cover Map

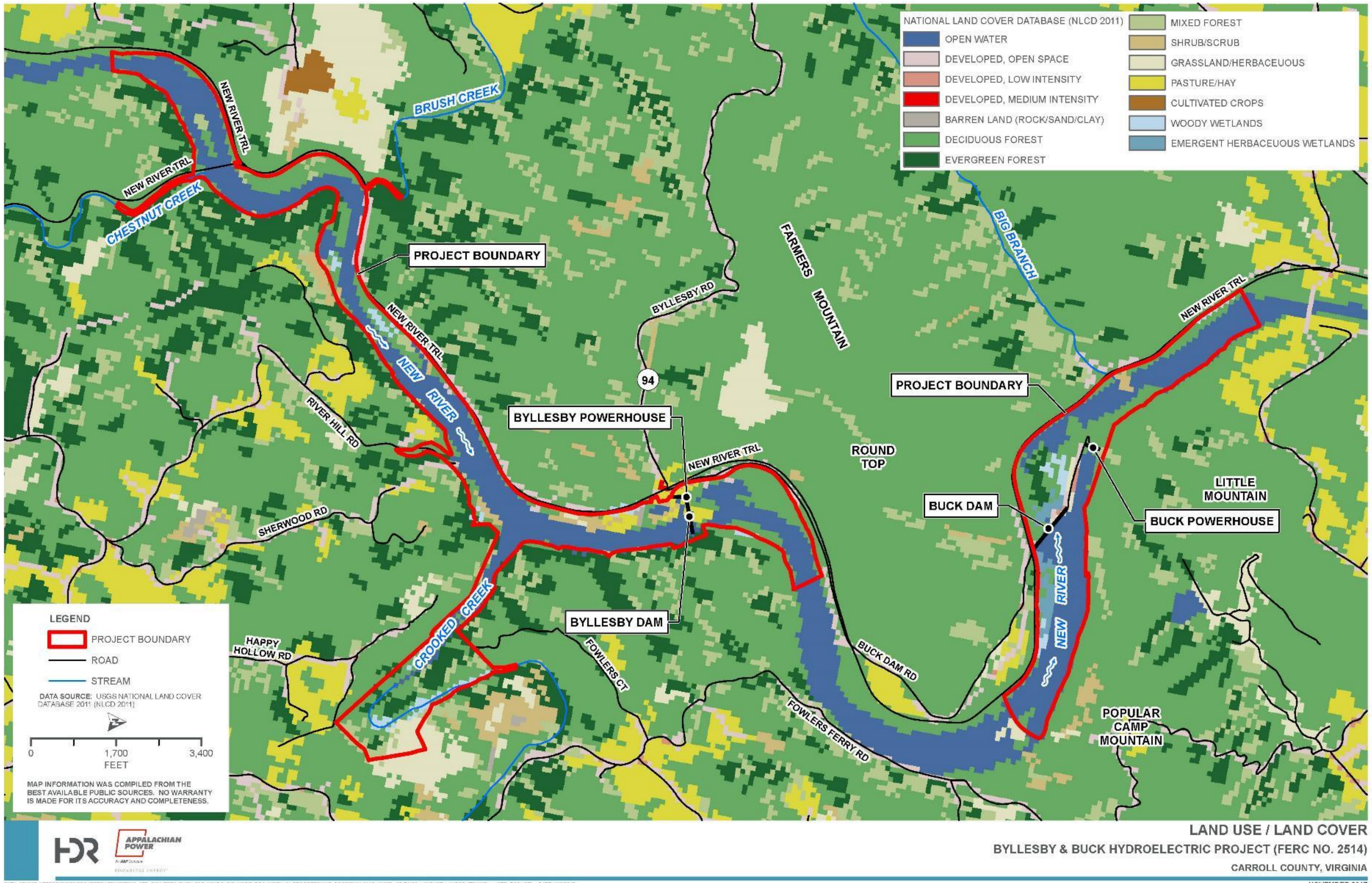
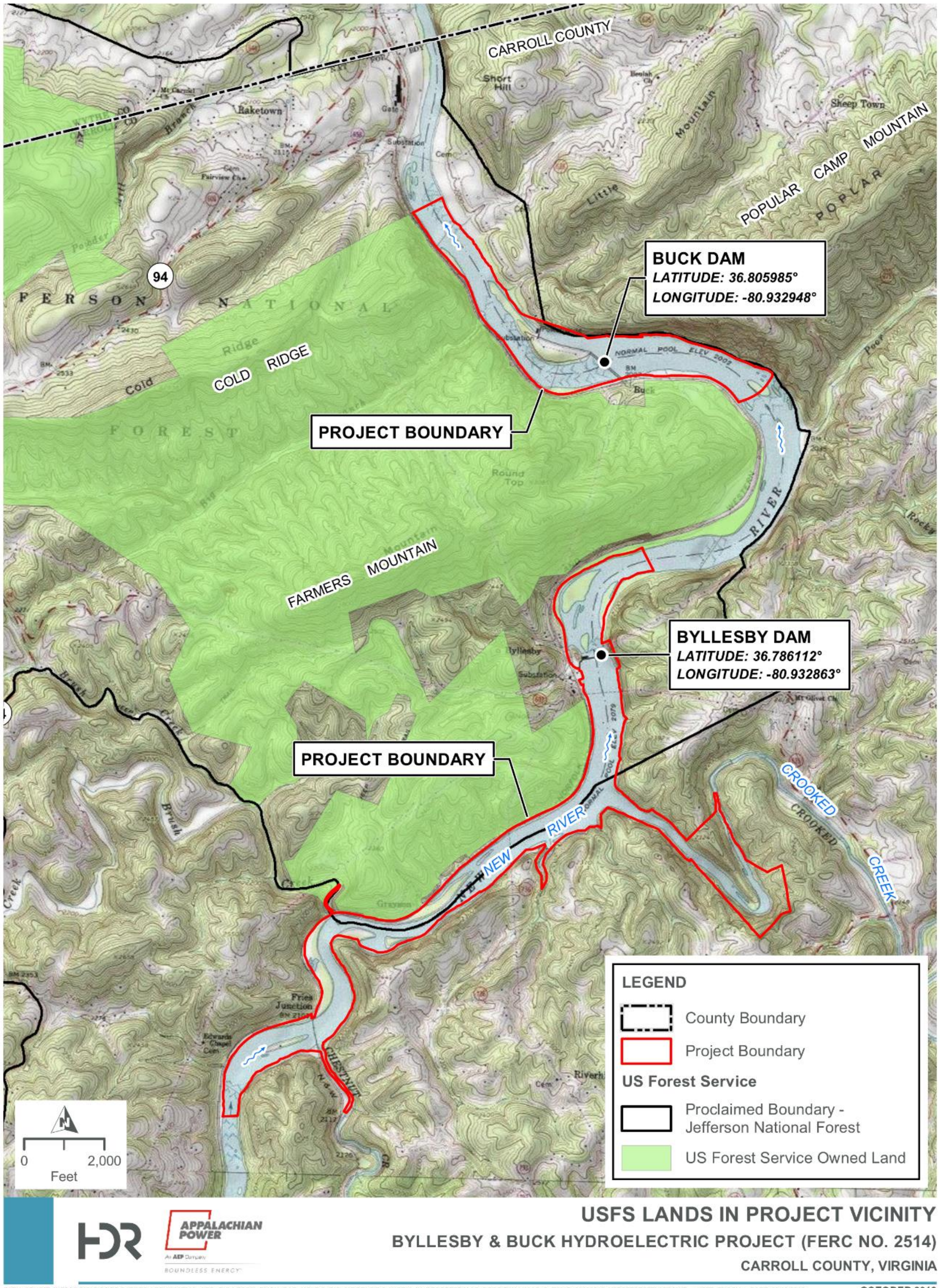


Figure 5.1-2
USFS Lands in Project Vicinity[4]



[4] As shown on this map, not all lands within the proclamation boundary of a National Forest are owned by the U.S. Forest Service. Privately held lands within a proclamation boundary, including land interests held

5.1.3 Dams and Diversion Structures within the Basin

There are a total of seven dams on the New River (Table 5.1-1). The non-FERC jurisdictional Fields Dam and the FERC jurisdictional Fries Dam are the only major dams located upstream of the Byllesby-Buck Project. There are three major dams located on the New River downstream of the Project, which are the Claytor (also owned and operated by Appalachian), Bluestone, and Hawks Nest dams.

Table 5.1-1
Land Use and Cover Map

Development/Dam	Owner	River	River Mile	FERC Project No.	Expiration of Current License	Capacity (MW)
Fields	Fields Electric	New	323	N/A	N/A	Unknown
Fries	Aquenergy Systems	New	303.6	P-2883	2020	5.2
Byllesby	Appalachian Power Company	New	295	P-2514	2024	21.6
Buck	Appalachian Power Company	New	292.3	P-2514	2024	8.5
Claytor	Appalachian Power Company	New	248.8	P-739	2041	75
Bluestone	U.S. Army Corps of Engineers (USACE)	New	162.4	N/A	N/A	N/A
Hawks Nest	Hawks Nest Hydro	New	103.57	P-2512	2064	102

5.1.4 Tributary Rivers and Streams

The major tributaries in the New River Basin include Indian Creek, the Bluestone River, and the Greenbrier River. Tributaries to the New River near the Byllesby-Buck Project include Big Branch, Poor Branch, and a couple of unnamed tributaries. The Project boundary of the Byllesby development extends up the lower reach of Crooked Creek, Brush Creek, and Chestnut Creek (see Figure 4.2-1 and the Project boundary map provided in Appendix C).

prior to the creation of the National Forest and not taken in condemnation proceedings, are termed "inholdings" and are not subject to provisions of the Federal Power Act for licensing projects on federal lands (see 54 FERC ¶61,132 [1991]).

5.2 Geology

5.2.1 Physiography and Topography

The Project area is located within the Southern Blue Ridge Physiographic Province on the Blue Ridge Plateau, an upland area generally ranging from about 2,000 to 3,000 ft above mean sea level. Numerous knobs, ridges, and mountain ranges rise to elevations of about 3,500 ft in the region. The Blue Ridge Escarpment, a southwest to northeast-trending range of mountains, separates the Blue Ridge Plateau from the Piedmont lowlands to the southeast (Appalachian 1991a).

The northwestern border of the Blue Ridge Plateau is formed by the southwest to northeast- trending Iron and Poplar Camp Mountains, beyond which lies a portion of the Great Valley, and extension of the Appalachian Valley. This area is known as the Valley and Ridge Physiographic Province (Appalachian 1991a).

The topography of the New River Basin is rugged, consisting of high mountains, narrow valleys, and steep ravines. This same description characterizes the area immediately surrounding the Project. The valley in which the Project is situated ranges from 700 to 1,000 ft in width and the adjacent slopes are steep with expanses of exposed rock (Appalachian 1991a).

5.2.2 Geological Features

The Blue Ridge Plateau begins narrowly just south of Roanoke, Virginia, and widens to nearly 50 miles, with Mount Rogers rising from the base. The Blue Ridge Plateau is a maturely dissected plain with rugged topography formed by numerous stream valleys that are 300 to 400 ft deep. The geologic structures comprising the region extend from the Roanoke, Virginia, area southwestward into Tennessee. The bedrock in this region has undergone folding and faulting (e.g., thrust faulting), which is apparent in cross-section. Thrust faults are shallow-dipping planar fractures which form in response to horizontal compressive stresses and oftentimes result in older rocks being placed on top of younger rocks. Lateral compression from the southeast formed these faults (as well as the northwestward displacements associated with them) during a mountain-building episode, or orogeny, during the late Paleozoic era (~200-245 million years ago). The original rocks from which these structures formed are of Precambrian and Cambrian age, and include igneous extrusive and intrusive rocks, sedimentary rocks, and several grades of derived metamorphic rocks. Overall, the regional geology of the Project area is quite complex, in part because the intense folding and southwest- to-northeast striking thrust faults have disrupted the original stratigraphic age relationships (Appalachian 1991a).

The effects of the late Paleozoic orogeny and subsequent erosion have resulted in the formation of parallel outcrops of rock ranging from less than one-tenth of a mile to several miles wide and extending many tens of miles trending in a southwest to northeast direction. The ages and geologic origins of adjacent rock units vary greatly and are often difficult to interpret due to overthrusting. Resistant rocks have formed ridges (i.e., sandstone and conglomerate) while less resistant rocks (i.e., limestone and shale) underlie valleys (Appalachian 1991a).

Although the Byllesby and Buck developments are within 1.2 miles of each other, they overlie different rock formations, both of Lower Cambrian age. The Byllesby development is founded on a locally mapped arkosic unit of the middle member of the Unicoi Formation, and the Buck development overlies the Erwin Quartzite, a slightly younger formation. These distinctions are explained below (Appalachian 1991a).

The Unicoi Formation occurs in a thin band about one mile wide, trending southwest to northeast between the Fries Overthrust to the southeast and the Byllesby Overthrust to the northwest. Approximately five miles southwest of the Byllesby development, the Unicoi Formation bifurcates into westward and southwestward trending branches as it traces around the plunging Elk Creek Anticline. The Byllesby development lies about 300 ft south of the Byllesby Overthrust. The Unicoi Formation contains arkosic, or feldspar-rich quartzite, shale, argillite, beds of conglomerate, and basalt flows. The middle member of this formation comprises the bedrock in the vicinity of the dam. Basalt flows with black argillite are present about 600 ft upstream of the dam, and a similar, locally mapped unit also containing arkose is found beneath the dam and on both abutments. The dam and its appurtenances are founded on bedrock because of very thin or absent soil cover in the area. The basalt is resistant to erosion and forms cliffs along the right side of the New River about one mile downstream of the dam (Appalachian 1991a).

Both abutments and the powerhouse of the Buck development are founded on interbedded thin quartzite and dark shale of the lowest member of the Erwin Quartzite Formation. When exposed, the thinly bedded, dark-banded quartzite of this member weathers to a rust color. It is of medium hardness and is less resistant to weathering and erosion than the next younger member of the formation, known as the Ridge-making member. This Ridge-making member forms the caps of Farmer Mountain and Round top, about 0.7 miles southwest of the dam, and extends eastward forming prominent ledges along the river upstream of the Buck powerhouse. These ledges create falls in the river upstream (Appalachian 1991a).

5.2.3 Seismicity

Most faults and fault sequences in the state of Virginia are considered inactive. Earthquakes that have occurred in the region are associated with three major seismic zones including the Central Virginia Seismic Zone, the Giles County Seismic Zone, and the Eastern Tennessee Seismic Zone. The Giles

County Seismic Zone borders the state of West Virginia in Southwestern Virginia and extends into the New River Valley, which includes Carroll County (Virginia Division of Geology and Mineral Resources 2015b).

5.2.4 Mineral Resources

Sandstone and quartzite are quarried in Carroll County for production of roadstone, concrete aggregate, asphalt stone, and manufactured fine aggregate (Virginia Division of Mineral Resources 1998). In the Blue Ridge Province, copper has been found in massive-sulfide zinc- and copper-bearing pyrrhotite deposits in the Late Precambrian Ashe Formation in Carroll County (Virginia Division of Geology and Mineral Resources 2015a).

5.2.5 Project Area Soils

The soils surrounding the Byllesby and Buck developments vary in depth from shallow to deep and include residuum from sandstone, granite, or greenstone. In the immediate Project area, soils consist of the Weikert and Ramsey soils series and are typified by high erosion potential.

The Weikert series consists of shallow, well-drained soils formed in material that weathered from interbedded gray and brown acid shale, siltstone, and fine-grained sandstone on gently sloping to very steep areas on uplands. Slopes range from 0 to 100 percent and permeability is moderately rapid (USDA 2009).

The Ramsey series consists of shallow and very shallow, somewhat excessively drained soils that formed in residuum or colluvium weathered from sandstone or quartzite. They are dominantly on plateaus and upper slopes of mountains. Runoff is moderate to rapid, permeability is rapid, and slopes range from 3 to 70 percent (USDA 2001).

The presence and operation of the Project has historically led to sediment deposition and accumulation in the reservoirs; however, as described in Section 4, the rate of sediment deposition has stabilized over recent decades. An extensive sedimentation study was conducted by Appalachian for the relicensing of the Claytor Project. As summarized in Appalachian's sedimentation study (2008), the New River carries a large amount of sand as bed material and suspended (during high flows) sediment from its headwaters to Claytor Lake. These high sand loads have filled the reservoir created by Fields Dam, and deposits extend past the Highway 94 Bridge near Galax. Downstream of Fields Dam, the reservoir formed by Fries Dam is also characterized by high rates of sediment deposition, requiring periodic "flushing" to remove sediment from the power bay of the dam. Downstream of Fries Dam, high sediment loads and bed sedimentation continue through to the Byllesby-Buck Project. Watershed sedimentation modeling completed for the Claytor study concluded that the run-of-river Byllesby-Buck reservoirs have little retention capacity, such that the transport-limited conditions of the New River are not removed until sediment reaches the Claytor Project, where it enters long-term storage.

Findings of this study included the following (Appalachian, 2008):

- Sedimentation occurred throughout Claytor Lake but was most pronounced in bays, coves, and tributary inlets, where sediments included a mixture of coarser sand and gravel from upstream channel sources, fine sediments from upland soil erosion, and organic matter deposits from terrestrial and aquatic sources.

- Due to the prevalence of bedrock and stable shorelines in Claytor Lake, shoreline erosion was not found to be significant sediment source to the Claytor Project.

- The largest source of contemporary sediment was determined to be soil erosion from watershed disturbances, primarily from agricultural lands.

A sedimentation study, consisting of desktop assessment and a field survey of the reservoir to try to estimate current storage volume, was also conducted for the Fries Project relicensing (Kleinschmidt 2017). The results of this study demonstrated the difficulty of comparing impoundment storage capacity measurements due to error introduced by different survey methods: the results of the study (presumably erroneously) suggested an increase in storage volume compared to historical surveys. The authors of this study report suggested that the Fries reservoir has likely reached a period of sediment balance, where sediment is passing the dam (Kleinschmidt 2017).

5.2.6 Shoreline and Stream Banks

In the Project area, the New River has carved moderately steep valley walls, ranging in height from about 50 ft to several hundred ft (FERC 1994b). Soils along the Project shoreline largely consist of steep to very steep, very stony Ramsey soil or quartzite rock. Because much of the shoreline is exposed bedrock, the limited extent and total thickness of soils limits the depth of erosion and slips, and such areas are expected to be limited to areas where vegetation cover is absent. Established vegetative cover is extensive along the shorelines of the Project, which helps to limit the extent and severity of erosion and movement of soils in the Project area that otherwise have high erosion potential. Additionally, accumulation of sediment along some portions of the Project shorelines has formed permanent riparian wetland communities, providing additional protection against shoreline erosion.

5.2.7 Known or Potential Adverse Effects and Proposed PM&E Measures

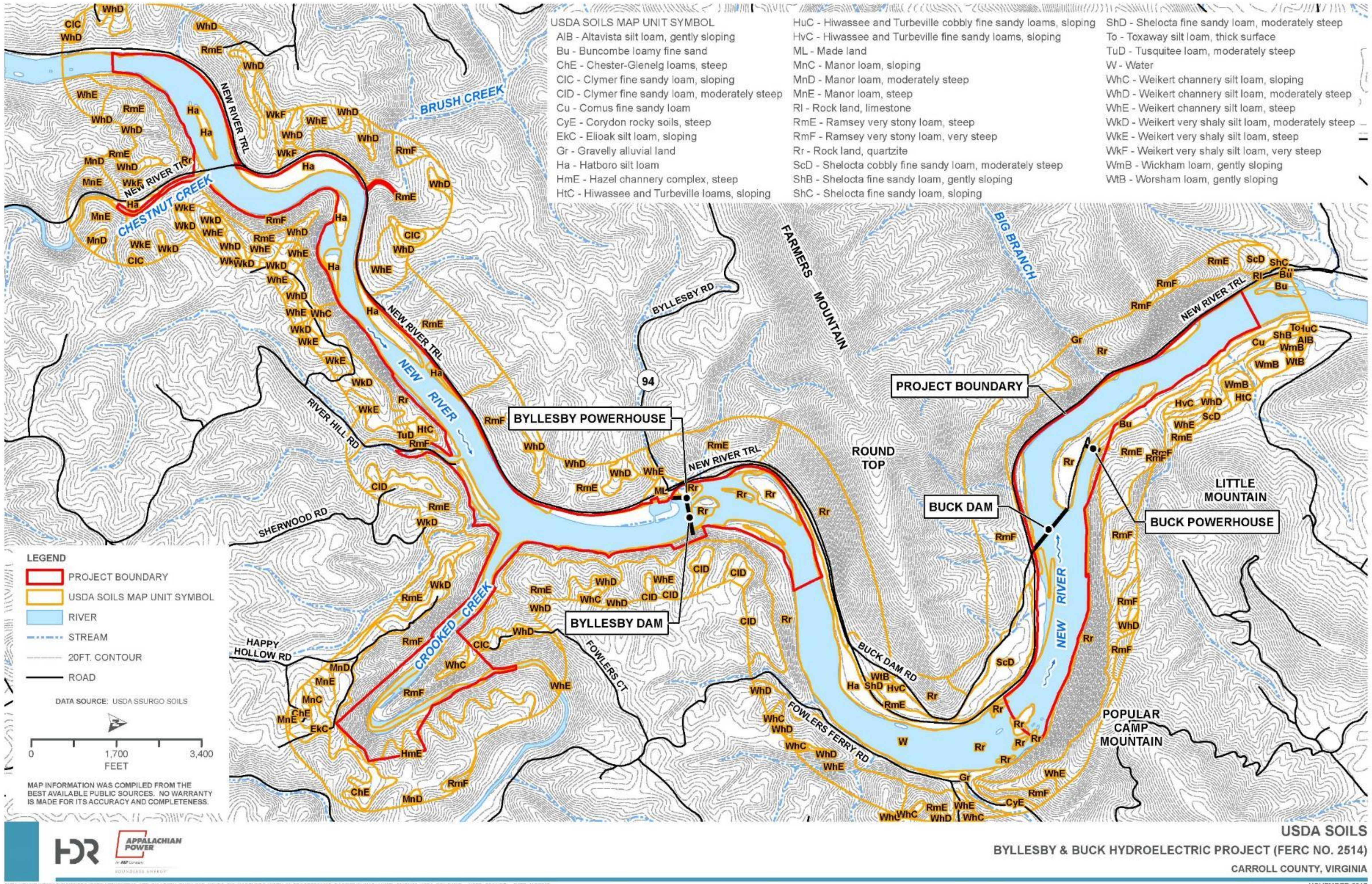
Continued operation of the Project has the potential to contribute to shoreline erosion over the new license period; however, erosion along any shoreline is an ongoing and natural process and one with many natural and anthropogenic contributing factors. Despite the high erosion potential of Project-area soils, no areas of significant erosion have previously been identified along the reservoirs. The run-of-river type operation of the Project, the vegetated and undeveloped nature of the shorelines in the Project boundary, and the erosion-resistant exposed bedrock along the shorelines provide some protection against bank erosion. Periodic drawdowns for maintenance work do, however, have the potential to contribute to additional shoreline erosion through bank failure and sloughing. Additionally, if a rain event would occur during a scheduled drawdown, the lower banks of the shoreline, which are typically covered by water, could be subject to erosion.

As discussed in Section 4, the rate of sediment deposition in the reservoirs has stabilized over time. Based on the results of the above-referenced sedimentation study conducted for the Claytor relicensing (Appalachian 2008), most of the sediment load that enters the Byllesby and Buck developments is expected to pass through the Project and be deposited downstream.

Sedimentation is expected to be limited to specific areas within the reservoirs, where it may have beneficial uses (e.g., creation of riparian wetlands). Sedimentation does result in minor loss of reservoir gross storage capacity, but this in turn does not normally affect operation, hydraulic capacity, or generation at the Project. At key areas such as the dam and intake, sedimentation over time may affect specific Project operations. Appalachian has historically dredged accumulated sediment on an as-needed basis. Significant maintenance dredging was performed at the Project in 1997. During this maintenance dredging project, accumulated sediment along a 250-ft by 350-ft area along the upstream face of the dam was hydraulically dredged to reestablish the intake area and maintain operability of the auxiliary spillway. The dredged material was used to create a new 6-acre area of emergent marsh. All work was conducted in accordance with the terms and conditions of permits and approvals by USACE and the VDEQ, as further authorized by standard FERC license article 12. Prior to dredging, sediment was subject to sediment toxicity testing to confirm the appropriateness of placing dredged materials in the proposed upstream mitigation site, as required by the Virginia Water Protection Permit (VWPP) issued for this maintenance activity. The most recent dredging activity at the Project was conducted at the Byllesby development forebay in 2014 following flooding that occurred at the Project in 2013. This work was also conducted pursuant to the terms and conditions of approvals and permits issued by USACE and VDEQ, as authorized by FERC license article 12. Materials removed as part of dredging were beneficially reused offsite after being tested for various constituents.

Appalachian proposes to continue operating the Byllesby and Buck developments as they are presently operated, including run-of-river operations, maintenance of existing vegetated and buffer areas, and coordination of any necessary future dredging and disposal with USACE and VDEQ pursuant to license article 12 and any additional permits or approvals issued for such activities. Any ground disturbance of shorelines or streambanks will be subject to the erosion control protections and requirements of the new license and the VWPP. As described above in Section 4, operation of the dams and reservoirs following completion of the replacement of sections of the wooden flashboards with the inflatable Obermeyer crest gates is expected to reduce the frequency of maintenance drawdowns, thereby minimizing the resultant potential for shoreline erosion. Additionally, bank erosion is monitored annually by Appalachian in consultation with VDGIF through implementation of the Wildlife Management Plan required by Article 408, which Appalachian proposes to continue under the term of the new license. As such, Appalachian does not expect continued operation and maintenance of the Project to adversely impact shoreline stability or soil resources. At this time, Appalachian does not propose any environmental PM&E measures related to these resources, beyond the existing measures and environmental (e.g. natural) protections described above.

Figure 5.2-1
Mapped Soils in the Vicinity of the Project



5.3 Water Resources

5.3.1 Drainage Area

The drainage area for the Byllesby development is 1,310 mi^2. The drainage area for the Buck development is 1,320 mi^2 (Appalachian 1991a).

USGS Gage 3165500 (New River at Ivanhoe, VA) is located approximately 3.3 miles downstream of the Buck Project. The drainage area at this gage is 1,350 mi^2.

5.3.2 Flows

New River stream flow characteristics are typical of the Virginia area, where the summer and fall are generally dry and the winter and spring are usually wet. For the purposes of this document, flows at the Project were estimated from the upstream USGS gage 03164000, New River Near Galax, VA, prorated for the drainage areas at the Project developments. The estimated daily flows are considered to be representative of discharge from run-of-river operation of the Project.

The median stream flow of the New River is approximately 1,653 cfs. Monthly daily average flows for the Project for the period of record range from 1,425 cfs to 3,214 cfs (Table 5.3-1). A significant historic flood for which stream flow data is available occurred in August 1940 with a flow of 141,000 cfs.

Table 5.3-1
Byllesby-Buck Project Daily Flow Data
(1987-2016)

Period	Minimum (cfs)	90% Exceedance (cfs)	Average (cfs)	10% Exceedance (cfs)	Maximum (cfs)
January	540	959	2,727	4,630	66,361
February	574	1,128	2,714	4,741	21,125
March	794	1,343	3,214	5,262	28,703
April	867	1,458	3,066	5,076	25,718
May	712	1,217	2,515	4,007	25,259
June	440	822	2,066	3,513	35,592
July	327	799	1,738	2,653	26,292
August	287	553	1,425	2,347	31,688
September	379	597	1,523	2,379	36,855

Period	Minimum (cfs)	90% Exceedance (cfs)	Average (cfs)	10% Exceedance (cfs)	Maximum (cfs)
October	370	552	1,477	2,561	25,259
November	445	688	1,809	3,378	26,636
December	482	803	2,202	3,894	14,351
Annual	287	739	2,235	3,961	66,361

5.3.3 Flow Duration Curves

Annual and monthly flow duration curves have been developed for the Project using flow data from the upstream USGS gage 03164000 (New River Near Galax, VA), prorated for the drainage area of the Project developments. These flow duration curves can be found in Appendix E.

5.3.4 Existing and Proposed Uses of Project Waters

Waters impounded by the Byllesby-Buck Project are used for purposes of electric generation and for public recreation. There are no known discharges to or withdrawals from the New River within the Project boundary or between the Byllesby and Buck developments.

5.3.5 Existing Instream Flow Uses

Existing instream flow uses of waters of the New River within the Project boundary include various recreational activities (e.g. fishing and boating) and hydroelectric generation.

5.3.6 Federally Approved Water Quality Standards

The VDEQ is responsible for carrying out the mandates of the State Water Control Law, as well as meeting federal obligations under the Clean Water Act (CWA) (VDEQ 2017c). All state waters are designated for recreational uses; the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources (Virginia Code 9VAC25-260-10). All state waters shall be free from substances attributable to sewage, industrial waste, or other waste in concentrations, amounts, or combinations which contravene established standards or interfere directly or indirectly with designate uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life.

Waters in the New River Basin are classified in Virginia Code 9VAC25-260-540. The New River in the vicinity of the Project is designated as Class IV (Mountainous Zone) (Table 5.3-2). Numerical criteria for dissolved oxygen (DO), pH, and maximum temperature for these waters are identified in 9VAC25-260-50 and are summarized in Table 5.3-3.

Table 5.3-2
Classification of Project Area Waters – New River

Section	Class	Special Standards	Section Description
2	IV	v, NEW-5	New River and its tributaries, unless otherwise designated in this chapter, from the Montgomery-Giles County line upstream to the Virginia-North Carolina state line.
2I	IV	PWS	New River and its tributaries inclusive of the Wythe County Water Department's Austinville intake near the Route 636 bridge, and the Wythe County Water Department's Ivanhoe intake on Powder Mill Branch just upstream of the Wythe-Carroll County line to points 5 miles above the intakes.

v – The maximum temperature of the New River and its tributaries (except trout waters) from the Montgomery-Giles County line upstream to the Virginia-North Carolina state line shall be 29 degrees Celsius (°C) (9VAC25-260-310).

NEW – nutrient-enriched waters; only includes New River and its tributaries, except Peak Creek above Interstate 81, from Claytor Dam upstream to Big Reed Island Creek (Claytor Lake) as per 9VAC25-260-350.

PWS – public water supply.

Table 5.3-3
Numeric Water Quality Criteria for
Class IV Waters

Parameter	Standard
Minimum DO	4.0 milligram per liter (mg/L)
Daily Average DO	5.0 mg/L
pH	6.0 – 9.0
Maximum water temperature	31°C*

*The maximum temperature of the New River and its tributaries (except trout waters) from the Montgomery-Giles County line upstream to the Virginia-North Carolina state line shall be 29°C (9VAC25-260-310).

The lower reach of Brush Creek, Chestnut Creek, and Crooked Creek, are located in the Project boundary. Portions of Chestnut Creek and Crooked Creek are further designated in 9VAC25-260-540, which are summarized in Table 5.3-4. A section of Chestnut Creek is designated as Class IV (Mountainous Zone) and the associated DO, pH, and water temperature criteria are summarized above in Table 5.3-3. Two sections of Crooked Creek are designated as Class VI (Natural Trout Waters) and applicable criteria are presented in Table 5.3-5. These sections of Crooked Creek are also classified as VDGIF Class ii and iii waters. Class ii waters are streams which contain a good wild trout population, or the potential for one, but are lacking in aesthetic quality productivity, and/or in some structural characteristic. Class iii waters are streams which contain a fair population of wild trout with carrying capacity depressed by natural factors or more commonly man-related land use practices.

Table 5.3-4
Classification of Project Area Waters – Tributaries

Section	Class	Special Standards	Section Description
Chestnut Creek			
2h	IV	PWS, v	Chestnut Creek and its tributaries from Galax's raw water intake upstream to their headwaters or to the Virginia-North Carolina state line.
Crooked Creek			
2	VI, iii	None	Crooked Creek (Carroll County) from Route 707 to Route 620.
2	VI, ii	None	Crooked Creek from Route 620 upstream including all named and unnamed tributaries.

PWS – public water supply.

Class iii – VDGIF stream description used for streams which contain a fair population of wild trout with carrying capacity depressed by natural factors or more commonly man-related land use practices.

Class ii – VDGIF stream description class used for streams which contain a good wild trout population or the potential for one but is lacking in aesthetic quality productivity, and/or in some structural characteristic.

Table 5.3-5
Numeric Water Quality Criteria for
Class VI Waters

Parameter	Standard
Minimum DO	6.0 mg/L
Daily Average DO	7.0 mg/L
pH	6.0 – 9.0
Maximum water temperature	20°C

All surface waters have criteria for bacteria. Those criteria that apply to recreational waters are found in 9VAC25-260-170. For primary contact recreational uses in surface waters, *Escherichia coli* (*E. coli*) bacteria shall not exceed a monthly geometric mean of 126 colony forming units (CFU)/100 milliliter (ml) in freshwater. In surface waters not used for primary contact recreation, *E. coli* bacteria shall not exceed a monthly geometric mean of 630 CFU/100 ml in freshwater.

5.3.7 Existing Water Quality Data

Water quality data have been collected approximately 2 RM downstream of the Buck dam by the USGS and the VDEQ. Due to the proximity of this monitoring location to the Project, the water quality data summarized below are expected to be indicative of the characteristics of Project outflows for the monitored periods. Water quality has also historically been monitored at the upstream USGS Gage 3164000 (New River at Galax, VA), approximately 15 miles upstream of Byllesby dam.

Daily mean water temperature and specific conductance data were collected from March 2007 to September 2008 at USGS Gage 3165500 (New River at Ivanhoe, VA). Daily mean water temperatures ranged from 0.3°C in to 28.9°C (Figure 5.3-1) and were below the maximum state criterion. Daily mean specific conductance ranged from 55 microsiemens per centimeter (µS/cm) to 108 µS/cm (Figure 5.3-2).

The VDEQ also collected water quality data approximately 2 RM downstream of Buck dam at Site 9-NEW127.49. Water temperature, DO, pH, and specific conductance data were collected at a depth of approximately 0.3 meters from 1992 to 2017. These data were obtained from the U.S. Environmental Protection Agency (USEPA) STOrage and RETrieval (STORET) warehouse. Water temperatures ranged from 0.0 to 28.7°C and were below established state criterion. DO concentrations ranged from 5.3 mg/L to 14.8 mg/L (Figure 5.3-3) and were well above the minimum state criterion. The pH ranged from 5.9 to 8.9 (Figure 5.3-4) and were within the state criteria range, except for a single day in December 1999. Specific conductance ranged from 20 to 80 µS/cm (Figure 5.3-5).

Figure 5.3-1
Daily Mean Water Temperature Data Collected at
USGS Ivanhoe Gage Downstream of Buck Dam from 2007 – 2008

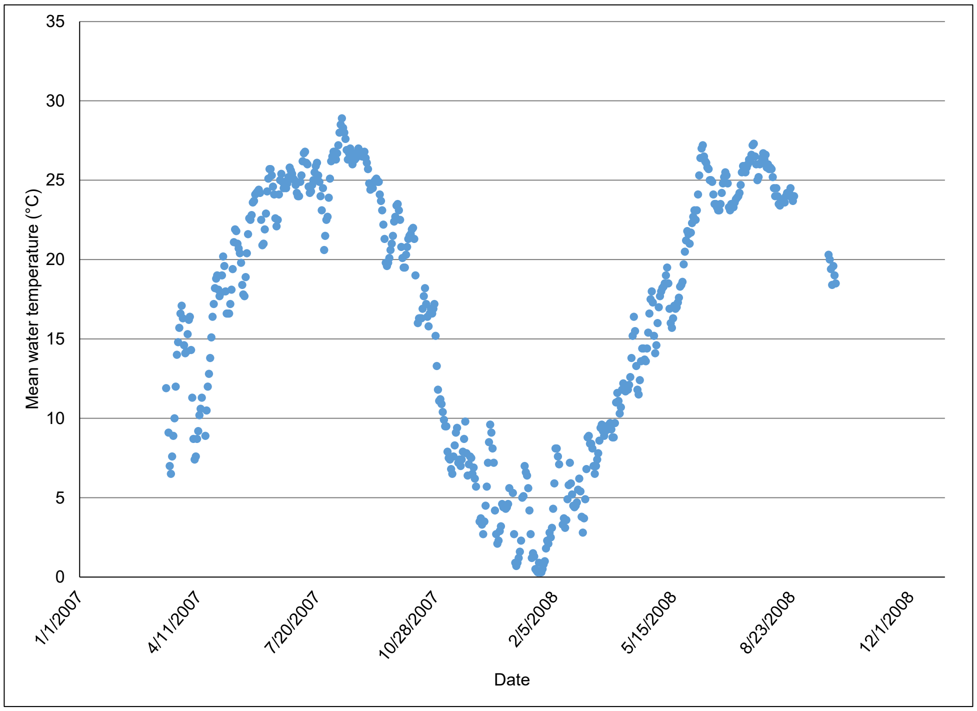


Figure 5.3-2
Daily Mean Specific Conductance Data Collected at USGS Ivanhoe Gage Downstream of Buck Dam from 2007 – 2008

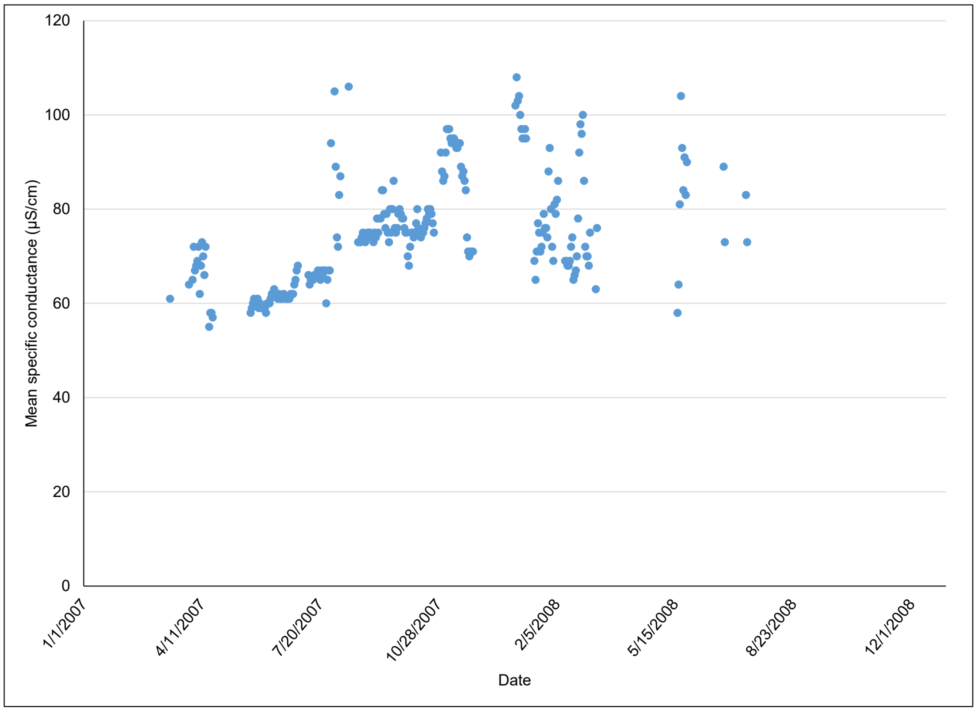


Figure 5.3-3
Dissolved Oxygen Data Collected at VDEQ Site 9-NEW127.49 from 1992 – 2017

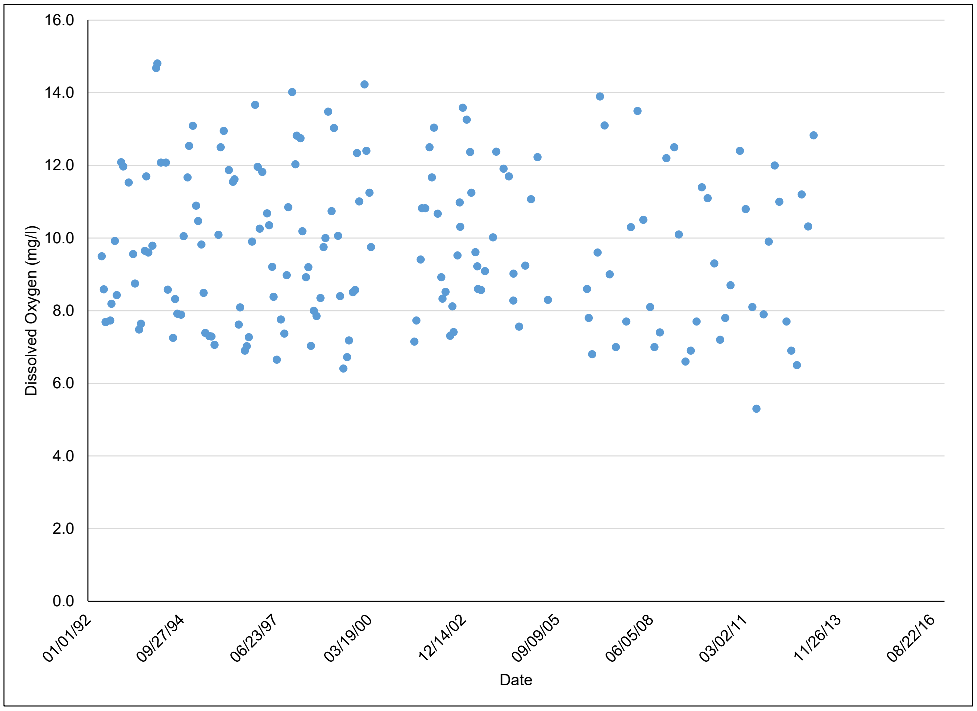


Figure 5.3-4
pH Data Collected at VDEQ Site 9-NEW127.49 from 1992 – 2017

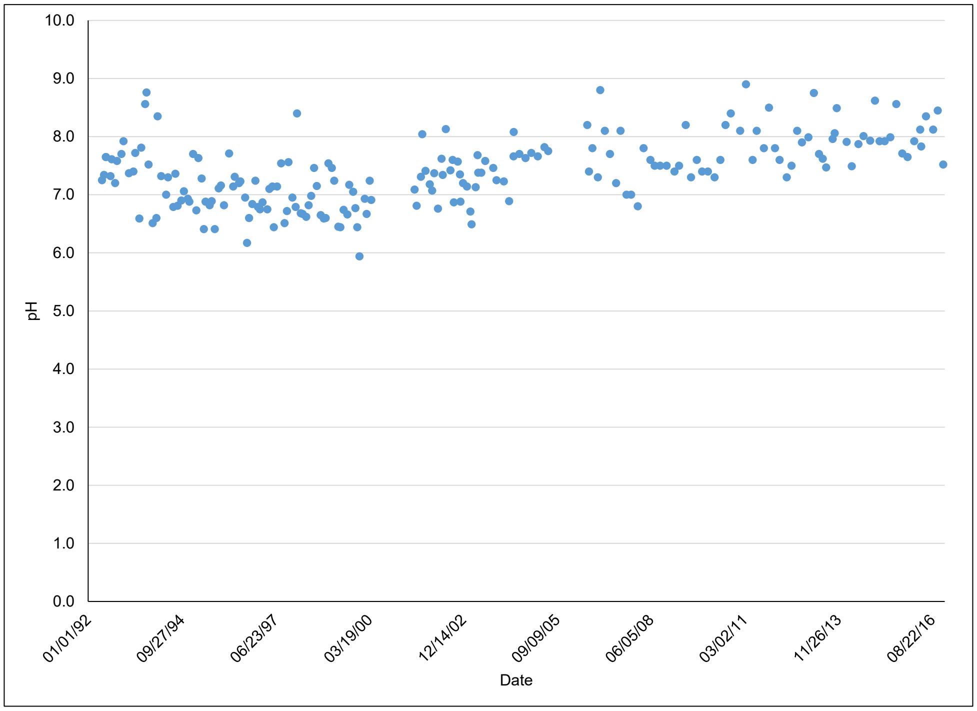
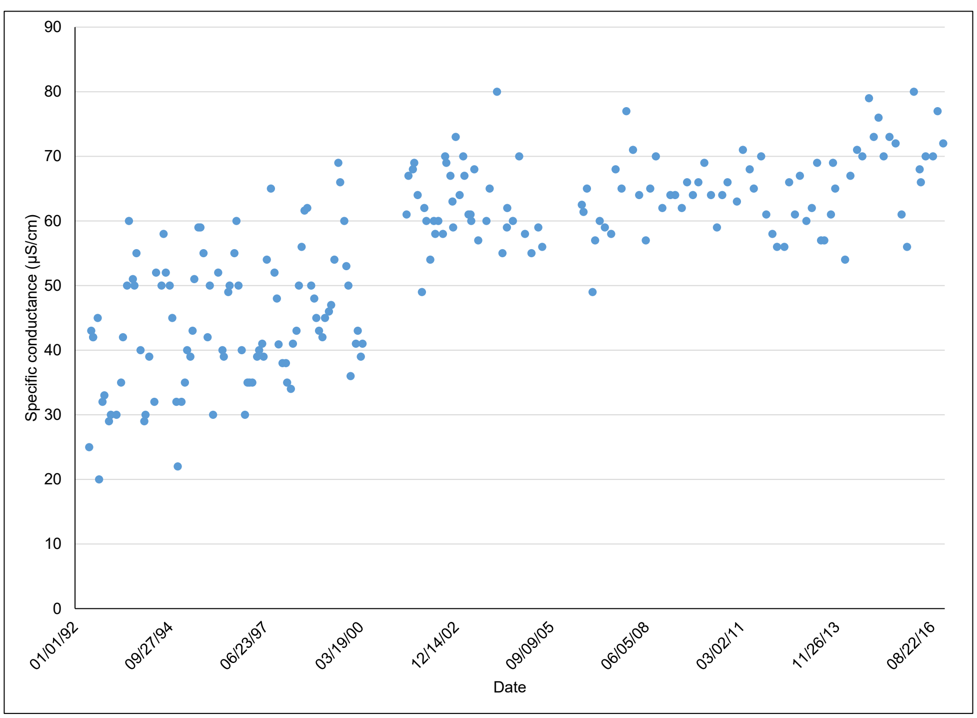
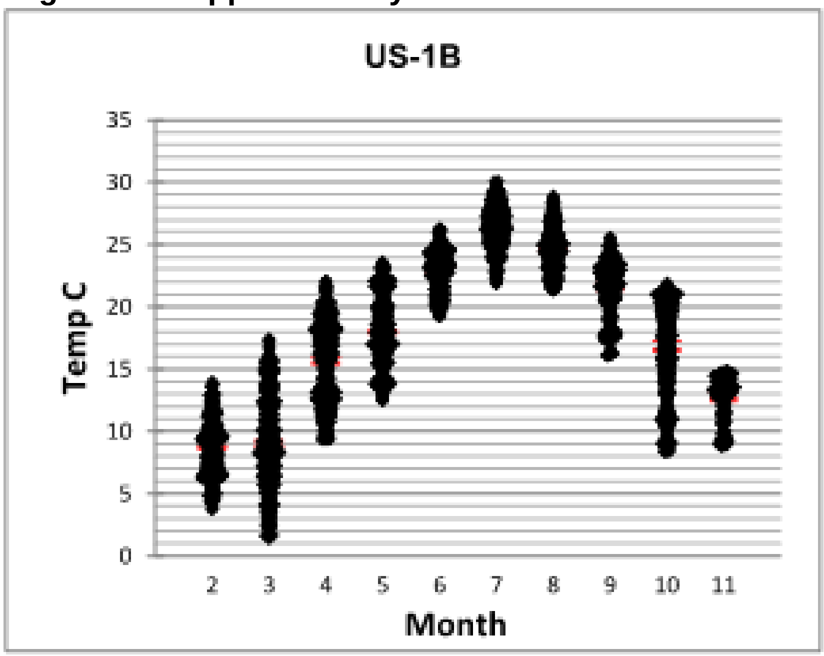


Figure 5.3-5
Specific Conductance Data Collected at VDEQ Site 9-NEW127.49 from 1992 – 2017



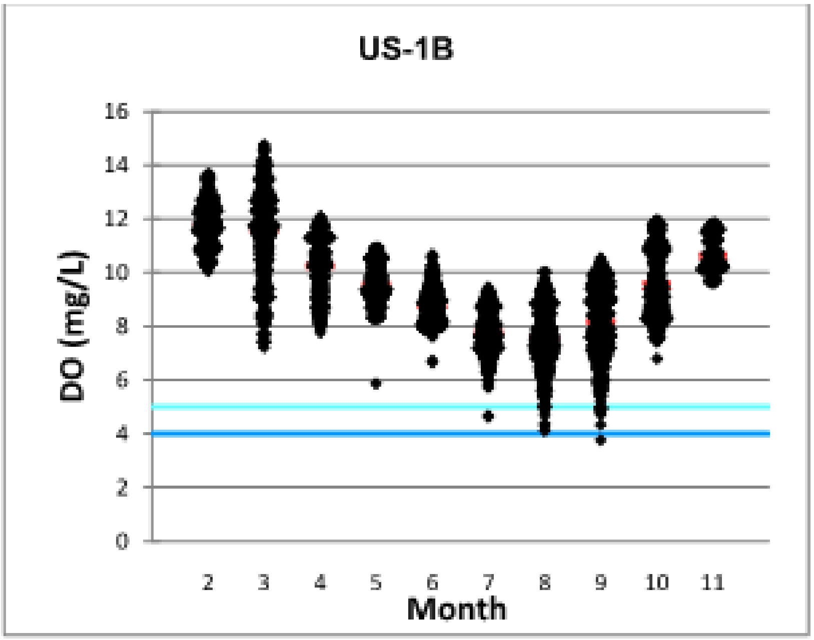
Temperature and DO measurements at a sampling location approximately 1 mile downstream of Buck dam were collected for Appalachian in 2017 in association with Year 3 monitoring conducted for the Claytor Project. Water quality was monitored using Onset HOBO U-26 temperature and DO data loggers, which were deployed from February through November 2017. Results of this monitoring are shown in Figure 5.3-6 and Figure 5.3-7.

Figure 5.3-6
Hourly Measurements of Temperature in 2017 at
Sampling Station Approximately 1 Mile Downstream of Buck Dam



Note: Red plus sign indicates median value for data set.
Source: Stantec (2017a).

Figure 5.3-7
Hourly Measurements of DO in 2017 at
Sampling Station Approximately 1 Mile Downstream of Buck Dam.



Note: Red plus sign indicates median value for data set. Light blue lines show USEPA DO criteria based on Freshwater Chronic Criteria for the Lowest Observed Effect Level, while dark blue lines show limit established by the state of Virginia for protection of beneficial uses of water body.

Source: Stantec (2017a).

Additional instantaneous measurements of basic water chemistry were collected in the field at mussel sampling locations. At the sampling location approximately 1 mile downstream of Buck dam, on September 7, 2017, the following field-based water quality measurements were collected:

- DO: 5.2 mg/L
- DO (percent saturation): 52.9%
- Temperature: 19.8°C
- pH: 7.55
- Turbidity: 7.3 Nephelometric Turbidity Unit (NTU)
- Visibility: 1.2 meters
- Conductivity: 69 µs

Basic water chemistry measurements were collected from two locations (upper and middle) in the Byllesby reservoir between April 30 and May 1, 2018, in association with the freshwater mussel survey and relocation efforts focused on an area of potential mussel habitat upstream of the dam. The following field-based water quality measurements were collected (Stantec 2018a):

- DO: (upper location) 10.02 mg/L, (middle location) 9.95 mg/L
- DO (percent saturation): (upper location) 102.6%, (middle location) 93.4%
- Temperature: (upper location) 15.2°C, (middle location) 12.8°C
- pH: (upper location) 8.68, (middle location) 8.15
- Turbidity: (upper location) 18 NTU, (middle location) 17.9 NTU
- Conductivity: (upper location) 62 µs, (middle location) 60 µs

Similar measurements were collected from a single location in the Buck reservoir on July 11, 2018, during a drawdown to replace failed flashboards. The following field-based water quality measurements were collected (Stantec 2018b):

- DO: 9.95 mg/L
- DO (percent saturation): 93.4%
- Temperature: 12.8°C
- pH: 8.15
- Turbidity: 17.9 NTU
- Conductivity: 60 µs

No other recent water quality data is available for the Byllesby and Buck reservoirs, bypass reaches, or tailraces. Historical water quality data collected in these areas is described below.

From May through October 1989, in support of the previous relicensing, DO and water temperature profiles were measured by Appalachian at four transects, one each located above and below the two developments:

- At the Byllesby development, mean reservoir temperatures ranged from 11.3 to 25.1°C. Mean DO ranged from 6.9 to 10.1 mg/L in the reservoir and from 7.1 to 10.9 mg/L in the powerhouse tailrace, and percent saturation was never below 78 percent for any measurement.

- At the Buck development, mean reservoir temperatures ranged from 10.9 to 25.3°C. Mean DO ranged from 6.7 to 11.1 mg/L in the reservoir and from 7.0 to 11.6 mg/L in the powerhouse tailrace, and percent oxygen saturation was never below 77 percent for any measurement.

- No evidence of thermal stratification was found in either reservoir.

    - For the Byllesby reservoir, at depths up to about 6 meters, the maximum surface-to-bottom temperature differential was 2.3°C, and the maximum DO differential was 1.2 mg/L.

  - For the Buck reservoir, at depths up to about 4.5 meters, the maximum surface-to-bottom temperature differential was 1.0°C, and the maximum DO differential was 1.5 mg/L (Appalachian 1991a).

Additional water quality data was collected in the Project reservoirs, as well as free-flowing riffle/run areas above and below each development, as part of the fishery survey conducted by Appalachian from May to October 1990, described below in section 5.4.1.1. This data is summarized in Appalachian (1991b) and below:

- DO and temperature did not significantly vary across the sampling locations.

- Conductivity varied very little, either spatially across the locations or temporally over the study period. Measurements were typically low, ranging from 46-60 micromhos per centimeter (umhos/cm), with the highest measurements recorded in September (65-138 umhos/cm).

- Secchi depth readings at the reservoir sampling locations did not vary significantly on a spatial scale, with mean values ranging from 1.33 meters at the upper Buck reservoir to 3.08 m at the upper Byllesby reservoir. Minimum water clarity values were recorded in October, and maximum clarity was recorded in October.

5.3.7.1 Impaired Waters

The VDEQ develops and maintains a listing, referred to as a Section 303(d) List, of all impaired waters in the state, which provides details on the pollutant causing the impairment and the potential sources of each pollutant per requirements of the CWA and Virginia Water Quality Monitoring, Information, and Restoration Act (WQMIRA). The VDEQ is required to develop and implement a Total Maximum Daily Load (TMDL) for waters listed on the Section 303(d) list. A TMDL is used to determine the total amount of a pollutant that a waterbody can handle without resulting in the impaired status of that waterbody (VDEQ 2017b).

Project waters listed as impaired in the 2016 303(d) Water Quality Assessment Integrated Report include:

- <u>Assessment Unit ID VAS-N08R_NEW03B98</u> – from Buck dam downstream 0.9 miles. Recreational uses are impaired due to *E. coli* associated with livestock grazing and feeding operations. A TMDL is required for this reach of the New River (VDEQ 2017a).
- <u>Assessment Unit ID VAS-N07R_CRK01A98</u> – a 12.1-mile reach of lower Crooked Creek from the confluence with the New River. Recreational uses are impaired due to *E. coli* and fecal

coliform from unrestricted cattle access and other unknown sources. A TMDL is required for Crooked Creek (VDEQ 2017a).

- Assessment Unit ID VAS-N06R CST01A94 – an 8.7-mile reach of lower Chestnut Creek from the confluence with the New River. Aquatic life is impaired by sedimentation/siltation and recreation uses are impaired due to *E. coli* (VDEQ 2017a). A sediment and bacteria TMDL for Chestnut Creek was finalized in 2015 (The Virginia Tech Department of Biological Systems Engineering 2015).

5.3.8 Gradient for Downstream Reaches

The river has an average gradient of approximately 6.3 ft/mile through the upper New River Basin (Appalachian 1991a), compared to an average gradient of 20 ft/mile one mile downstream of the Project and of approximately 24 ft/mile in the Buck bypass reach. The gradient of the Byllesby bypass reach is known to be steep as well, though detailed digital elevation model data is not available to calculate the gradient over this short (approximately 475 ft) reach.

5.3.9 Known or Potential Adverse Effects and Proposed PM&E Measures

The results of the studies conducted for the previous relicensing support a conclusion that due to the small size and short retention time of the Project reservoirs, the lack of thermal stratification in the reservoirs, and the run-of-river operation of the Project, operation of the Project does not affect ambient water quality (i.e., water temperature and DO levels) in this reach of the upper New River.

Diversion of flows for power generation does have the potential to impact water quality in the bypass reaches. Reductions of flow in the bypass reaches increases the travel time of water through the reach and also reduces the dilution of any substances introduced into the bypass reach. Reduced discharge into the bypass reaches also modifies the temperature regime immediately downstream of the dams.

As described above in Section 5.2.5, infrequent maintenance dredging has historically been conducted in the vicinity of the dam or intake at either development. Dredging has the potential to have short-term impacts on local water quality through the resuspension of sediment. Conducting all dredging operations in accordance with the terms and conditions of permits and approvals issued by USACE and VDEQ, including implementation of Best Management Practices (silt curtails, controlled return water, etc.), should maintain water quality at and downstream of the powerhouse.

While no additional environmental PM&E measures beyond those protections already in place under the existing license are proposed by Appalachian at this time, Appalachian will consult with resource agencies and other stakeholders through the relicensing process regarding potential effects of Project operations on water quality and the need for updated baseline water quality data in the Project boundary.

5.4 Fish and Aquatic Resources

5.4.1 Existing Fish Communities

The New River contains a variety of popular sportfish species such as Smallmouth Bass (*Micropterus dolomieu)*, Spotted Bass (*Micropterus punctulatus*), Largemouth Bass (*Micropterus salmoides*), Rock Bass (*Ambloplites rupestris*), Striped Bass (*Morone saxatilis*), hybrid bass (Striped Bass x White Bass hybrid), Muskellunge (*Esox masquinongy*), Walleye (*Sander vitreus*), Black Crappie (*Pomoxis nigromaculatus*), Channel Catfish (*Ictalurus punctatus*), Flathead Catfish (*Pylodictis olivaris*), Redbreast Sunfish (*Lepomis auritus*), and Bluegill (*Lepomis macrochirus*).[5] Trophy Smallmouth Bass and Channel Catfish are known to occur between the Fries and Byllesby dams. Channel Catfish are often sought near the base of the Byllesby Dam, while Smallmouth Bass, Spotted Bass, and Walleye are found throughout the entire reach (VDGIF 2017a). State record walleye have been caught near Buck dam, and deep pools downstream of the dam have yielded trophy-size catfish and Muskellunge (VDGIF 2017a).

The New River is characterized as having a low number of native species compared to similarly sized rivers in the eastern U.S. (Carey et al. 2017). However, the number of endemic species in the New River is high in comparison to other eastern U.S. rivers; of the 44 native fish species to the New River (compared to at least 57 introduced species), eight are endemic (Orth 2017). According to Orth (2017), the New River has a relatively high number of endemic species due to the immobility of species and natural barriers, which geographically isolated fishes during the Pleistocene.

The eight endemic fishes include three minnows, two sculpins, and three darters, as follows: Bigmouth Chub (*Nocomis platyrhynchus*), Kanawha Minnow (*Phenacobius teretulus*), New River Shiner (*Notropis scabriceps*), Kanawha Sculpin (*Cottus kanawhae),* Bluestone Sculpin (*Cottus sp.),* Candy Darter (*Etheostoma osburni),* Kanawha Darter *(Etheostoma kanawhae),* and Appalachian Darter *(Percina gymnocephala)* (Orth 2017). The Bigmouth Chub and Kanawha Minnow both prefer habitats of clear, rocky streams and rivers (Jenkins and Burkhead 1983, as cited by Virginia Tech). The New River Shiner inhabits cool, clear tributaries and the upper main channel of the New River (Jenkins and Burkhead 1983). The Kanawha Sculpin is found in rocky areas of limestone streams and cave streams

[5] In accordance with the "Common and Scientific Names of Fishes from the United States, Canada, and Mexico" (American Fisheries Society Special Publication 34; 2013), throughout this document, common names of fishes are capitalized.

(Encyclopedia of Life 2017). The Bluestone Sculpin, Candy Darter, and Kanawha Darter all prefer swift riffles over gravel or rubble (Jenkins and Burkhead 1983; NRCS, undated; NatureServe. 2013).

5.4.1.1 Previous Fishery Surveys and Assessments

1990 Byllesby-Buck Project Survey

In 1990, a fish survey was conducted by Appalachian in the Project area as part of the previous relicensing of the Byllesby-Buck Project. Adult and juvenile fish were sampled as follows:

- Electrofishing was performed at two stations within reaches upstream of the Byllesby reservoir, between the two dams, and downstream of Buck dam.
- Electrofishing and hoop netting were performed at two stations each in the upper, middle, and lower portions of the Byllesby and Buck reservoirs.
- Gill netting was performed at two stations each in the upper, middle, and lower portions of the Byllesby reservoir.

Seining was reportedly not conducted due to the lack of suitable substrate (Appalachian 1991b). Water quality, physical, hydrological, and operational data were also collected and analyzed as part of this study. Six sampling events were completed per month from May through October 1990.

A total of 2,679 fish and 34 distinct species were collected. Smallmouth and Spotted basses were the most abundant fish collected; however, Rock Bass, Redbreast Sunfish, Rosyface Shiner (*Notropis rubellus*), Channel Catfish, Spotfin Shiner (*Cyprinella spilopterus*), and Northern Hogsucker (*Hypentelium nigricans*) were also abundant. Locational differences in electrofishing catch per unit effort (CPUE) mainly existed between riffle/run versus reservoir sampling sites, reflecting habitat preferences of various species. In comparing the three riffle/run sites (upstream of the Byllesby development, between the dams, and downstream of the Buck development), the site downstream of the Buck development typically exhibited the highest catch rates. Catch rates were fairly even between the other two sites. The authors of the study report noted that this result may be attributable to the isolation of the two upstream sites by the Project dams and the upstream Fries Dam, limiting fish movement into this portion of the river (Appalachian 1991b).

A complete list of species collected during this study is provided in Table 5.4-1. Excerpts from the study report (filed with FERC as part of the license application) including a map and description of sampling locations, and catch per unit effort data for the different locations, is provided in Appendix F.

Table 5.4-1
Fish Community Documented near the Project in 1990 (Appalachian 1991b)[1]

Family	Common Name	Scientific Name	Number	Percent composition
Catostomidae	Northern Hogsucker	*Hypentelium nigricans*	96	3.6
	Redhorse	*Moxostoma* sp.	1	0.0
	Silver Redhorse	*Moxostoma anisurum*	1	0.0
	White Sucker	*Catostomus commersonii*	26	1.0
Centrarchidae	Black Crappie	*Pomoxis nigromaculatus*	3	0.1
	Bluegill	*Lepomis macrochirus*	35	1.3
	Hybrid Sunfish	*Lepomis* hybrid	3	0.1
	Largemouth Bass	*Micropterus salmoides*	2	0.1
	Pumpkinseed	*Lepomis gibbosus*	5	0.2
	Redbreast Sunfish	*Lepomis auritus*	237	8.8
	Rock Bass	*Ambloplites rupestris*	352	13.1
	Smallmouth Bass	*Micropterus dolomieu*	606	22.6
	Spotted Bass	*Micropterus punctulatus*	460	17.2
Cottidae	Sculpin	*Cottus* spp.	2	0.1
Cyprinidae	Bigmouth Chub	*Nocomis platyrhynchus*	14	0.5
	Bluehead Chub	*Nocomis leptocephalus*	16	0.6
	Bluntnose Minnow	*Pimephales notatus*	23	0.9
	Central Stoneroller	*Campostoma anomalum*	1	0.0
	Common Carp	*Cyprinus carpio*	76	2.8
	Golden Shiner	*Notemigonus crysoleucas*	11	0.4
	Mimic Shiner	*Notropis volucellus*	17	0.6
	New River Shiner	*Notropis scabriceps*	23	0.9
	Rosyface Shiner	*Notropis rubellus*	167	6.2
	Shiner	*Notropis* spp.	9	0.3
	Silver Shiner	*Notropis photogenis*	7	0.3
	Spotfin Shiner	*Cyprinella spiloptera*	123	4.6
	Spottail Shiner	*Notropis hudsonius*	20	0.7
	White Shiner	*Luxilus albeolus*	29	1.1
Esocidae	Muskellunge	*Esox masquinongy*	7	0.3
Ictaluridae	Channel Catfish	*Ictalurus punctatus*	141	5.3
	Flathead Catfish	*Pylodictis olivaris*	77	2.9
Percidae	Appalachia Darter	*Percina gymnocephala*	5	0.2
	Greenside Darter	*Etheostoma blennioides*	5	0.2
	Johnny Darter	*Etheostoma nigrum*	6	0.2
	Common Logperch	*Percina caprodes*	71	2.7
	Sharpnose Darter	*Percina oxyrhynchus*	1	0.0
	Yellow Perch	*Perca flavescens*	1	0.0
		Total	2,679	-
		Number of Species	34*	-

[1] This list was compared with the undated species list provided by the VDGIF for the entire New River; these species represent approximately 55 percent of the species diversity of the comprehensive list from the entire New River.
* *Lepomis* spp., *Moxostoma* sp., and *Notropis* spp. were not counted as distinct taxa, as additional individuals from these genera were collected and identified to the species level.

1997 Survey Below Buck Dam

In 1997, Appalachian conducted an assessment of the effectiveness of the ramping procedures for the Buck dam spillway gate operations for the protection of fish communities in the bypass reach. Additional fish sampling in the bypass reach was conducted as part of this study, via backpack electrofishing following the cessation of spillway releases in the range of 4,300 cfs to 6,140 cfs. This assessment of representative pools resulted in the collection of a combined total of 734 fish representing 24 species. The final report on this assessment was filed with FERC by Appalachian on September 12, 1997. Compared to electrofishing conducted for the relicensing study (described above), fourteen species that were collected in the 1990 sampling (most of which were predominantly collected in the Buck and Byllesby reservoirs) were not collected in the Buck bypass in 1997. With respect to spatial distribution in the bypass reach based on the 1997 sampling data, several species including Central Stoneroller (*Campostoma anomalum*), White Shiner (*Luxilus albeolus*), White Sucker (*Catostomus commersonii*), Northern Hogsucker, darters, and Walleye were collected more frequently within about 1,600 ft downstream of the spillway compared to collections farther downstream, where species such as Rock Bass, Redbreast Sunfish, Green Sunfish (*Lepomis cyanellus),* and Bluegill were collected in greater numbers. The report of the 1997 ramping rate assessment noted that there was much more flowing-water habitat in the area immediately downstream of the spillway compared to a greater number of isolated pools farther downstream, which matches the habitat preferences of the species described in the locations above (Appalachian 1997). (Refer to Section 5.4.4 for additional information about habitat preferences of select species.)

2016-2017 Fries Hydroelectric Project Survey (Upstream of Project)

The Fries Project is located approximately 8.6 RM upstream of the Byllesby dam. In association with the relicensing of the Fries Project, fish sampling was performed utilizing a variety of methods and gear types (i.e., backpack, raft, and boat electrofishing; snorkel surveys; cast netting; angling; night observations; set lines; gill netting; and minnow traps) from July to October 2016, and May to July 2017. Five study reaches were established within the Fries Project, including reference reaches upstream and downstream of the dam, the impoundment, the bypass, and the tailwaters (Table 5.4-2) (Carey et al. 2017).

Table 5.4-2
Summary of Study Reach Descriptions (Carey et al. 2017)

Reach	Location and Length	Description
1	Upstream Reference Reach (400 m)	The widest part of the river with heterogenous habitats, flows, and substrates; some submerged aquatic vegetation (SAV) present
2	Impoundment (2,300 m)	Within 1.4 RM of the dam structure; characterized by sediment accumulations with sand substrate; some boulders and bedrock present; SAV growth in the lower half of the reach
3	Bypass (150 m)	Approximately 150 m downstream of the dam structure; characterized by a scoured streambed with boulders or bedrock; little or no flow; some silt and algae present along the left descending bank
4	Tailwater (800 m)	Just below the powerhouse; mostly non-wadeable, slow pools and glides with bedrock, boulder, sand, and silt substrates; transitional area in downstream end containing greater habitat diversity
5	Downstream Reference Reach Mainstem (400 m)	Riffles, runs, and glides with gravel and sand substrates
	Downstream Reference Reach Side Channel (500 m)	Channel flowing along an island; characterized by slow-moderate flowing glides, riffles, and runs with sand, gravel, and cobble substrates and large woody debris present.

The study found 43 fish species across all five study reaches and multiple sampling techniques (Carey et al. 2017). Native and endemic species combined for 57 percent of the total number of fish collected, with the remaining 43 percent consisting of introduced species. A list of fish species documented in this study is provided in Table 5.4-3.

Table 5.4-3
Fish Community Documented near the Fries Project in 2016 (Carey et al. 2017)

Common Name	Scientific Name	Native/Endemic/Introduced
Catostomidae		
Northern Hogsucker	*Hypentelium nigricans*	N
White Sucker	*Catostomus commersonii*	N
Centrarchidae		
Black Crappie	*Pomoxis nigromaculatus*	I
Bluegill	*Lepomis macrochirus*	I
Green Sunfish	*Lepomis cyanellus*	N
Largemouth Bass	*Micropterus salmoides*	I
Pumpkinseed	*Lepomis gibbosus*	I
Redbreast Sunfish	*Lepomis auritus*	I
Rock Bass	*Ambloplites rupestris*	I
Smallmouth Bass	*Micropterus dolomieu*	I
Spotted Bass	*Micropterus punctulatus*	I

Common Name	Scientific Name	Native/Endemic/Introduced
Clupeidae		
Gizzard Shad	*Dorosoma cepedianum*	I
Cyprinidae		
Bigmouth Chub	*Nocomis platyrhynchus*	E
Bluehead Chub	*Nocomis leptocephalus*	N
Bluntnose minnow	*Pimephales notatus*	NI
Central Stoneroller	*Campostoma anomalum*	N
Common Carp	*Cyprinus carpio*	I
Golden Shiner	*Notemigonus crysoleucas*	I
Kanawha Minnow	*Phenacobius teretulus*	E
Longnose Dace	*Rhinichthys cataractae*	N
Mimic Shiner	*Notropis volucellus*	N
New River Shiner	*Notropis scabriceps*	E
Rosyface Shiner	*Notropis rubellus*	N
Saffron Shiner	*Notropis rubricroceus*	I
Silver Shiner	*Notropis photogenis*	N
Spotfin Shiner	*Cyprinella spiloptera*	N
Spottail Shiner	*Notropis hudsonius*	I
Swallowtail Shiner	*Notropis procne*	N
Telescope Shiner	*Notropis telescopus*	I
Warpaint Shiner	*Luxilus coccogenis*	I
White Shiner	*Luxilus albeolus*	N
Whitetail Shiner	*Cyprinella galactura*	I
Esocidae		
Muskellunge	*Esox masquinongy*	I
Ictaluridae		
Channel Catfish	*Ictalurus punctatus*	N
Flathead Catfish	*Pylodictis olivaris*	N
Margined Madtom	*Noturus insignis*	N
Percidae		
Appalachia Darter	*Percina gymnocephala*	E
Fantail Darter	*Etheostoma flabellare*	N
Greenside Darter	*Etheostoma blennioides*	N
Logperch	*Percina caprodes*	N
Sharpnose Darter	*Percina oxyrhynchus*	N
Walleye	*Sander vitreus*	N
Yellow Perch	*Perca flavescens*	I

Species richness (number of distinct taxa) was greatest in Reach 4 (Tailwater), and lowest in the Main Channel of Reach 5 (Table 5.4-4). However, Reach 5 contained the greatest percentage of native and endemic species followed by the Tailwater (Reach 4) and the Upstream Reference Reach (Reach 1). Reach 4 likely had the greatest species richness due to the increased habitat complexity in the downstream area where it transitioned to Reach 5. Reaches 2 (Impoundment) and 3 (Bypass) contained the highest percentage of introduced species at 57 and 53 percent, respectively. Many of the introduced species consist of sportfish, such as Rock Bass and Redbreast Sunfish, which were commonly collected throughout the study. Bigmouth Chub was the most dominant species collected in both reference reaches (which contained a greater amount of the riffle-run habitat preferred by this species), and was absent from the Impoundment (Reach 2). The Impoundment exhibited a different fish community as compared to the other study reaches, with higher collections of White Sucker, Common Carp, Largemouth Bass, Bluegill, Channel Catfish, and Black Crappie, as well as the only instances of Gizzard Shad (*Dorosoma cepedianum*) and Golden Shiner (*Notemigonus crysoleucas*), both characterized as pelagic species. Notably, the Appalachia Darter was collected both above and below Fries dam, however the Kanawha Minnow was only collected downstream of the dam.

Table 5.4-4
Fries Project Survey Results by Study Reach (Carey et al. 2017)

Reach	Location	No. Species Collected	No. of Species [Percent Total]		
			Native	Endemic	Introduced
1	Upstream Reference Reach	17	9 [53%]	2 [12%]	6 [35%]
2	Impoundment	23	9 [39%]	1 [4%]	13 [57%]
3	Bypass	19	8 [42%]	1 [5%]	10 [53%]
4	Tailwater	30	16 [53%]	4 [13%]	10 [33%]
5	Downstream Reference Reach Mainstem	11	8 [53%]	3 [20%]	4 [27%]
	Downstream Reference Reach Side Channel	16	13 [62%]	3 [14%]	5 [24%]

Given that the Fries Project is in close proximity to the Byllesby dam (approximately 8.6 RM upstream), it is likely that similar fish species are found within the Byllesby-Buck Project where habitat characteristics are similar to the study reaches.

5.4.1.2 Surveys, Assessments, and Management Activities by VDGIF

Surveys and Assessments

The VDGIF (2015) performed fish surveys on the upper New River from 2004 to 2014. In spring 2014, electrofishing samples were collected at twelve sites from Allisonia in Pulaski County upstream to Fries Dam. Samples were dominated by Smallmouth Bass, followed by Rock Bass, Channel Catfish, Walleye, Flathead Catfish, and Redbreast Sunfish. A total of 232 adult Smallmouth Bass were collected, ranging in size from 7 to 22 inches (presumably total length, but not stated in original report).

The Proportional Size Distribution (PSD) index was calculated for select sportfish species. The PSD is a simple measure summarizing the size structure of a fish population by categorizing each species by specific length classes, as originally described by Gabelhouse (1984). Length classes are defined as stock (S), quality (Q), preferred (P), memorable (M), and trophy (T) lengths. Stock-length fish are generally defined as the age at which the fish enters the fishery, i.e., when it becomes vulnerable to gear and/or reproductively active, and when it becomes recreationally valuable (the minimum size of fish most anglers would like to catch) (Murphy and Willis 1996). The most common metric used for PSD values is quality length (or PSD-Q), where PSD equals the number of fish greater than quality length, divided by the number of fish at stock length, multiplied by 100. PSD values range from 0 to 100. A low PSD value indicates there are very few large fish in the population, whereas a large PSD value indicates few small fish in the population. An ideal fish population ("balanced") comprises a wide range of size structures. A balanced fish community comprises predator species with a PSD range of 40-70, and prey species with a PSD range of 20-60 (Murphy and Willis 1996).

In 2014, the Smallmouth Bass PSD-Q downstream from Fries Dam was 45, indicating that 45 percent of Smallmouth Bass collected were of quality length (11 inches) or larger. According to VDGIF (2015), healthy river Smallmouth Bass populations usually have a PSD-Q value between 40 and 60. The remainder of the 2014 data indicated PSD-P was 28, PSD-M was 17, and PSD-T was 4. The average relative weight of Smallmouth Bass was 90, indicating that Smallmouth Bass in this section of the New River are healthy (VDGIF 2015).

Rock Bass ranged in size from 3 to 9 inches with an average size of 6 inches (VDGIF 2015). In 2014, the Rock Bass PSD-Q was 27, which falls within the ideal PSD range for a prey species (Rock Bass are not a true bass and are more similar to sunfishes and in size close to Smallmouth Bass). Flathead and Channel catfish showed evidence of excellent reproduction in sampling, but no additional information was provided for these fish. Walleye length ranged in size from 13 to 29 inches, with an average of 17 inches. The Walleye PSD-Q was 95, indicating that a large portion of the Walleye population is greater than or equal to quality length (15 inches). The optimal PSD-Q range for Walleye in a balanced fish community is 30-60 (Murphy and Willis 1996); therefore, the PSD-Q shows a high proportion of the Walleye community comprises larger fish. This may suggest limited recruitment (fewer younger fish) or gear bias (Gouffaux et al. 2005). However, the relative weight of Walleye was 84, suggesting the population is in moderately healthy condition (VDGIF 2015).

Management Activities by VDGIF

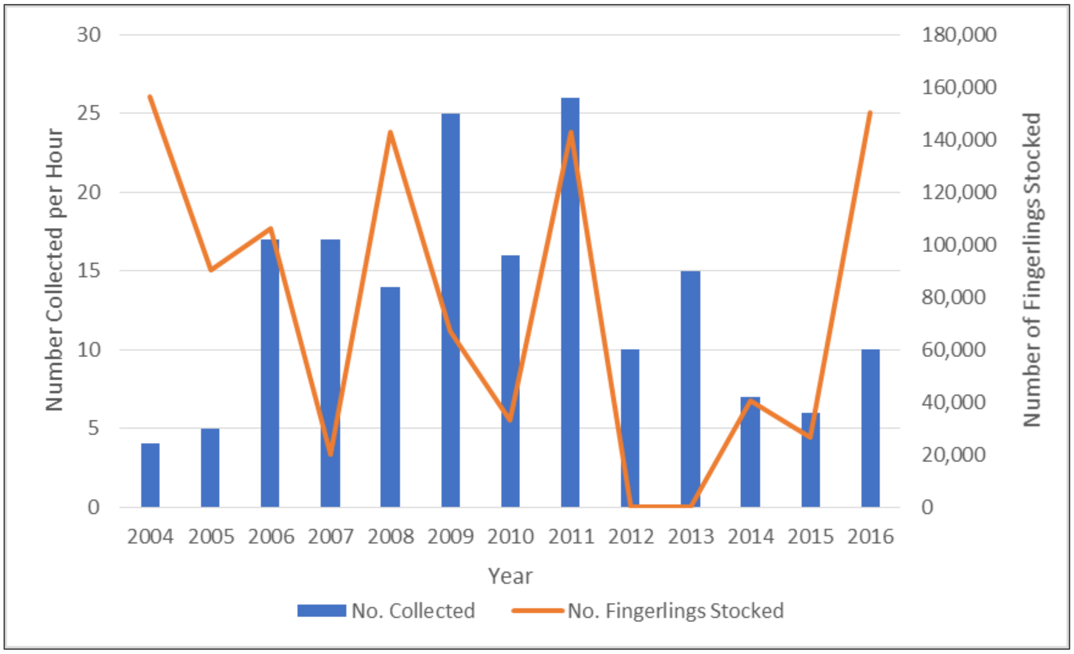
Walleye

Palmer et al. (2005) performed a radio-telemetry study of walleyes of Claytor Lake and the upper New River over a period of two years. The study suggests that two populations (i.e., more than one genetic stock) of Walleye coexist within the system. According to Palmer et al. (2005), Walleye living in Claytor Lake generally spawn at the first riffle area above the reservoir, while those living in the New River spawn at two riffle areas well upstream. One population originates from Walleye fingerlings obtained from outside of the New River drainage (i.e., not native to the New River), while the other is an indigenous population unique to the upper New River (Palmer et al. 2005).

Walleye are stocked and managed from Fries dam downstream to Claytor Lake dam. The VDGIF has managed the indigenous Walleye population since 2000 in efforts to restore it to a self-sustaining size (VDGIF 2013). According to Palmer et al. (2005), the coexistence of the two distinct populations of Walleye within the upper New River and Claytor Lake may warrant different management strategies, and suggested that management focus efforts on encouraging the exploitation of the Claytor Lake stock to reduce the nonindigenous population, and supporting the conservation of the indigenous population. The indigenous Walleye population may be restored by stocking with offspring from upstream spawning sites and/or strict harvest regulations. Indigenous Walleye fingerlings may be better adapted to the New River environment and may exhibit higher recruitment to the fishery than the nonindigenous stocks.

Over one million indigenous Walleye from upstream spawning sites have been stocked from Allisonia to Fields dam since 2003 (VDGIF 2017b) (Figure 5.4-1). Based on recent surveys performed by VDGIF, the largest numbers of Walleye were collected from 2006 to 2011, following years of consistently high stocking rates (an average of almost 95,000 fingerlings per year from 2004 to 2011). However, no Walleye were stocked between 2012 and 2013 as part of an evaluation of the need for continued stocking. 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.

Figure 5.4-1
Walleye Catch Per Hour and Annual Stocking Rates from the Upper New River – Allisonia Upstream to Fries Dam, 2004-2016 (VDGIF 2017b)



A recent upper New River Walleye Management Plan developed by the VDGIF (2017b) outlines several objectives with the goal of maintaining the genetically unique, naturally reproducing upper New River Walleye stock. These objectives include: (1) maintaining an average spring electrofishing catch rate between 15 and 25 Walleye per hour; (2) sustaining angler catch rates of adult Walleye at one fish per four hours of fishing between February and April; (3) maintaining New River Walleye stock through allele frequency monitoring; and (4) increasing the Walleye spawning stock to adequate levels for natural reproduction in support of a viable recreational fishery. With these objectives, VDGIF annually collects adult Walleye to use as broodstock in order to maintain the genetic structure of the population. Annual electrofishing surveys and allele frequency monitoring are conducted, as well as creel surveys and review of management strategies. Management regulations are dependent upon the river reach so that certain populations are protected for spawning and/or during spawning seasons.

Muskellunge

Since the 1970s, Muskellunge have also been stocked in the New River with the hopes of producing a population sustained through natural reproduction. Muskellunge are managed primarily as a trophy fish and secondarily as a predator for forage fish control (Brenden 2005). In the New River, Muskellunge exhibit fast growth rates and regularly reach trophy sizes, suggesting that the conditions of the New River are well-suited to support this species (Brenden 2005). Management is implemented by minimum length and creel limit regulations. As with other Virginia Rivers, Muskellunge are stocked to the New River on a rotating priority system, where waterbodies not stocked the previous year are given higher priority than those that were stocked (Brenden 2005). According to the latest (available) warmwater fish production and stocking information from VDGIF (2014), 500 nine-inch-long Muskellunge were stocked in the upper New River in Wythe and Carroll Counties in 2014. However, as of 2014, in response to an increase in the population and evidence of natural production, Muskellunge stockings had been suspended in the lower New River below Claytor Lake (Copeland 2014).

No additional stocking information was available for Muskellunge.

According to recent stocking records, no other fish have been stocked by the VDGIF in the upper New River (VDGIF 2014).

5.4.2 Essential Fish Habitat

Based on a review of the National Marine Fisheries Service (NMFS) Essential Fish Habitat (EFH) online database, no EFH, as defined under the Magnuson-Stevens Fishery Conservation and Management Act or established by the NMFS has been identified in the vicinity of Project.

5.4.3 Temporal and Spatial Distribution of Fish Communities

No obligate migrant fish species (catadromous or anadromous) exist between or upstream of the Project dams; however, some species may exhibit local spawning migrations, such as Walleye or Muskellunge (Younk et al. 1996, Hayden et al. 2014). Although the movement of these species is largely precluded by the dams, the area upstream and downstream remains a high-quality fishery.

5.4.4 Spawning Run Timing and Extent and Location of Spawning, Rearing, Feeding, and Wintering Habitats

As stated previously, the upper New River supports a cool-water fishery and is a popular fishing area for a variety of sportfish. Based on information provided by VDGIF (2017a), the Project area is specifically known for the quality of Smallmouth Bass, Channel Catfish, Spotted Bass, Walleye, and Muskellunge fishing opportunities. These species exhibit a range of seasonal behaviors related to spawning season, location of spawning, rearing, feeding, and wintering habitats. The life-history characteristics of these species are described below. Threatened or endangered fish or aquatic species are discussed in Section 5.7.

Spawning characteristics of fish species likely to use the Project waters is summarized from VDGIF (2017c), as well as the fishery study conducted by Appalachian for the previous relicensing process (Appalachian 1991b). These studies concluded that <1 to 13 percent of available spawning habitat within the Project area is potentially exposed under natural riverine conditions. Refer to Table 13 in Appalachian (1991b), provided in Appendix F, for a listing of spawning characteristics developed for this study of fish species in the Project area.

5.4.4.1 Smallmouth Bass

Smallmouth Bass are native only to the Tennessee and Big Sandy River drainage streams of southwest Virginia (VDGIF 2017c) but have been introduced into, and are now abundant in, most large rivers and lakes. Smallmouth Bass prefer slow-to-moderate currents and select areas of rocky shorelines. They are most active at temperatures between 67 degrees Fahrenheit (°F) to 72°F and are intolerant of silty, warm, polluted water (VDGIF 2017c).

Spawning usually occurs in late April to early June as temperatures exceed 60°F. Males build a nest in sand, gravel, or rubble at a depth of two to four ft, where they will guard the nest and fry (VDGIF 2017c). Eggs hatch between 7 and 21 days, depending on water temperature (Smith 1985).

5.4.4.2 Spotted Bass

Spotted Bass are native to western Virginia. They are typically found in warm, slow-moving streams and stream-like or riverine arms of reservoirs. Spotted bass feed on crayfish, small fish, and larval and adult insects. They spawn in the spring when water reaches between 63°F and 68°F. Males sweep silt from gravel or rocky substrates on the bottom of streams and rivers to make nests near brush or logs; after hatching the males guard the eggs and fry (VDGIF 2017c).

5.4.4.3 Rock Bass

Rock Bass, although not a true bass, is part of the Centrarchidae family. The Rock Bass is native to the Mississippi River, Great Lakes, and Southern Hudson Bay drainage areas, although it has been introduced throughout the Atlantic slope drainages (Rohde et al. 2009). Rock Bass prefer pools and backwater areas of clear and cool, rock-bottomed streams, usually associated with structure such as rocks or logs. Rock Bass are generalists and when young, will feed on micro-crustaceans and aquatic insects, shifting to small fish and crayfish as adults. Males construct a circular nest in shallow water over sand for spawning, which occurs from April to June.

5.4.4.4 Channel Catfish

Channel Catfish are found in lakes and larger rivers with relatively clean sand, gravel, or stone substrate, over mud flats, and seldom in dense weedy areas. They live in deep, slow pools of swift, clear-running streams. They are often found below dams in large reservoirs (VDGIF 2017c).

Spawning occurs from late May through July when water temperatures reach the mid-70s (°F). Channel Catfish often deposit their eggs on rocky ledges, undercut banks, hollow logs, and other underwater structures. Males guard the nest and the eggs hatch in 7 to 10 days. The fry travel in schools, which are often herded and guarded by the male (VDGIF 2017c).

5.4.4.5 Walleye

Walleye are native to the Tennessee and Big Sandy River drainages (VDGIF 2018a), as well as the New River drainage (Palmer et al. 2005) in Virginia. They prefer cool water and have been introduced into numerous waterbodies. They are often found next to ledges, large rocks, underwater islands, large logs, edges of large beds of aquatic vegetation, along old riverbed channels, and along reefs and bars (VDGIF 2017c).

Spawning begins as early as late February, when water temperatures reach approximately 45 to 55°F (7 to 12°C). 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. Walleye are broadcast spawners (i.e., do not create nests); eggs are non-adhesive and unattended after being released. Eggs free-fall onto substrate or into cracks and crevices and hatch in about two weeks (VDGIF 2017c).

Spawning takes place primarily at dusk or night in relatively shallow, flowing habitats comprised of rocky substrates (Paragamian 1989; Smith 1985; McMahon et al. 1984; Ellis and Giles 1965). Walleye prefer shallow shoreline areas, shoals, riffles, and dam faces with rocky substrates and good water circulation from waves or currents. Walleye typically display diurnal staging behavior at or just adjacent to spawning sites; however, studies have reported spawning during the day and in slack water habitats (Lowie et al. 2001; Corbett and Powles 1986). Males often arrive at spawning sites before females, where multiple males may spawn with one female. This usually involves a series of courtship behaviors including lateral pushing, rolling, and rapid bursts of swimming (Ellis and Giles 1965). Eggs and milt are simultaneously broadcast over the substrate when males and females are in close proximity. Fertilized eggs likely drift downstream and settle into interstitial spaces between the substrate. Studies have shown that egg survival is greatest when larger, harder substrates such as boulders, rubble, and gravel dominate (Smith 1985; Johnson 1961). Hatching time varies depending on water temperature, and newly hatched fry may drift further downstream to lentic habitats and continue first-year development there (Corbett and Powles 1986; McMahon et al. 1984; Olson et al. 1978). Male Walleye usually mature at ages two to three (300–340 millimeters [mm]) and females at ages four to five (430 mm) (Smith 1985).

5.4.4.6 Muskellunge

Muskellunge are not believed to be native to Virginia, but have been introduced to the New River, as well as other drainages. Muskellunge prefer cool, clear lakes with abundant vegetation or long pool areas of rivers near fallen debris and other submerged structures.

They spawn in early spring. Eggs are fertilized and discharged over muck or marl bottoms with aquatic vegetation in shallow bays and coves of lakes, or in eddies upstream or downstream of riffles. In Virginia, most Muskellunge populations are maintained through stocking.

5.4.5 Benthic Macroinvertebrates Habitat and Life-History Information

Benthic macroinvertebrates are an important component of riverine systems where they serve as a food resource for fish and as useful indicators of water quality and environmental stressors. Often, the presence of pollution-intolerant species, or EPT taxa (Ephemeroptera [mayflies], Plecoptera [stoneflies], and Trichoptera [caddisflies]) can be indicative of a healthy stream. However, this is only one of many indices that can be used to assess the biological integrity of a stream.

5.4.5.1 Crustaceans

Crayfish function as an important prey item for sportfish species in the New River. In comments filed on the PAD for the Fries Project, Orth (2015) noted that a number of species of New River crayfishes live amongst the gravel and cobble substrates (Roell and Orth 1992, as cited by Orth [2015]). Many of the large-bodied fishes (Smallmouth Bass, Rock Bass, Flathead Catfish, Walleye) in the New River are highly dependent on crayfish as an energy source (Roell and Orth 1993, as cited by Orth [2015]) and these crayfish can support local bait harvest, when locally abundant (Nielsen and Orth 1988, as cited by Orth [2015]).

In 2008, a crayfish survey was conducted in the New River in association with the relicensing of the Claytor Project. Six hundred and ninety crayfish representing three species were identified during the survey (Devine Tarbell & Associates [DTA] 2008). Three crayfish taxa were documented at multiple sites downriver from the Claytor Lake dam including the invasive Northern Virile Crayfish (*Orconectes virilis*), Spiny Stream Crayfish (*Orconectes cristavarius*), and the New River riffle Crayfish (*Cambarus chasmodactylus*)[6]. The invasive Northern Virile Crayfish dominated overall densities at sites (DTA 2008).

[6] The New River crayfish is currently under federal review for listing under the Endangered Species Act (76 FR 59835).

Concurrent to fish surveys at the Fries Project in 2016 and 2017 (described in Section 5.4.1.1), crayfish surveys were also completed using a variety of sampling gear and methodologies (e.g., kick-net, seine-haul, D-frame dip nets, and snorkel surveys) (Carey et al. 2017). 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). The Spiny Stream Crayfish was the only taxon of crayfish collected in the New River during the surveys. 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.

5.4.5.2 Aquatic Insects

By letter dated September 23, 2017, the VDCR identified two species of aquatic insect as “species of greatest conservation need (SGCN)” with the potential to occur within the Project vicinity: the mustached clubtail (*Gomphys adelphus*) and the pygmy snaketail (*Ophiogomphus howei*). Additional information regarding these rare species is provided in Section 5.7.2

During the 2016-2017 aquatic resource surveys conducted at the Fries Project, 17 species of Odonata representing 4 families were collected from Reaches 1, 2, 4, and 5; none were collected from Reach 3 (Carey et al. 2017). The pygmy snaketail was collected in Reaches 4 and 5. Additionally, the Allegheny river cruiser (*Macromia alleghanensis*), spine-crowned clubtail (*Gomphus abbreviates*) and green-faced clubtail (*G. viridifrons*) were also collected in the surveys.

5.4.6 Freshwater Mussels

Eleven species of freshwater mussels have been documented in the upper New River in recent surveys of the upper New River (Pinder et al. 2002, Alderman 2008, Stantec 2016; Stantec 2017a, 2018a, 2018b), as summarized in Table 5.4-5.

5.4.6.1 Mussel Surveys 2002 through 2017

Pinder et al. (2002) conducted a drainage-wide survey to determine the status and distribution of freshwater mussels in the New River in Virginia. Mussels were sampled at 134 sites, which included the mainstem and tributaries in the New River Basin between 1997 and 1998. Sampling was conducted in summer and early fall during low-flow, clear-stream conditions. Sites were sampled using snorkel or viewscope survey methods. Sample transect lengths were 500 meters on the mainstem and 250 meters on most tributary sections. Fifty of the 134 sites yielded mussels for a total of 1,181 individuals representing eight species (Table 5.4-5). The two most widely distributed species were the purple wartyback (*Cyclonaias tuberculata*) and spike (*Elliptio dilatata*).

Alderman (2008) conducted a mussel survey within Claytor Lake and the New River between 2007 and 2008. In the 2007 surveys, six extant mussel species were documented in Claytor Lake in 2007: giant floater (*Pyganodon grandis*), paper pondshell (*Utterbackia imbecillis*), purple wartyback, pistolgrip (*Quadrula verrucosa*), pocketbook (*Lampsilis ovate*), and spike. In 2008, 16 sites were surveyed in the New River (two just downstream of Buck dam: Site 080724.1 and 080724.2) with particular emphasis on mussels downriver from Fries dam and Buck dam. A total of 1,189 mussels representing 6 extant taxa were documented during the 2018 survey including pistolgrip, spike, giant floater, wavy-rayed lampmussel (*Lampsilis fasciola*), pocketbook, and purple wartyback. For these sites just downstream of Buck dam, a total of 79 pistolgrip, 11 purple wartyback, 4 pocketbook, and 1 spike mussel were documented at Site 080724.1, and a total of 123 purple wartyback, 46 pistol grip, 5 pocketbook, and 6 spike mussels were documented at Site 080724.2 (Alderman 2008).

In October 2015, Stantec (2016) performed a mussel survey on the New River in Virginia. There were 7 sample sites, three upstream and four downstream of Claytor dam. Two of the sites located upstream of Claytor dam were located less than a mile downstream of Buck dam. Sites were surveyed with a combination of transect and quadrat sampling either by scuba diving or snorkeling. After transects were surveyed, the areas with the highest abundance of mussels was determined and selected for quantitative sampling. A total of 130 live mussels were observed in the New River during the survey. The purple wartyback was the most abundant species with 96 individuals documented, followed by the pistolgrip with 26 mussels documented. Recruitment was observed for these two species as multiple-year classes were observed and measured.

In June and September 2017, Stantec (2017a) reassessed the mussel assemblage at sites along the New River. The primary objective of the sampling in June was to document reproductive behaviors, whereas September sampling focused more on overall abundance and population dynamics. In June, two upstream sites were sampled, one of which was close to RM 32, and the other was just under RM 2 downstream of Claytor Lake. A total of 129 live mussels were collected, with reproductive status assessed on 59 of those, none of which were observed to brood glochidia.

Table 5.4-5
Mussel Occurrences in the New River Basin

Common Name	Pinder et al. (2002)			Alderman (2008)		Stantec (2016)		Stantec (2017)				Stantec (2018a, 2018b)	
								June Survey		September Survey		April-May [1]	July [2]
	Historical Occurrence in New River	Main Stem of New River	Tributaries to New River	Site 080724.1- Below Buck dam	Site 080724.2- Below Buck dam	Above Claytor Lake	Below Claytor Lake	Above Claytor Lake	Below Claytor Lake	Above Claytor Lake	Below Claytor Lake	Above Byllesby dam	Above Buck dam
Purple wartyback (*Cyclonaias tuberculata*)	X	674	27	11	123	78	18	104	-	265	25	3	1
Spike (*Elliptio dilatata*)	X	316	57	1	6	3	-	9	-	8	-	-	-
Pocketbook (*Lampsilis ovata*)	X	27	-	4	5	3	-	-	-	2	-	-	-
Pistolgrip (*Quadrula verrucosa*)	X	15	-	79	46	24	2	2	4	32	5	-	-
Wavy-rayed lampmussel (*Lampsilis fasciola*)	X	15	4	-	-	-	2	-	-	-	-	-	1
Elktoe (*Alasmidonta marginata*)	X	2	-	-	-	-	-	-	-	-	-	-	-
Green floater (*Lasmigona subviridis*)	X	7	17	-	-	-	-	-	1	-	-	1	-

Common Name	Pinder et al. (2002)			Alderman (2008)		Stantec (2016)		Stantec (2017)				Stantec (2018a, 2018b)	
								June Survey		September Survey		April-May [1]	July [2]
	Historical Occurrence in New River	Main Stem of New River	Tributaries to New River	Site 080724.1-Below Buck dam	Site 080724.2-Below Buck dam	Above Claytor Lake	Below Claytor Lake	Above Claytor Lake	Below Claytor Lake	Above Claytor Lake	Below Claytor Lake	Above Byllesby dam	Above Buck dam
Tennessee heelsplitter (*Lasmigona holstonia*)	X	-	20	-	-	-	-	-	-	-	-	-	-
Mucket (*Actinonaias ligamentina*)	X	-	-	-	-	-	-	-	-	-	-	-	-
Paper pondshell (*Utterbackia imbecillis*)	X	-	-	-	-	-	-	-	-	-	-	-	-
Giant floater (*Pyganodon grandis*)	X	-	-	-	-	-	-	-	9	-	-	-	-
TOTAL NUMBER	-	1,056	125	95	180	108	22	115	14	307	30	4	2
NUMBER OF SPECIES	11	7	5	4	4	4	3	3	3	4	2	2	2

1) Mussel salvage and relocation performed by Stantec at Byllesby dam (2018a).
2) Mussel rescue performed by Stantec at Buck dam (2018b).

Furthermore, divers did not observe any displaying females. Multiple size classes were observed for three of the five species at sites upstream from Claytor Lake, which suggests recruitment is occurring. Mussels at the site downstream of Claytor Lake were larger, older individuals and recruitment was not evident.

In September 2017, seven sites were surveyed; three upstream of Claytor dam and four downstream (Stantec 2017a). A total of four species and 337 live freshwater mussels were collected during the survey. Substantially more mussels were collected at sites upstream of Claytor Lake (307 mussels) than at downstream sites (30 mussels). One of the sites located upstream of Claytor dam was located less than a mile downstream of Buck dam where 49 purple wartyback, 3 spike, and 30 pistolgrip were collected. Collectively, these comprised nearly 25 percent of the mussels collected during the survey.

Freshwater mussels were also surveyed along the same five survey reaches where fish sampling was performed at the Fries Project, as described above in Section 5.4.1.1. Surveys targeted live mussels and shell material using timed snorkel surveys focused in suitable habitat areas. Dive searches were completed for deeper habitats located in Reach 4 (the Tailwater). A total of 61 live mussels representing 2 species were collected from Study Reaches 1, 4, and 5. Notably, green floater (*Lasmigona subviridis*) were collected in the Upstream Reference Reach (Reach 1), which represents a new occurrence locality for this state-listed threatened species. The purple wartyback were patchily distributed in Reach 4 and Downstream Reference Reach (Reach 5). There was no evidence of recent recruitment of the purple wartyback based on the absence of smaller sized individuals. A comparison of CPUE data from this study with surveys completed in 1997 (Pinder et al. 2002) suggests a local decline in abundance of purple wartyback; however, survey areas and protocols were not identical between the two studies. Shell materials for a third species, spike, were also collected from Reach 1. No live mussels or shell material were identified in the Impoundment (Reach 2) or Bypass (Reach 3). No live individuals or shell material of the state-listed threatened pistolgrip were found during the mussel searches. The Flathead Catfish, a common host for pistolgrip glochidia, was present in all study reaches except for Reach 1 (see Section 5.4.1.1).

Appalachian consulted with USFWS and VDGIF regarding freshwater mussels at the Byllesby-Buck Project in 2016 in support of the non-capacity amendment application for the installation of the inflatable Obermeyer crest gates. In correspondence to Appalachian, dated November 15, 2016, USFWS stated that green floater may be present in the Byllesby-Buck Project reservoirs. During a riparian habitat assessment conducted at the Byllesby-Buck Project in April 2017, it was reported to Appalachian (and in turn reported to VDGIF, USFWS, and FERC) that a weathered, dead shell of a green floater was found on a dry gravel bar along the New River, upstream of the Byllesby dam (correspondence from W. Baltzersen, ESI, to AEP, dated May 2, 2017).

5.4.6.2 Mussel Salvage and Relocation Activities 2018

Mussel salvage and relocation activities were conducted in the Byllesby reservoir from April 30-May 1, 2018, during a planned reservoir drawdown for the above-mentioned Obermeyer crest gate replacement at Byllesby dam (Stantec 2018a). The mussel salvage and relocation effort was performed along 500-meter-long areas of the exposed channel margins above Byllesby dam. Search areas were surveyed, and where suitable substrates were observed, a visual search for mussels was performed for a minimum of 30 minutes, resulting in a total search effort of 27.2 hours. Four live mussels, three purple wartyback and one green floater (Table 5.4-5), were identified and measured, and then relocated upstream of the impoundment in areas with suitable substrate with a similar mussel assemblage.

A mussel rescue was performed in the pool upstream of Buck dam during a drawdown on July 10-11, 2018 (Stantec 2018b). Surveys for mussels were performed along exposed channel margins, in addition to a section of islands above Buck dam, which were divided into five, 500-meter search areas and one, 400-meter search area. Search areas were surveyed, and where suitable substrates were observed, a visual search for mussels was performed for a minimum of 30 minutes, resulting in a total search effort of 15.55 hours. Two live mussels, one wavy-rayed lampmussel and one purple wartyback (Table 5.4-5) were removed and held until post-drawdown, when they were returned to wetted areas in suitable habitat that was similar to that which was exposed during mussel surveys.

In summary, of the 11 species historically documented in the New River Basin, 7 species have been collected in monitoring efforts since 2002: the purple wartyback, spike, pocketbook, pistolgrip, wavy-rayed lampmussel, green floater, and giant floater (Table 5.4-5).

5.4.7 Invasive Aquatic Species

Invasive species are those which do not naturally occur in a specific area and cause ecological and economic damage. The invasive Northern Virile Crayfish have been documented throughout the New River (DTA 2008). It is found in streams with moderate flow and turbidity, abundant cover, and stable water levels. It is believed that anglers use of this species as a live bait has been a major factor contributing to its spread throughout the country (USFWS 2015a). The Northern Virile Crayfish are known to modify aquatic macrophyte and macroinvertebrate communities, which in turn can lead to a decline and reconfiguration of the fish community. They may also consume eggs of sunfish, Bluegill, and other fish leading to reduced population sizes (USFWS 2015a). As described above in Section 5.4.5, this species dominated overall densities of crayfish observed in the 2008 crayfish survey conducted in the New River for the Claytor Project relicensing (DTA 2008).

5.4.8 Known or Potential Adverse Effects and Proposed PM&E Measures

5.4.8.1 Fish and Aquatic Resources

Generally on smaller systems, such as the reservoirs formed by the Project developments with high flushing rates and low retention times, there is minimal difference of abiotic and biotic variables between upstream to downstream areas. As such, minimal project effects are expected on fish stocks in the riverine-like reservoirs due to the run-of-river operations.

Pool Fluctuation Effects on Spawning Habitat

Periodic drawdown of the Project reservoirs for maintenance, including flashboard replacement, has the potential to dewater spawning and nesting fish habitat. Mussels may also become exposed in dewatered areas, leaving them vulnerable to desiccation, freezing, or predation. In the previous Appalachian study (1991b), spawning characteristics of common fish species were evaluated for the maximum percentage of potential spawning habitat made unavailable due to pool fluctuations. Fish species were categorized into three groups according to spawning season and preferred spawning depth. Mean monthly pool fluctuations within the forebays based on historical data was compared with mean monthly fluctuations of the free-flowing river. This analysis indicated that less than 1 to 13 percent of available habitat is potentially exposed under natural riverine conditions, compared to 9 to 57 percent potentially exposed by project-related fluctuations under the previous license.

Entrainment

At hydroelectric projects, fish and other aquatic organisms can be drawn into turbine intakes, where they may be injured or killed. There are several factors which influence the probability of fish entrainment, such as fish species; size and swimming ability; spawning behavior; and general habitat preferences.

A desktop entrainment study was conducted for the Byllesby-Buck Project during the previous relicensing (Appalachian 1991b). Electric Power Research Institute (EPRI) data, project characteristics, as well as the behavioral and life history characteristics and preferred habitat of the resident fish were used to assess entrainment potential.

The fish species and life stages likely to be entrained are those most likely to be found within the area of influence in forebay areas. Several of the species in the Centrarchidae family (black basses and sunfishes) and the Ictaluridae family (catfishes) prefer habitat types with structure and cover, such as rocks, logs, stumps, and aquatic vegetation. These species are also generally nest or cavity spawners, depositing adhesive or demersal eggs in beds created by males and often guarded until hatching.

Unless these habitats are found within the forebay of the dam, it is unlikely that these species, as eggs, larvae, or adults, will be in the vicinity to become entrained. An exception are crappie species, such as White Crappie (*Pomoxis annularis*) or Black Crappie, which construct nests in the littoral zone, but have pelagic larvae until the juvenile stage, when they move inshore (Rohde et al. 2009).

Habitat generalists, pelagic species, or benthic species may be more likely to be found within the forebay areas, such as clupeids (ex. Gizzard Shad [*Dorosoma cepedianum*]), cyprinids (shiners, minnows, chubs, or carp), catostomids (suckers), or moronids (temperate basses). Some of these species, such as clupeids, are broadcast spawners. Broadcast spawners release eggs within the water column, providing them at the mercy of the current with increased likelihood of entrainment. However, even if fish larvae and eggs become entrained, it is unlikely that turbine passage would cause harm under optimal design conditions and if cavitation is not excessive (Appalachian 1991b).

The susceptibility of Muskellunge to entrainment into the turbines at the Project likely varies throughout the year due to variations in predatory behavior (Cook and Solomon 1987). Immediately following spawning in the spring and through midsummer, Muskellunge typically begin to exhibit crepuscular prey seeking behaviors at a variety of water depths and across a range of habitat types; as such, Muskellunge may enter the forebay area in pursuit of forage fish (i.e., pelagic species). In late summer, Muskellunge become sedentary ambush predators with a strong association with vegetated areas. Although Muskellunge may be found in the forebay area during certain times of year, the age and size (and subsequent swimming ability) at which they would be seeking forage fish (i.e., older/larger individuals), would likely allow them to avoid entrainment into the turbines (EPRI 2000).

While any fish within the vicinity of the intake can be considered at risk for entrainment, larger fish tend to have greater swimming abilities (EPRI 2000, Froese, et al. 2017). Many adult fish have swimming speeds greater than the maximum intake velocity (1.8 ft per second [Appalachian 1991b]). In a meta-analysis of 225 records comprising 80 species, Froese et al. (2017) determined that there is a positive relationship between fish length and swimming speed. Furthermore, burst speeds were approximately 10 times higher than sustained swimming speeds (Froese, et al. 2017). This study also shows that fish greater than approximately 2.2 inches in length generally would not be susceptible to the maximum intake velocity at Byllesby and Buck dams and, therefore, not become impinged or entrained (Froese, et al. 2017). As there have been no changes to powerhouse equipment, intake structures, or trashracks, Appalachian believes intake velocities at the Project are unchanged.

If juvenile or larger fish are drawn into the facility turbines, Appalachian (1991b) determined that pressure changes, turbulence and shear effects, and cavitation would be minimal and unlikely to cause substantial harm. In addition, fish are likely swimming with negative rheotaxis as they enter through the stay vanes and wicket gates and, therefore, unlikely to contact the vanes perpendicularly

(Appalachian 1991b). The Appalachian (1991b) study also evaluated the probability of contact with a runner blade based on measurements of the Byllesby and Buck turbine dimensions. The study concluded that the probability of collision with runner blades was less than five percent for most species, particularly for the smaller species which have a higher likelihood of entrainment (Appalachian 1991b). Mortality would, therefore, be lower than five percent, assuming blade strikes can range from slight glancing blows to head-on collisions (Appalachian 1991b).

Angled-bar trash-racks with close spacing, such as those installed at the Byllesby and Buck developments, are a common protection measure in place at hydroelectric projects to reduce entrainment. To the extent that the existing Project causes impingement or entrainment, such impacts would be expected to continue at their existing levels under the new license.

The study reported in Appalachian (1991b) that the potential for substantial entrainment effects at the Byllesby and Buck developments was low. Based on behavioral characteristics, habitat preferences (including spawning habitat), and life-history characteristics of resident species, the likelihood of substantial numbers of fish occurring in the forebays was also determined to be minimal.

Based on the results of this previous entrainment study and accounting for the trashracks already installed at the Project intakes, Appalachian does not propose any additional measures to address impingement and entrainment. Appalachian expects to operate the Project in the existing run-of-river mode and with the existing minimum flows and ramping rate. Operating the Project in this manner provides a relatively stable reservoir elevation and protects shoreline stability and water quality for the benefit of fish and other resources. Appalachian will consult with resource agencies and stakeholders through the relicensing process regarding potential project effects and, as appropriate, will consider additional measures to protect and/or enhance fishery resources at the Project recommended by licensing participants.

5.4.8.2 Bypass Reach Habitat and Flows

Periodic or intermittent release of flows over the spillways through the Tainter gates, crest gates, flashboards, or sluice gates creates the potential for fish stranding in pockets of water in the rough substrate of the bypass reaches. Flow releases over the main spillways into the bypass reaches are generally infrequent at the Project, though more common during the wet months of November-December and February-April, and necessary during plant outages. As previously noted, replacement of sections of wooden flashboards with inflatable Obermeyer crest gates at both developments is expected to reduce inadvertent flow into the bypass reach that may potentially attract and expose fish to stranding.

For times when flows are required to be released over the main spillway, ramping rates and associated procedures (i.e., incremental gate openings and closings) are in place at each development to mitigate, as feasible, fish stranding due to spillway gate operations. 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. Additionally, no minimum flows were proposed by Appalachian or recommended by resource agencies during the previous relicensing.

As a condition of the existing license, Appalachian conducted a ramping rate assessment in 1997 to assess the effectiveness of the ramping procedures for the protection of the fisheries downstream of the Buck spillway. Observations, including backpack electrofishing, of representative pools were conducted following three spill events during the period March through May 1997. The first assessment (March 12, 1997) resulted in the collection of 185 fish representing 16 species. The majority of the fish appeared to be permanent residents of the larger pools in the bypass. These particular pools are maintained year-round by leakage through the flashboards and/or subsurface flow. A second assessment (March 18-19, 1997) resulted in the collection of 348 fish representing 20 species. Similar to the first assessment, almost all of the fish collected were likely full-time residents of the bypass reach. A few large Common Carp, White Suckers, and Northern Hogsuckers were identified and likely migrants. The third assessment (May 2-3, 1997) resulted in the collection of 201 fish representing 16 species. Species identified were similar to the first two assessments, but with an increased presence of larger fish such as Common Carp and Northern Hogsucker that were likely not resident to the bypass reach (Appalachian 1997).

The ramping rate assessment concluded that fish stranding is not a significant problem below the Buck spillway when the ramping procedures are followed in accordance with Article 406. The majority of the fish collected (85-90%) appeared to be permanent residents of the bypass area in pools or flowing-water areas fed by leakage through the flashboards, rain events, and possibly subsurface flow. Very few spring-migrating fish and almost no large game fish were observed in a stranded location following any of the three spill events. Additionally, in many areas of the bypass, particularly the area within 1,600 ft of the dam, leakage and other flows continue to provide an escape route to fish species when the gates are closed. Local observers also indicated that fish that moved into the area during spill events largely departed during the final period of spill at a 1-foot gate opening (Appalachian 1997). On March 27, 1998, FERC approved Appalachian's ramping rate assessment report, inclusive of and recommendations for Appalachian to continue to retain the ramping rate protocol assessed in the 1997 study.

Based on this assessment, for the protection of fishery and aquatic resources in the bypass reach, Appalachian proposes to continue to operate the Project with the existing ramping rate. Additionally, as described above, Appalachian expects that operation of the Project with the inflatable Obermeyer crest gates installed at each dam will reduce instances of spills to the bypass reach that may not conform to the ramping rate required for the spillway gate operations.

5.4.8.3 Project Tailraces and Downstream River Reaches

During the previous relicensing, 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. Erosion and deposition impacts were considered negligible due to the steep, rocky, and relatively straight river channel below each powerhouse. The study found (1) that the fish likely to spawn in the tailrace would likely do so in the spring when water levels would typically be elevated and, (2) because the channels below the powerhouses are steep-sided, little spawning surface would be exposed. Based on these findings, the study concluded that impacts of powerhouse operations on spring spawning habitat would be minimal. Based on field observations during various flows, it was determined that a flow of 360 cfs was adequate for fish habitat and that higher minimum flows only increased downstream water levels by small amounts (Appalachian 1991a). Appalachian proposes to continue to provide the minimum flow at this existing amount for the term of the new license.

The primary effect to downstream aquatic resources is the physical barrier to fish movement created by the respective developments (in combination with the barriers created by other dams downstream and upstream of the Project). The presence of dams on the New River can also affect mussel populations by inhibiting movements of fish species that serve as hosts to glochidia. Although no obligate migrant fish species (diadromous or catadromous) or critical habitat for such species exists in between or upstream of the Project dams, and the quality of the fishery at and upstream and downstream of the Project is high, movement of riverine species is largely precluded by the dams. Appalachian understands that fish passage at dams on the upper New River is not presently a management objective of USFWS or VDGIF, the latter of whom is instead focusing resources on fish stocking activities (VDGIF, personal communication).

Appalachian does not propose any additional PM&E measures related to fish passage but expects to evaluate and confirm this proposal on consultation with resource agencies and other stakeholders through the relicensing process.

5.5 Wildlife and Botanical Resources

5.5.1 Botanical Resources

Most of the land adjacent to the Project is steep and forested. Forest cover in the vicinity of the Project is of the oak-chestnut type, although there are many bare rock exposures in the rugged terrain. There is also a noteworthy percentage of pine and other types, such as hickory, hemlock, maple, ash, birch, rhododendron, locust, and basswood. The west side of the project is bounded by the Jefferson National Forest, and the east side consists of similarly forested terrain (Appalachian 1991a). According to the EA prepared by FERC for the existing license (FERC 1994b), project lands include both upland forest and riparian forest, characterized by silver maple (*Acer saccharinum*), black willow (*Salix nigra*), and American sycamore (*Platanus occidentalis*) as the primary species.

5.5.1.1 Invasive Terrestrial Plant Species

The VDCR maintains a list of invasive plant species found within the State (VDCR 2017a). The list includes species that pose a threat to Virginia's forests, marshes, wetlands, and waterways. They are ranked based on the level of threat they present to natural communities and species. There are close to 100 invasive plant species in Virginia (VDCR 2017a) (Appendix G).

5.5.2 Wildlife

The Project area supports a number of small mammals, avifauna, reptiles, and amphibians. Over 511 species were identified as potentially occurring within a three-mile radius of the Project per a geographic search on the VDGIF's Fish and Wildlife Information Service (VDGIF 2017a).

5.5.2.1 Mammals

Mammals, including commercially and recreationally important wildlife species, that occur within the Project area include white-tailed deer (*Odocileus virginianus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), and gray fox (*Urocyon cinereoargenteus*) (VDGIF 2017a). Other species also known to occur within the general Project area include the Eastern chipmunk (*Tamias striatus*), red squirrel (*Tamiasciurus hudsonicus*), Eastern gray squirrel (*Sciurus carolinensis*), longtail weasel (*Mustela frenata*), common mink (*Neovison vison*), American beaver (*Castor canadensis*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), woodchuck (*Marmota monax*), muskrat (*Ondatra zibethicus*), meadow vole (*Microtus pennsylvanicus*), deer mouse (*Peromyscus maniculatus*), white-footed mouse (*Peromyscus leucopus*), and Northern short-tail shrew (*Blarina brevicauda*) (VDGIF 2017a).

5.5.2.2 *Avifauna*

Birds such as the Northern cardinal (*Cardinalis cardinalis*), American crow (*Corvus brachyrhynchos*), mourning dove (*Zenaida macroura*), pileated woodpecker (*Dryocopus pileatus*), and wood duck (*Aix sponsa*) are some of the many birds known to occur in the Project area (VDGIF 2017a), along with commercially and recreationally important species such as eastern turkey (*Meleagris gallopavo*), ruffed grouse (*Bonasa umbellus*), and various waterfowl species.

Bald eagle (*Haliaeetus leucocephalus*) nesting or roosting habitat has the potential to occur in the vicinity of the Project. The bald eagle was removed from the Federal Endangered Species List on August 8, 2007, and is no longer protected under the Endangered Species Act (ESA); however, bald eagles are protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. In association with agency consultation for the recent non-capacity amendment application for installation of the Obermeyer crest gates, searches for bald eagles and/or their nests were completed in the Project vicinity in April and July 2017 on behalf of Appalachian. A single bald eagle was observed on the first day along the west bank of the New River, approximately 1.4 miles upstream of the State Road 606 Bridge. The report presenting these findings was submitted to USFWS and VDCR in July 2017. On the second day, approximately 0.2 miles from this location, two bald eagles were observed perching on rocks in the river (one bald eagle was determined to be likely the same as that observed the previous day). A single juvenile bald eagle was observed fishing approximately 0.4 mile south of Byllesby dam during the searches conducted in July 2017; this individual flew to a roost in a tree on the river bank upon successfully catching a fish. No calls were heard nor nests observed during any of these observations in 2017.

5.5.2.3 *Reptiles and Amphibians*

A variety of reptiles and amphibians have been known to occur in the general Project vicinity. Common species may include the snapping turtle (*Chelydra serpentine*), painted turtle (*Chrysemys picta*), eastern garter snake (*Thamnophis sirtalis*), red-spotted newt (*Notophthalmus viridescens*), American toad (*Anaxyrus americanus*), spring peeper (*Pseudacris crucifer)*, green frog (*Lithobates clamitans*), American bullfrog (*Lithobates catesbeianus*), pickerel frog (*Lithobates palustris*), and wood frog (*Lithobates sylvaticus*) (VDGIF 2017a). Based on comments filed with FERC by VDGIF on the PAD for the Fries Project (VDGIF letter dated November 19, 2015), additional herpetofauna that may occur in the Project area includes two amphibians—the Blue Ridge dusky salamander (*Desmognathus orestes*) and Yonahlossee salamander (*Plethodon yonahlossee*), and four additional reptiles—woodland box turtle (*Terrapene carolina carolina*), eastern hog-nosed snake *(Heterodon platirhinos*), queen snake (*Regina septemvittata*), and common ribbonsnake (*Thamnophis sauritus sauritus)*.

VDGIF also noted the potential for occurrence of the eastern hellbender *(Cryptobranchus alleganiensis alleganiensis).* See Section 5.7.2 for additional information about this species.

5.5.3 Known or Potential Adverse Effects and Proposed PM&E Measures

The Project has been in continuous operation for over 100 years, and botanical and wildlife species are well established. Short-term minimal effects from normal maintenance, temporary construction activities, and ongoing operations may temporarily impact some generalist terrestrial wildlife species, but such species would be expected to move to adjacent habitat, returning once activities are complete. No significant impacts to wildlife or botanical resources at the Project are known to be occurring or expected to occur during the term of the new license.

Appalachian proposes to continue to operate the Project in the existing run-of-river mode and to continue the annual monitoring of undeveloped lands required by the License Article 408 Wildlife Management Plan. No additional environmental PM&E measures related to wildlife or botanical resources are proposed at this time.

5.6 Wetlands, Riparian, and Littoral Habitat

Wetlands are generally defined as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support vegetation typically adapted for life in saturate soil conditions. The USACE and VDEQ have jurisdiction over wetlands in Virginia.

The littoral zone, in the context of a large river system, is the habitat between about a half-meter of depth and the depth of light penetration (Wetzel 1975). The littoral width varies based on the geomorphology and rate of sedimentation of the stretch of river (Wetzel 1983).

Riparian habitats are areas that support vegetation found along waterways such as lakes, reservoirs, rivers, and streams. The boundary of the riparian area and the adjoining uplands is gradual and not always well defined. However, riparian areas differ from the uplands because of their high levels of soil moisture, frequency of flooding, ability to provide important ecosystem functions, and unique assemblage of plant and animal communities (Virginia State University 2000; Mitsch and Gosselink 2000). Riparian habitat in the Project area is dominated by hardwood forest. Small areas of open field or cleared areas are present along parts of the western and eastern shorelines of the New River, including electric transmission corridors in the vicinity of the Project.

Wetland, riparian, and littoral habitats within the Project boundary are associated with the margin and near-shore areas of the impoundments. The USFWS National Wetlands Inventory (NWI) data and digital orthophotography of the Project area identifies the vegetated wetlands within the Project boundary as consisting of areas of aquatic beds in the impoundment, palustrine emergent (PEM) wetlands along the edge of the river channel and palustrine forested (PFO) wetlands along the New River. Sediment deposition in the backwater areas of the project reservoirs has created sites suitable for wetland vegetation, including about 27 acres of emergent wetland vegetation bordering the Byllesby reservoir and about 15 acres bordering the Buck reservoir (Appalachian 1991a). Additional wetlands are also created by sediment deposition at other areas, such as a small area approximately 100 yards upstream of the gated spillway dam at the Buck development.

5.6.1 Wetland, Riparian Zone, and Littoral Maps and Acreage

A map of wetland habitats existing in the Project vicinity is presented in Figure 5.6-1. Table 5.6-1 defines the NWI classification system associated with the wetlands maps (USFWS Undated) and provides the available acreage of each classification of wetlands within the Project vicinity. The NWI wetlands in the vicinity of the Project encompass approximately 9.17 acres.

Table 5.6-1
National Wetlands Inventory Classification System and Estimated Acreage

Wetlands Code	System	Class	Subclass	Regime	Special Modifier	Estimated Acres
PEM1C	Palustrine	Emergent	Persistent	Seasonally flooded	-	5.89
PFO1C	Palustrine	Forested	Persistent	Seasonally flooded	-	0.21
PUSC	Palustrine	Unconsolidated Shore	-	Seasonally flooded	-	3.07

The approximately 6-acre emergent wetland listed in Table 5.6-1 is the Byllesby wetland, created as mitigation for dredging conducted at the Project in 1997 (see Section 5.2.5). This wetland is located approximately 500 ft upstream of the Byllesby dam. Wetland vegetation at this location is at an elevation higher than the normal reservoir operating level.

Wetlands at the Project were surveyed by boat in August 1990 in support of development of the license application for the previous relicensing.

Based on the NWI maps, site observations, and review of aerial photography of the Project area, some potential littoral habitats for wildlife (such as frogs, turtles, and wading birds) have been identified in three locations: the area associated with the exposed bedrock below the Byllesby development; near the confluence of Crooked Creek; and the southern extent of the Project boundary below Chestnut Creek.

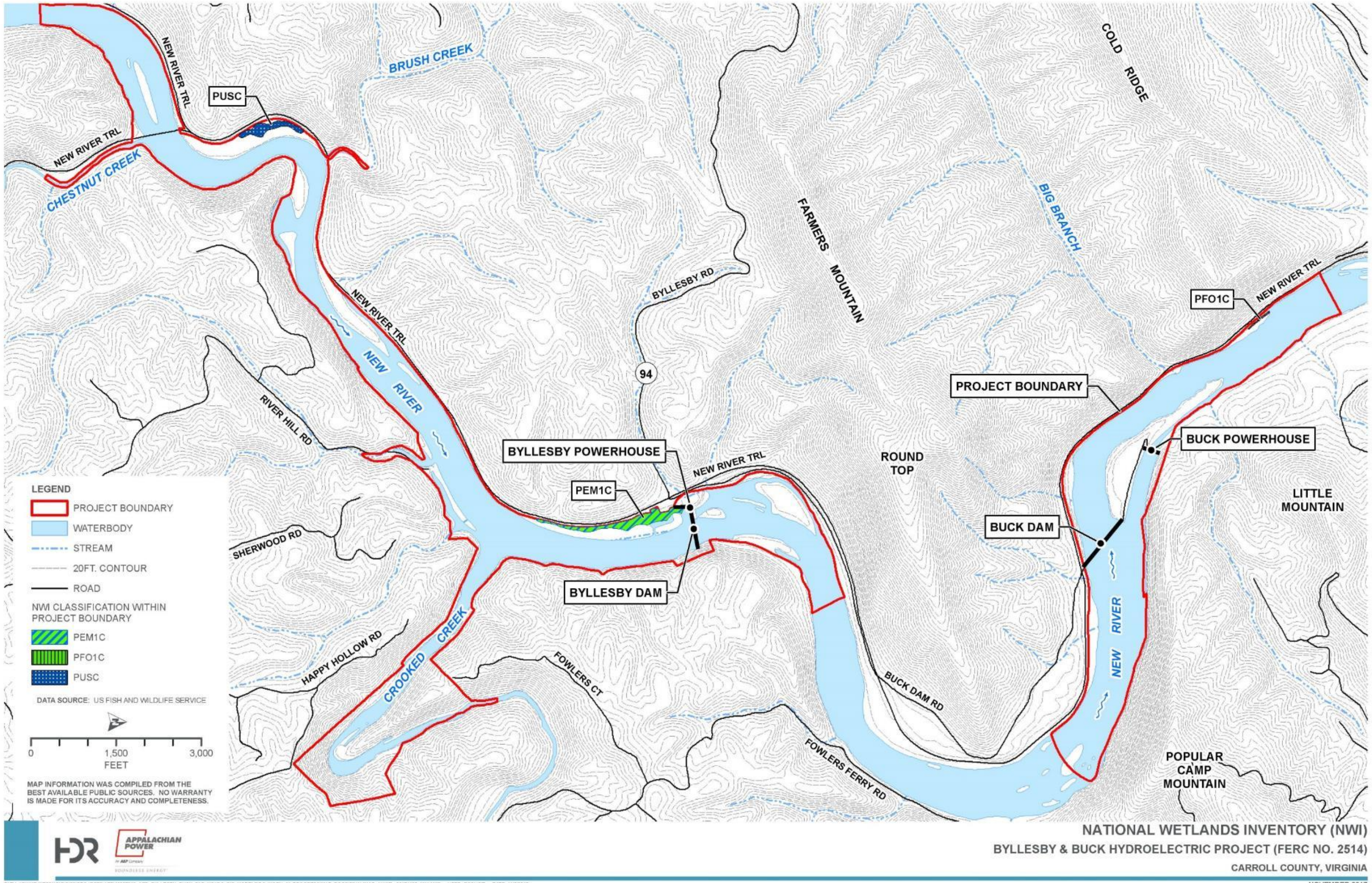
For the purposes of this section, the term "riparian" shall be used to refer to anything connected or immediately adjacent to the shoreline or bank of the New River, Crooked Creek, or Chestnut Creek. Although the term "riparian buffer" generally refers to the naturally vegetated shoreline, floodplain, or upland forest adjacent to a surface water body, the quantification of riparian habitat requires the calculation of a buffer size from which to base the amount of riparian habitat located within a specified area. The Virginia Department of Conservation and Recreation Riparian Buffers Modification and Mitigation Guidance Manual (VDCR 2006) suggests a 100-ft buffer in order to effectively slow down runoff, prevent erosion, and to filter non-point source pollution from runoff. The riparian zone serves as the primary interface between riverine and upland habitats, influencing both the primary productivity and food resources within the river. The majority of riparian habitat within the Project boundary is located within the Deciduous Forest, Mixed Forest, and Developed, Low-Intensity cover types. As noted in Section 5.5.1, lands associated with the Byllesby development include about 32 acres of riparian forest, including silver maple, black willow, and sycamore with understory riparian herbaceous species (Appalachian 1991a). Table 5.6-2 lists the estimated land use acreage within the Project boundary.

Table 5.6-2
Estimated Land Use Acreage within the Project Boundary

Land Use	Estimated Acres
Open Water	369
Deciduous Forest	197
Evergreen Forest	34
Woody Wetlands	23
Mixed Forest	22
Shrub/Scrub	14
Herbaceous	14
Emergent Herbaceous Wetlands	12
Hay/Pasture	11
Developed, Open Space	7
Developed, Low Intensity	2
Barren Land	1

Source: USGS 2014.

Figure 5.6-1
NWI Wetlands in the Vicinity of the Project



5.6.2 Wetland and Riparian Vegetation

The species composition of the approximately 6-acre wetland (Photo 5.6-1) upstream of the Byllesby dam has been more recently documented through transect monitoring (described below in Section 5.6.4) of this wetland that occurred over 2004-2007. The dominant species observed at this wetland in 2007 are listed in Table 5.6-3. Species noted with an "*" were also noted as present (at the genus level) at wetlands within the larger Project boundary during the 1990 survey conducted by Appalachian. Additional emergent wetland vegetation observed during the 1990 survey included water plantain (*Alisma* sp.), swamp milkweed (*Asclepia incarnata),* red willow dogwood *(Cornum amomum*), Joe-pye-weed (*Eupatorim* sp.), witch hazel (*Hamamelis virginia*), cardinal flower (*Lobelia cardinalis*), monkey flower (*Mimulus* sp.*)*, green cone flower (*Rudbeckia* sp.), black willow, cord grass (*Spartina* sp.)*,* and vervain (*Verbena* sp.).

Table 5.6-3
2007 Byllesby Wetland Vegetation Survey Species List

Common Name	Scientific Name	Indicator Status[1]
False nettle (bog hemp)	*Boehmeria cylindrica*	FACW+
Rough (or American) barnyard grass	*Echinochloa muricata*	FACW+
Orange (or common or spotted) jewelweed or touch-me-not	*Impatiens capensis**	FACW
Common (or soft) rush	*Juncus effuses**	FACW+
Cut-grass	*Leersia oryzoides*	OBL
Reed canary grass	*Phalaris arundinacea*	FACW+
Dotted smartweed (or knotweed)	*Polygonum punctatum**	OBL
American (or arrowleaf) tearthumb	*Polygonum sagittatum**	OBL
Broadleaf arrowhead	*Sagittaria latifolia**	OBL
Woolgrass	*Scirpus cyperinus**	FACW+
Bur-reed	*Sparganium* spp.	OBL
Woolgrass	*Typha latifolia**	OBL
Wingstem	*Verbesina alternifolia*	FAC

[1] obligate wetland (OBL), facultative wetland (FACW), facultative (FAC).

Photo 5.6-1
Representative photograph of Byllesby wetland (2007)

A detailed habitat assessment in the vicinity of the Project was conducted for Appalachian in April 2017, as part of a habitat assessment for Virginia spiraea (*Spiraea virginiana*) in support of the non-capacity amendment application for installation of the inflatable Obermeyer crest gates. The report of this survey was submitted to USFWS and VDCR in July 2017. The survey area was covered by a combination of desktop assessment, field-based habitat assessments, and presence/absence surveys within identified suitable habitat encompassed approximately 12 miles along the New River between the Fries dam and the portion of the New River just downstream of Buck dam. The survey area also included tributaries along this span, where suitable Virginia spiraea habitat was identified. A total of 102 separate habitat patches were delineated within the survey area.

The study report for this habitat assessment includes a detailed list of all habitat patches, including habitat type, acreage, and a description of vegetation present. This table, which is included in Appendix H, provides an updated list of wetland, riparian, and littoral plant species that occur at the Project.

The riparian plant Virginia spiraea, which is federally listed as threatened, is of interest for the Project, as this species is known or believed to occur in Carroll County, Virginia. Virginia spirea may have potentially occurred upstream of the Byllesby dam historically, however, there has been no documentation or verification of its presence or exact location. There are no verified records of this species occurring in or adjacent to the Project boundary. Additional information about this species is provided in Section 5.7.1.3.

The majority (84) of the habitat patches delineated during the above-referenced 2017 habitat assessment did not contain any habitat suitable to support Virginia spiraea. Ten patches were found to provide low-suitability habitat, and eight patches were found to provide moderate-suitability habitat. No instances of Virginia spiraea were, however, observed in any of these patches (ESI 2017).

5.6.2.1 Invasive Aquatic Plants

As noted in Section 5.5.5.1, there are close to 100 invasive plant species in Virginia (VDCR 2017a) (Appendix G). Hydrilla (*Hydrilla verticillata*), curly-leaf pondweed (*Potamogeton crispus*), and brittle naiad (*Najas minor*) have been previously documented in the New River in Claytor Lake (Normandeau 2008). Hydrilla is a perennial herb that is found in a variety of aquatic environments. It spreads through dispersal of plant fragments. It grows aggressively and spreads through shallower areas forming thick mats in surface waters, which block sunlight to native plants below. This species has been shown to displace native vegetation and significantly alters the physical and chemical characteristics of waterbodies. In Virginia, it was first reported in 1982 in the Potomac River and is now present in waters throughout the state. Triploid Grass Carp (*Ctenopharyngodon idella)* have been stocked in the upper New River by VDGIF to control Hydrilla in Claytor Lake with great success (Weberg et al. 2015).

An aquatic plant community study was conducted in 2012 on the reach of the upper New River between Buck dam and the head of Claytor Lake to evaluate the success of the Grass Carp stockings. The reach was visually surveyed from canoe, utilizing a double-sided rake attached to a rope to monitor for plant presence in deeper pool sections. To gauge the occurrence and abundance of aquatic-plant species, a single 5-minute drift-net sample using a seine was done every 5 river kilometers. Drift samples were also collected by wading into the river at each sampling site. The study resulted in identification of 13 macrophyte species, including one Virginia-listed aquatic invasive plant, curly-leaf pondweed, discussed in further detail below. No hydrilla was observed in the 2012 survey (Weberg et al 2015).

Curly-leaf pondweed grows entirely as a submersed aquatic plant with no floating leaves. It can survive and grow at very low light levels and low water temperatures (USGS 2016). As a result, it often thrives in polluted waters with low light penetration. It can survive under the ice throughout the winter and exhibit rapid growth in the spring when water temperatures rise above 10°C. It can outcompete native species for light and space early in the growing season, which can reduce plant diversity and alter predator/prey relationships. Large infestations can impede water flow and cause stagnant water conditions (USGS 2016).

Brittle naiad is an annual submersed rooted or floating plant. It prefers stagnant or slow-moving waters such as ponds, lakes, reservoirs, and canals. It can grow in depths of up to four meters and is tolerant of turbidity and eutrophic conditions. It reproduces by fragmentation and by one-seeded fruits. It starts growing early in the season and blocks sunlight from native species, thereby inhibiting their growth. It can also form dense underwater meshes, which can produce unfavorable conditions for aquatic organisms (NOAA 2017).

5.6.3 Wetland and Riparian Wildlife

Information on specific wildlife known to occur in wetland and riparian habitats in the Project vicinity is not available. However, many species likely to occur within the Project vicinity typically use wetland or riparian habitats at some point in their lives. Many of the species mentioned in Section 5.5 may utilize riverine and lacustrine habitat within the Project boundary for permanent, temporary, or transient uses.

5.6.4 Known or Potential Adverse Effects and Proposed PM&E Measures

Periodic drawdowns of the reservoir for Project maintenance has the potential to temporarily dewater wetland, riparian, or littoral areas, though for short-duration drawdowns, soils are likely to remain saturated between inundation periods. Longer-term drawdowns could potentially cause soils in wetland areas to lose saturation, resulting in temporary loss of wetland vegetation. This potential Project impact has been previously studied at the Byllesby wetland. Following completion of maintenance activities at Byllesby dam in 2005-2006 that required a drawdown of the reservoir by approximately 11 ft, Appalachian conducted monitoring of the plant community in an adjacent wetland that was created by deposition of dredged material in shallow water during 1997, pursuant to a Virginia Water Protection Permit. Monitoring of the plant community was performed each year from 2004 through 2007. Despite the lower water levels during two growing seasons during this period, no appreciable change in the extent or composition of the wetland plant community occurred.

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. If such areas interfere with Project operations, there could be a need in the future to dredge such areas, such as was done during 1997 and 2014. Adverse effects of this activity would be addressed through the protections and mitigations required by approvals and permits to be issued by USACE and VDEQ.

No additional environmental PM&E measures beyond those already in place at the Project are presently proposed by Appalachian. Appalachian will consult with resource agencies and other stakeholders through the relicensing process regarding potential Project effects on wetland and riparian habitat and reasonable additional measures to protect and/or enhance wetland and riparian habitat at the Project or to mitigate adverse Project-related impacts.

5.7 Rare, Threatened, and Endangered Species

As part of the information-gathering process conducted to support the development of this PAD, Appalachian requested information from the VDCR and USFWS regarding federally and state-listed rare, threatened, or endangered species, critical habitat, sensitive natural communities, and species of special concern within the Project's vicinity.

5.7.1 Federally Listed Threatened, Endangered, and Candidate Species

A review of federally listed threatened, endangered, and candidate species using USFWS' IPaC online system was conducted on December 18, 2018 for both the Byllesby and Buck Project boundaries. Based on the IPaC review, a total of three threatened, endangered, or candidate species have the potential to occur within the Project boundary (Table 5.7-1).

Table 5.7-1
Federally Listed Species Potentially Occurring within the Project Boundary

Common Name	Scientific Name	Status	Byllesby Development	Buck Development
Indiana bat	*Myotis sodalis*	Endangered	X	X
Northern long-eared bat	*Myotis septentrionalis*	Threatened	X	X
Virginia spiraea	*Spiraea virginiana*	Threatened	X	

Source: USFWS 2018c

Additionally, on November 21, 2018, the Candy Darter was listed as endangered under the Endangered Species Act with proposed designated critical habitat, effective December 21, 2018 (USFWS 2018a).

5.7.1.1 Candy Darter

The Candy Darter, as stated in Section 5.4.1, is an endemic fish found in the New River drainage basin. The Candy Darter prefers rock, rubble, or gravel riffles in creeks or small to medium rivers (Rohde et al. 1996). Five watersheds that contain known Candy Darter habitats are listed as critical habitat; all five watersheds are tributaries to the New River. The nearest critical habitat to the Project is the Cripple Creek tributary, which confluences with the New River 5 RM downstream of Buck dam.

5.7.1.2 Indiana Bat

Indiana bats are found over most of the eastern half of the United States (USFWS 2016). The Indiana bat is a relatively small, dark-brown bat. Although they only weigh around one-quarter of an ounce, they have a wingspan of 9 to 11 inches (USFWS 2016).

Indiana bats hibernate during winter in caves or occasionally in abandoned mines. They hibernate in cool, humid caves with stable temperatures under 10°C but above freezing. Very few caves are known to have these characteristics. After hibernation, Indiana bats migrate, often long distances, to their summer habitat in wooded areas where they roost under loose tree bark on dead or dying trees. They forage in or along the edges of forested areas (USFWS 2016). Migratory females may migrate up to 357 miles to form (summer) maternity colonies to bear and raise their young, with each giving birth to just a single pup (USFWS 2016). Both males and females return to hibernacula in late summer or early fall. Indiana bats mate during the fall before they enter hibernation, but fertilization is delayed until the spring after they emerge from the caves (USFWS 2007).

Indiana bats are found over most of the eastern half of the United States. Critical habitat for this species designated by USFWS includes 11 caves and two abandoned mines in Illinois, Indiana, Kentucky, Missouri, Tennessee, and West Virginia. During winter, Indiana bats are restricted to suitable underground hibernacula. The vast majority of these sites are caves located in karst areas of the east-central U.S.; however, Indiana bats also hibernate in other cave-like locations, including abandoned mines. No critical habitat is designated within the Project boundary. Hellhole Cave in Pendleton County, West Virginia, northeast of the Project, is a Priority 1 (≥ 10,000 bats) hibernacula and is designated as critical habitat for the Indiana bat.

In summer, most reproductive Indiana bat females occupy roost sites under the exfoliating bark of dead trees that retain large, thick slabs of peeling bark. Primary roosts usually receive direct sunlight for more than half the day. Roost trees are typically within canopy gaps in a forest, in a fence line, or along a wooded edge. Habitats in which maternity roosts occur include riparian zones, bottomland and floodplain habitats, wooded wetlands, and upland communities. Indiana bats typically forage in semi-open to closed (open understory) forested habitats, forest edges, and riparian areas (USFWS 2007). Habitat suitable for Indiana bat foraging and roosting is likely available within the Project boundary.

Multiple biological opinions have been developed for the Indiana bat (USFWS 2017a). A draft recovery plan was issued for the Indiana bat in April 2007 (USFWS 2007). No official status reports exist for the Indiana bat; however, the general status of this species, the associated listing, fact sheets, range maps, and other important information are available on the USFWS website.

5.7.1.3 Northern Long-Eared Bat

The northern long-eared bat is found across much of eastern and north-central United States and all Canadian provinces from the Atlantic Ocean west to the southern Yukon Territory and British Columbia (USFWS 2013). It is a medium-sized bat, measuring 3.0 to 3.7 inches, with a wingspan of 9 or 10 inches. Its fur color can be medium to dark brown on the back and tawny to pale brown on the underside. The bat is distinguished by its longer ears relative to other bats in the genus Myotis (USFWS 2013).

The northern long-eared bat spends winters hibernating in caves and mines, preferring hibernacula with very high humidity. During the summer months, the northern long-eared bat prefers to roost singly or in colonies underneath bark, in cavities, or in the crevices of live or dead trees (USFWS 2013). Breeding begins in late summer or early fall when males swarm near hibernacula. After a delayed fertilization, pregnant females migrate to summer colonies where they roost and give birth to a single pup. Young bats start flying 18 to 21 days after birth, and adult northern long-eared bats can live up to 19 years (USFWS 2013).

Northern long-eared bats emerge at dusk and fly through the understory of forested hillsides feeding on moths, flies, leafhoppers, caddisflies, and beetles. They also feed by gleaning motionless insects from vegetation and water (USFWS 2013).

The most severe and immediate threat to the northern long-eared bat is white-nose syndrome. As a result of this disease, numbers have declined by 99 percent in the northeast. Other significant sources of mortality include impacts to hibernacula from human disturbance. Loss or degradation of summer habitat as a result of highway or commercial development, timber management, surface mining, and wind facility construction and operation can also contribute to mortality (USFWS 2013).

The spatial distribution for the northern long-eared bat extends from Montana and Wyoming in the west, south to eastern Texas, across the northern portions of Mississippi, Alabama, Georgia, and North Carolina, north to Maine, and across the Great Lakes. As this species overwinters in local or regional hibernacula, it does not migrate extensive distances and, therefore, does not have significant temporal distribution (USFWS 2013). No critical habitat has yet been determined or designated by USFWS for this species.

Multiple biological opinions have been developed for the northern long-eared bat (USFWS 2017b). No official status reports exist for the northern long-eared bat; however, the general status of this species, the associated listing, fact sheets, range maps, and other important information are available on the USFWS website. A recovery plan has not yet been developed for the northern long-eared bat.

5.7.1.4 Virginia Spiraea

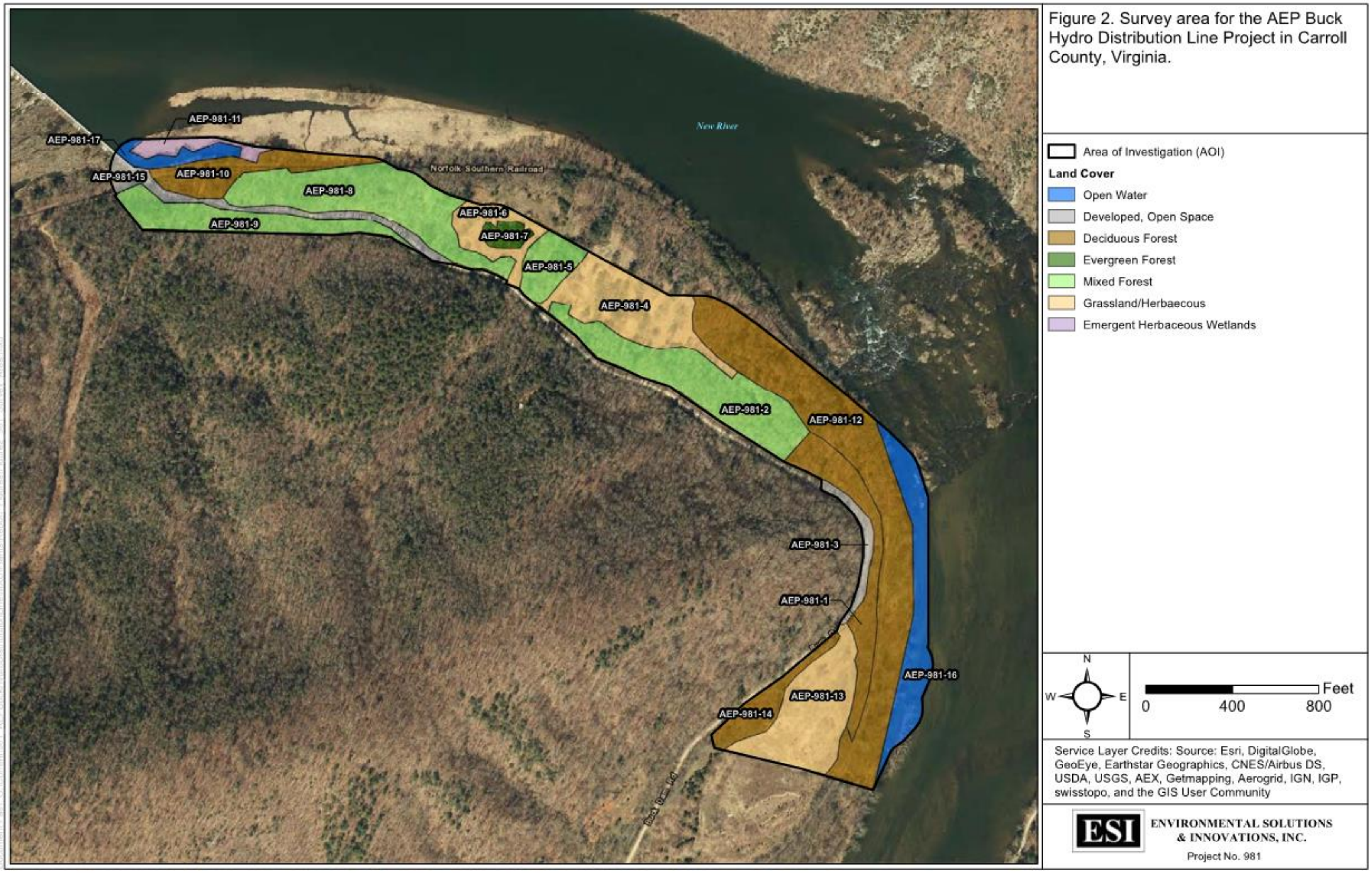
Virginia spiraea is a perennial shrub with many branches growing in height from 3 ft to 10 ft. The plant produces flowers that are yellowish green to pale white. The shrub blooms from May through early July, but flower production is sparse and does not begin until after the first year of establishment. Virginia spiraea occurs along rivers and streams and relies on periodic disturbances, such as high-velocity scouring floods, which eliminate competition from trees and other woody vegetation. Virgina spiraea is a southern Appalachian species, with isolated populations found in the mountain regions of Georgia, North Carolina, Tennessee, Kentucky, Virginia, Ohio, and West Virginia. Little population expansion has been reported for this species and temporal distribution is limited (USFWS 2015b). No critical habitat has been designated by USFWS for this species.

Multiple biological opinions have been developed for Virginia spiraea (USFWS 2015b). No official status reports exist for Virginia spiraea; however, the general status of this species, the associated listing, fact sheets, range maps, and other important information are available on the USFWS website. A draft recovery plan was issued for Virginia spiraea in November 1992 (USFWS 1992).

As described above in Section 5.6.2, following consultation with the USFWS in support of the non-capacity license amendment application for installation of the inflatable Obermeyer crest gates at both developments, a habitat suitability assessment and a presence/absence survey for Virginia spiraea was conducted by Appalachian in 2017. The geographic scope of this survey was from Fries dam to the downstream extent of the Project boundary for the Buck development. No instances of Virginia spiraea were observed within any habitat patches identified as having at least low or moderate suitability for this species (ESI 2017). The report of this survey was submitted to USFWS and USFS in July 2017.

An additional rare plant field survey was completed by Appalachian in July 2017 in support of a non-Project related transmission project in the vicinity of Buck Dam Road. Prior to the survey, USFS provided a list of 56 designated sensitive species under the National Threatened, Endangered, and Sensitive Species Program that had the potential to occur in this area, including Virginia spiraea and the federally threatened small whorled pogonia (*Isotria medeoloides*). Neither presence nor suitable habitat for either species was observed in the survey area (Figure 5.7-1).

Figure 5.7-1
Area Subject to Rare Plant Survey in July 2017



5.7.2 State-listed Threatened, Endangered, and Candidate Species

Authorized by the 1979 Endangered Plant and Insect Species Act of the Code of Virginia, the Virginia Department of Agriculture and Consumer Services (VDACS), VDGIF, and VDCR cooperate to provide protection for Virginia's threatened and endangered species. The VDACS is the regulatory authority for the conservation and preservation of threatened and endangered plant and insect species. The VDGIF has legal authority for preservation of vertebrate and other invertebrate endangered and threatened species. The VDCR Division of Natural Heritage produces an inventory of the Virginia's natural resources, and maintains a database of ecologically significant areas.

By letter dated September 23, 2017, the VDCR identified two species of concern within the Project vicinity including the moustached clubtail and the pygmy snaketail. The VDCR provided information on these species, which are summarized below.

In addition to the information the VDCR provided, a geographic search of the VDGIF's Fish and Wildlife Information Service was conducted for a 3-mile radius from each Project dam and those species with a status concern for conservation are identified in Table 5.7-2. Species lists between the two developments were the same, with the exception of the elktoe, which was only identified during the search for the Byllesby development. In addition, a search using the VDGIF Little Brown Bat and Tri-colored Bat Winter Habitat and Roosts Application indicated that both of the developments boundaries are outside of the 5.5-mile buffer zone of the closest known hibernaculum sites (VDGIF 2018b).

Table 5.7-2
Rare Species with Historical Records at or within the Project Vicinity

Common Name	Scientific Name	Status*	Tier**
Amphibians			
Blue Ridge dusky salamander	*Desmognathus orestes*		IVc
Blue Ridge two-lined salamander	*Eurycea wilderae*		IIIa
Eastern hellbender	*Cryptobranchus alleganiensis alleganiensis*	CC	Ia
Green salamander	*Aneides aeneus*		IIb
Jefferson salamander	*Ambystoma jeffersonianum*		IVa
Mountain chorus frog	*Pseudacris brachyphona*		IIa
Yonahlossee salamander	*Plethodon yonahlossee*		IVc
Birds			
American black duck	*Anas rubripes*		IIa
American woodcock	*Scolopax minor*		IIa
Bank swallow	*Riparia riparia*		IIIc
Barn owl	*Tyto alba pratincola*		IIIa
Belted kingfisher	*Ceryle alcyon*		IIIb
Black-and-white warbler	*Mniotilta varia*		IVa
Black-billed cuckoo	*Coccyzus erythropthalmus*		IIb
Brown thrasher	*Toxostoma rufum*		IVa
Canada warbler	*Cardellina canadensis*		IVb
Cerulean warbler	*Setophaga cerulea*		IIa
Chimney swift	*Chaetura pelagica*		IVb
Eastern wood pewee	*Contopus virens*		IVb
Eastern kingbird	*Tyrannus tyrannus*		IVa
Eastern meadowlark	*Sturnella magna*		IVa
Eastern towhee	*Pipilo erythrophthalmus*		IVa
Eastern whip-poor-will	*Antrostomus vociferus*		IIIa
Field sparrow	*Spizella pusilla*		IVa
Golden eagle	*Aquila chrysaetos*		Ia
Golden-winged warbler	*Vermivora chrysoptera*		Ia
Grasshopper sparrow	*Ammodramus savannarum pratensis*		IVa
Gray catbird	*Dumetella carolinensis*		IVa
Green heron	*Butorides virescens*		IVb
Kentucky warbler	*Geothlypis formosa*		IIIa
Loggerhead shrike	*Lanius ludovicianus*	ST	Ia
Migrant loggerhead shrike	*Lanius ludovicianus migrans*	ST	Ia
Northern rough-winged swallow	*Stelgidopteryx serripennis*		IVc
Northern saw-whet owl	*Aegolius acadicus*		Ic
Northern flicker	*Colaptes auratus*		IVb
Northern harrier	*Circus cyaneus*		IIIa
Peregrine falcon	*Falco peregrinus*	ST	Ia
Red crossbill	*Loxia curvirostra*		IIIc
Ruffed grouse	*Bonasa umbellus*		IIIa

Common Name	Scientific Name	Status*	Tier**
Short-billed dowitcher	*Limnodromus griseus*		IVa
Swainson's warbler	*Limnothlypis swainsonii*		IIc
Wood thrush	*Hylocichla mustelina*		IVb
Yellow-billed cuckoo	*Coccyzus americanus*		IIIa
Yellow-breasted chat	*Icteria virens virens*		IVa
Crustaceans			
Longclaw crayfish	*Cambarus buntingi*		IIIa
Fish			
Appalachia Darter	*Percina gymnocephala*		IVc
Blackside Darter	*Percina maculata*		IVc
Brassy Jumprock	*Moxostoma sp*		IVc
Brook Trout	*Salvelinus fontinalis*		IVa
Candy Darter	*Etheostoma osburni*	FE[1]	Ib
Highback Chub	*Hybopsis hypsinotus*		IVc
Kanawha Darter	*Etheostoma kanawhae*		IIIc
Kanawha Minnow	*Phenacobius teretulus*		IIIc
Logperch	*Percina caprodes*		IVc
Longear Sunfish	*Lepomis megalotis*		IVb
New River Shiner	*Notropis scabriceps*		IVc
Redlip Shiner	*Notropis chiliticus*		IVc
Sauger	*Sander canadensis*		IIIb
Sharpnose Darter	*Percina oxyrhynchus*		IVc
Stonecat	*Noturus flavus*		IVc
Tonguetied Minnow	*Exoglossum laurae*		IVc
Insects			
Diana fritillary	*Speyeria diana*		IVc
Monarch butterfly	*Danaus plexippus*		IIIa
Mottled duskywing butterfly	*Erynnis martialis*		IIIc
Moustached clubtail	*Gomphys adelphus*		IVc
Pygmy snaketail	*Ophiogomphus howei*		IIc
Regal fritillary	*Speyeria idalia idalia*		Ia
Mammals			
Appalachian cottontail	*Sylvilagus obscurus*		IVa
Eastern red bat	*Lasiurus borealis borealis*		IVa
Eastern small-footed bat	*Myotis leibii*		Ia
Eastern spotted skunk	*Spilogale putorius putorius*		IVc
Hoary bat	*Lasiurus cinereus cinereus*		IVa
Little brown bat	*Myotis lucifugus lucifugus*	SE	Ia
Long-tailed shrew	*Sorex dispar dispar*		IVc
Northern long-eared bat	*Myotis septentrionalis*	FTST	Ia
Northern bobwhite	*Colinus virginianus*		IIIa
Silver-haired bat	*Lasionycteris noctivagans*		IVa
Tri-colored bat	*Perimyotis subflavus*	SE	Ia

Common Name	Scientific Name	Status*	Tier**
Mussels			
Elktoe	*Alasmidonta marginata*		IIc
Green floater	*Lasmigona subviridis*	ST	IIa
Pistolgrip	*Quadrula verrucosa*	ST	IIIb
Pocketbook mussel	*Lampsilis ovata*		IVa
Tennessee heelsplitter	*Lasmigona holstonia*	SE	IIa
Reptiles			
Bog turtle	*Clemmys muhlenbergii*	FTSE	Ia
Common ribbonsnake	*Thamnophis sauritus sauritus*		IVa
Eastern hog-nosed snake	*Heterodon platirhinos*		IVc
Queen snake	*Regina septemvittata*		IVa
Snapping turtle	*Chelydra serpentina*		IVb
Timber rattlesnake	*Crotalus horridus*	CC	IVa
Woodland box turtle	*Terrapene carolina carolina*		IIIa
Snails			
Seep mudalia snail	*Leptoxis dilatata*		IVc

[1] The Candy Darter was listed as endangered by the USFWS on November 21, 2018 (effective December 21, 2018) (USFWS 2018a).

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened;
FP=Federal Proposed; C=Federal Candidate; CC=Collection Concern.

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need.
II=VA Wildlife Action Plan - Tier II - Very High Conservation Need.
III=VA Wildlife Action Plan - Tier III - High Conservation Need.
IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need.

Virginia Wildlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented.
b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.
c - No on-the-ground actions or research needs have been identified, or all identified conservation opportunities have been exhausted.

5.7.2.1 Odonates

The moustached clubtail is a dragonfly, which inhabits mostly rapid, clear, rocky streams and rivers and occasionally the exposed shorelines of lakes. This species is found in southeastern Canada and the northeastern portion of the United States where its range extends southward along the Appalachian Mountains, but rarely reaches into North Carolina and Georgia. In Virginia, this species is known to occur from areas of the New River, specifically Grayson, Carroll, and Wythe counties, but it has historically occurred in August and Bath Counties.

According to the VDCR, the pygmy snaketail is a dragonfly that is found from northeast Maine, west to Wisconsin, and south to Virginia and Kentucky. It is found in big, clear rivers with high water quality and stable flow over coarse cobbles and periodic rapids. The larvae overwinter and take flight late

April to early June. The nymph of this species occurs in fast-flowing water in sand and gravel substrates (USFWS 2015c).

Adult dragonflies are predators that typically forage in clearings with scattered trees and shrubs near the parent river. They feed on mosquitoes and other smaller flying insects. Dragonflies lay their eggs on emergent vegetation or debris along the water's edge. The larvae (nymphs) are aquatic and generally inhabit sand and gravel substrate. Nymphs are particularly vulnerable to shoreline disturbances. They are also sensitive to alterations in poor water quality, thermal fluctuations, and changes in aquatic habitat.

Five study reaches ranging from upstream to downstream of the Fries Project were surveyed for dragonfly larvae in 2016-2017 (Carey et al. 2017). At least 17 species representing 4 families were identified in all reaches except Reach 3 (bypass). Moustached clubtail was found at the upstream reach and tailwater reach, but not within the Fries Project reservoir or bypass reach. Pygmy snaketail was found in the tailwater reach and downstream reach. The Allegheny river cruiser, spine-crowned clubtail and green-faced clubtail were also identified within the Fries Project area.

5.7.2.2 Mussels

As shown in Table 5.7-2, five species of freshwater mussels considered rare in the state of Virginia have been historically documented in the Project vicinity. The VDCR also indicated that the New River has been designated by the VDGIF as "Threatened and Endangered Species Waters" for the pistolgrip. Due to the legal status of the pistolgrip, the VDCR recommended further coordination with the VDGIF to ensure compliance with the Virginia Endangered Species Act.

Refer to Section 5.4.6 for additional information about freshwater mussels that potentially occur in the Project area.

5.7.2.3 Herpetofauna

In preliminary consultation with VDGIF about potential Project impacts or information needs, the potential for habitat and/or occurrences of eastern hellbender was raised. The eastern hellbender is listed as a federal species of concern. In Virginia, the eastern hellbender is listed as a species of special concern and as a Tier II species in the Virginia Wildlife Action Plan. Eastern hellbender is a large, stout-bodied, fully-aquatic salamander that occupies portions of New York, Pennsylvania, Ohio, Indiana, West Virginia, Kentucky, Tennessee, Alabama, Georgia, North Carolina, and Virginia. In Virginia, eastern hellbenders are found in the mainstem and tributaries of the New River drainage and in the Clinch, Powell, and Holston River tributaries of the upper Tennessee River. Eastern hellbenders prefer clear, fast-flowing, well-oxygenated streams and rivers. Eastern hellbenders prefer stream bottoms with many large flat boulders, logs, and debris (VDGIF 2017d). According to Carey et al. (2017), the most recent eastern hellbender encounters in the upper New River have occurred periodically from 2013-2016 near the North Carolina border. Site assessments identified Reaches 1, 4, and 5 as containing potential suitable habitat for the Eastern hellbender, however no individuals were observed. The study also noted that although suitable substrate was found (large flat rocks in gravel and cobble substrates), water temperature was well above (77 to 88°F [25 to 31°C]) the eastern hellbender's preference range (50 to 73°F [10 to 23°C]). Although the survey did not identify Eastern hellbenders in the vicinity of the Fries Project, an individual was incidentally captured by an angler in the Impoundment (Reach 2) in February 2018. The last recorded captures of the Eastern hellbender in the mainstem of the upper New River otherwise occurred in 2002 and 2014 over 30 RM upstream of the Fries Project.

Table 5.7-2, as well as the consultation record for the relicensing of the Fries Project, indicate the potential for the bog turtle (*Clemmys [Glyptemys] muhlenbergii*) to occur within the Project vicinity. The bog turtle is listed in as threatened wherever found, except for Georgia, South Carolina, North Carolina, Tennessee, and Virginia (USFWS 2018b). However, the bog turtle's status in Virginia is "Similarity of Appearance (Threatened)". Species listed for Similarity of Appearance are not subject to Section 7 consultations by the USFWS (USFWS 2018d); however, this species has unique habitat requirements. Bog turtles occur in headwater areas where they inhabit shallow, spring-fed habitats (fens, sphagnum bogs, swamps, marshy meadows, and pastures characterized by soft, muddy bottoms) characterized by clear, cool, slow-flowing water, high humidity, and an open canopy (USFWS 2015c). A desktop review of known bog turtle sites and field observations by Carey et al. (2017) showed no populations within the Fries Project vicinity, and no potential suitable habitat with hydrologic connectivity to the study area. It is unlikely that this species is present in the vicinity of the Project, and if specimens were to occur in headwater areas upstream of the Project vicinity, the continued operation of the Project is not anticipated to have an effect on their continued survival.

5.7.3 Known or Potential Adverse Effects and Proposed PM&E Measures

Wildlife habitats and species in the vicinity of the Project are reflective of current Project operations. Appalachian proposes to maintain the run-of-river mode of operation for each development and existing measures and programs to protect wildlife habitat. Appalachian does not expect that operation of the Project as presently proposed over the term of the new license to affect habitat for RTE species.

As noted above, suitable foraging and potential roosting habitat for bats, including the species listed above, is likely common in the Project area, which supports a range of upland, riparian, wetland, and open water habitats. The upland forested habitats used by these species are not affected by normal or proposed Project operations. While habitat with low or moderate suitability for Virginia spiraea has been identified at the Project, the species is not known to occur based on recent survey in these previously identified areas.

There are no current plans for improvements or activities at the Project that would require the clearing of trees that may provide habitat for roosting or maternity colonies for Indiana bat and northern long-eared bat. Ongoing land and facility maintenance performed by Appalachian, including vegetation management, maintenance of project structures, and recreational facility maintenance has the potential to affect terrestrial and riparian or littoral habitats for RTE species. Appalachian expects that future activities at the Project will need to be conducted in accordance with prevailing guidelines of Appalachian and the USFWS.

With respect to state-listed aquatic species, periodic drawdown of the Project reservoirs has the potential to have short-term impacts on littoral and near-shore habitat. Water level fluctuations in the bypass reaches have the potential to limit habitat and habitat connectivity. As previously discussed, the existing ramping rate provides a level of protection against stranding of fish in the Buck bypass reach. During the term of the new license, these issues are expected to be mitigated by completion of installation of the Obermeyer gates, which will allow for better control of water levels and more stable water levels. Operation of the dams with the new gates is expected to reduce the risk of deviations from the allowable 1-foot reservoir operating band, and to reduce the frequencies of inadvertent spills to the bypass reaches and of reservoir drawdowns required to repair/replace flashboards damaged by high flow events. 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.

No additional environmental PM&E measures beyond those already in place at the Project are presently proposed by Appalachian. Appalachian will consult with resource agencies and other stakeholders through the relicensing process regarding potential Project effects on RTE species and reasonable additional measures for the continued protection of species or potential habitat.

5.8 Recreation and Land Use

5.8.1 Existing Recreation Facilities and Opportunities

The New River is a major recreational resource in southwest Virginia. A majority of the land to the west of the Project is owned by USFS and consists of the George Washington and Jefferson National Forest. Additional outdoor recreation activities are available along the river, including the New River Trail State Park, which extends along the west shore of the Project, along the right-of-way for the former Norfolk & Western railroad. The New River Trail State Park allows recreationists to hike, horseback ride, and bicycle along the river. Of particular note along the New River in southwest

Virginia is the historical Shot Tower State Park, Claytor Lake in Pulaski County, and Claytor State Park adjoining Claytor Lake providing campgrounds, cottages, a marina, and hiking trails (VDGIF 2017e).

As the New River flows through mountain scenery, craggy rock cliffs, and gorges, it provides opportunities for whitewater boating, with several major Class I-III rapids, as well as an abundance of flatwater for motor-boaters and canoeists (VDGIF 2017e). Class I, II, and III rapids (for normal flows) are present from Fries to the Byllesby reservoir for whitewater boating. Class II and III rapids (for normal flows) are present below the Buck development (American Whitewater 2017).

Fishing in the New River is popular, as the river supports populations of just about every major freshwater game fish in Virginia, including Smallmouth Bass, Spotted Bass, Largemouth Bass, Rock Bass, Striped Bass, White Bass, hybrid striped bass, Muskellunge, Walleye, Black Crappie, Channel Catfish, Flathead Catfish, Yellow Perch, Redbreast Sunfish, and Bluegill (VDGIF 2017e).

The majority of the recreation at the Project consists of fishing, hiking, and small craft boating.

The Project is accessible by a small secondary road. Lands on both sides of the Project are steep, but there are some flat parcels along the river suitable for recreation. The Byllesby and Buck reservoirs are attractive for recreation, particularly sport fishing. VDGIF describes the 7-mile stretch of the New River below Fries dam as a broad river channel with ledges and rock structures with deep currents producing trophy Smallmouth Bass and Channel Catfish up to the slower waters of Byllesby dam just below the confluence of Chestnut Creek. The slower waters in this stretch are often fished for Flathead Catfish, Channel Catfish, Walleye, and Smallmouth Bass (VDGIF 2017e). While the 2.5-mile stretch between Byllesby and Buck dams is not as accessible for fishing, it provides additional fishing opportunities for game species such as Smallmouth Bass, Rock Bass, and catfish (J. Copeland, personal communication, November 15, 2018). Trout are occasionally caught near the mouth of Cripple Creek (VDGIF 2017e).

With respect to recreation requirements under the existing Project license, Article 411 of the license required recreational improvements at the Project. To monitor usage of these recreational improvements, FERC required Appalachian to file a Recreation Report documenting recreational use at the Project every six years concurrently with FERC’s Form 80 requirements through the length of the license. The Recreation Reports have included 1) a description of the methodology used to collect the use data; 2) recreation use figures; and 3) an evaluation of the need for additional facilities or safety measures, and if appropriate, proposed amendments to the Project’s recreation and public safety plans that would accommodate such need. FERC originally approved the revised Recreation Plan on July 30, 1995, and approved the amended Recreation Plan on February 28, 1996. The most recent Recreation Report documenting recreational use at the Project was filed by Appalachian with

FERC on March 19, 2015. 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. These public recreation facilities at the Project are discussed in detail below by development.

5.8.1.1 Byllesby Development

Byllesby VDCR Boat Launch

The Byllesby VDCR Boat Launch (Photo 5.8-1 through Photo 5.8-3), which is operated by VDGIF, is located on the eastern side of the Byllesby reservoir 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 five regular vehicles and seven vehicles with trailers. Signage prohibits camping and swimming at this site (Kleinschmidt 2015).

Photo 5.8-1
Byllesby VDCR Boat Launch Parking Area

Photo 5.8-2
Byllesby VDCR Boat Launch

Photo 5.8-3
View of the New River Trail from the Byllesby VDCR Boat Launch

Byllesby Canoe Portage

The Byllesby Canoe Portage (Photo 5.8-4 through Photo 5.8-6) 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 ft 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 ft with a single, unpaved, Americans with Disabilities Act (ADA) parking space. Signage indicates that the site is open to the public and owned by Appalachian; provides the bass size and creel limit for the New River; and directs users to the portage train put-in (Kleinschmidt 2015).

Photo 5.8-4
Byllesby Canoe Portage Signage and New River Trail

Photo 5.8-5
Byllesby Canoe Portage Access Road and Directional Signage

Photo 5.8-6
Byllesby Canoe Portage Parking Area

New River Canoe Launch

Directly downstream of the Byllesby dam is the New River Canoe Launch, which consists of a small, gravel parking area with space for five vehicles (Photo 5.8-7 through Photo 5.8-9). There is a short trail leading to a hand-carry boat launch that serves as the put-in for the Byllesby Canoe Portage. Signage indicates that motor vehicles are prohibited on the trail leading down to the water (Kleinschmidt 2015).

Photo 5.8-7
New River Canoe Launch Signage

Photo 5.8-8
New River Canoe Launch Parking Area

Photo 5.8-9
New River Canoe Launch Trail to the Water

5.8.1.2 Buck Development

Buck Dam Picnic Area

The Buck Dam Picnic Area (Photo 5.8-10 and Photo 5.8-11), located on the western bank of Buck dam, is operated by the VDCR. The site provides gravel parking for four vehicles, an information kiosk, and access to the New River Trail. A picnic area with picnic table, trashcan, portable restroom facility, and a hitching post for equestrian trail users is located approximately 1,000 ft from the parking area on the New River Trail. 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 of the dam (Kleinschmidt 2015).

Photo 5.8-10
Buck Dam Picnic Area Parking Area, Trailhead, and Kiosk

Photo 5.8-11
Buck Dam Picnic Area

New River Trail Picnic Area

The New River Trail Picnic Area (Photo 5.8-12 and Photo 5.8-13), located along the Buck reservoir between the Buck and Byllesby Developments, 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 reservoir. There is no parking or signage associated with this site (Kleinschmidt 2015).

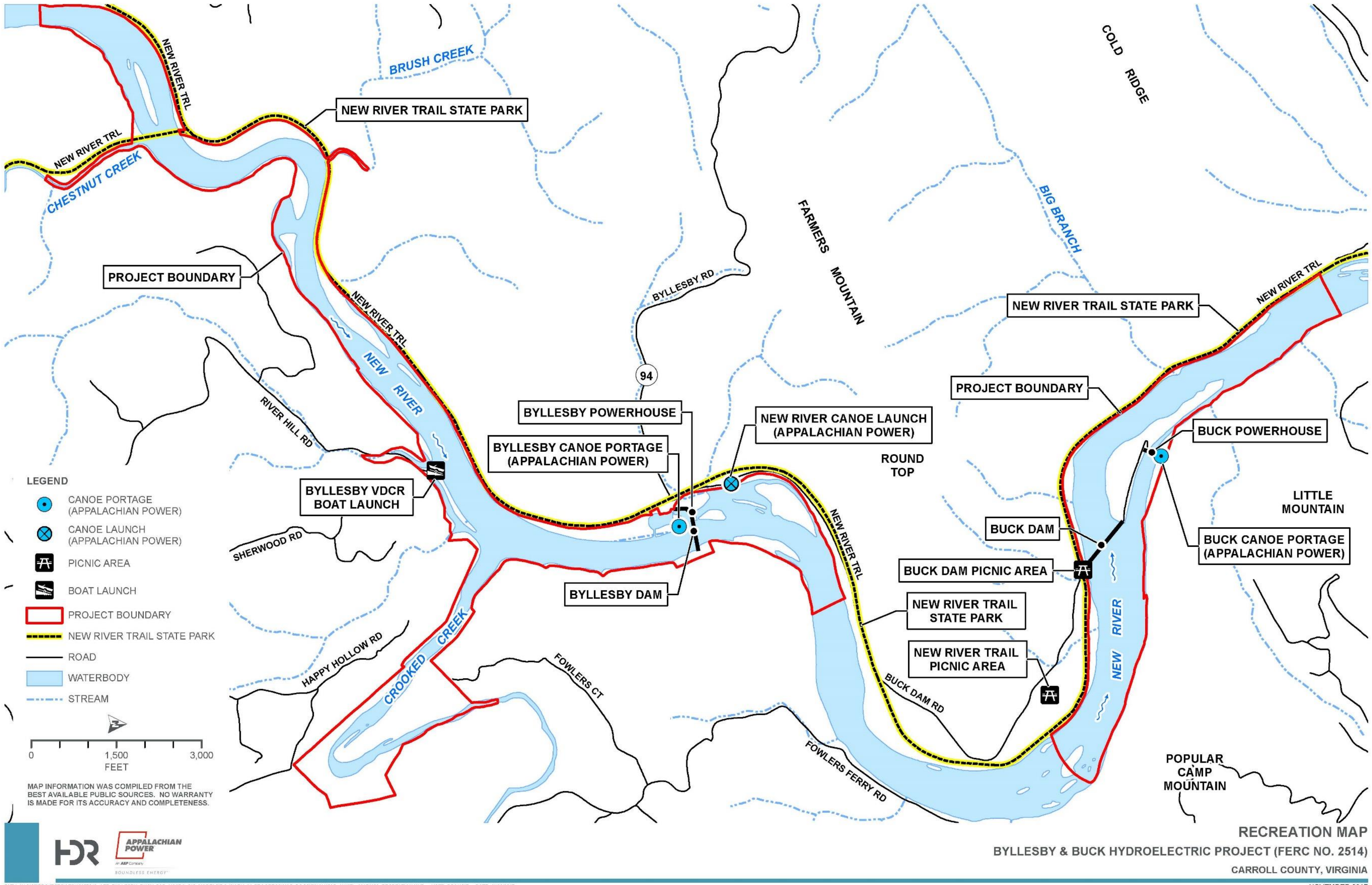
Photo 5.8-12
New River Trail Picnic Area

Photo 5.8-13
New River Trail

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 accessible by water (Kleinschmidt 2015).

Figure 5.8-1
Location Map of Recreation Areas in the Vicinity of the Project



5.8.2 Current Project Recreation Use Levels and Restrictions

Appalachian filed a Recreation Report, including the FERC Form 80, on March 19, 2015. To support the Recreation Report and Form 80, Appalachian placed traffic counters at strategic locations from late March through October 2014 at the Byllesby Canoe Portage, the New River Canoe Launch, and the Buck Dam Picnic Area to accurately capture entrances and exits by vehicles. Data collected by a trained recreation clerk supplemented the traffic counters. 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 (Kleinschmidt 2015).

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. None of the recreation facilities at the Project were close to exceeding their capacity. According to spot count data, fishing was the most popular activity at the recreation sites (Kleinschmidt 2015).

5.8.3 Existing Shoreline Buffer Zones

With the exception of some property on the east side of Byllesby reservoir, which is privately owned with flowage easements in favor of Appalachian, most of the lands within the Project boundary are owned by Appalachian (Appalachian 1991a). Most lands in the Project vicinity are in public ownership, dominated by the Jefferson National Forest bounding the west side of the Project. There are no homes or industrial development in the immediate Project vicinity as development along the Project reservoirs and downstream is limited because of the rugged terrain. As previously noted, the former Norfolk & Western Railroad right-of-way has been converted to the New River Trail State Park, which provides a buffer along the western shore. Additionally, pursuant to License Article 408, Appalachian currently implements the Wildlife Management Plan, which provides for the monitoring of the riparian forest areas within the Project boundary. The Wildlife Management Plan is discussed further in Section 5.8.5.

5.8.4 Recreation Needs Identified in Management Plans

The VDCR's Virginia Outdoors Demand Survey is conducted every five years in preparation for the development of the Virginia Outdoors Plan. The main purposes of the survey are to assess Virginians' attitudes about outdoor recreation resources, estimate participation in and demand for a wide variety of recreational activities, and provide a channel of citizen input into the Virginia Outdoors Plan.

The latest Outdoors Demand Survey was administered in 2017 and was mailed to nearly 14,000 households and 3,375 responded. Overall, the Virginia Outdoors Demand Survey found high regard for the importance of outdoor recreation opportunities, open spaces, and a strong commitment to the protection of natural areas and conservation lands among the general public. The four most frequently mentioned activities in which respondents had participated in the last 12 months were visiting natural areas (up 50% since the 2011 survey), driving for pleasure, walking for pleasure, and visiting parks (local, state, national) (up 51% since the 2011 survey). Table 5.8-1 lists the top ten activities in which survey respondents participated in the last 12 months (University of Virginia 2017).

Table 5.8-1
Percent of Respondents Participating in Activities [2017]

Activity	Percent
Visiting Natural Areas	71%
Driving for Pleasure	67%
Walking for Pleasure	67%
Visiting parks (local, state, national)	56%
Swimming/ outdoor pool	48%
Sunbathing/relaxing on a beach	47%
Viewing the Water	38%
Swimming/beach/lake river (open water)	37%
Visiting historic areas	35%
Fresh water fishing	34%

Source: University of Virginia 2017.

Respondents identified the need for better access to natural areas (53.8%); more public access to parks, hiking and walking trails (49.2%); more water access (42.9%); historic areas (38.8%); scenic drives (28.6%); and playing fields, or sports and golf facilities (22.2%) (University of Virginia 2012).

The Project currently provides access to waters, and other top-identified, in-demand activities are available within the Project vicinity as described further in Section 5.8.7.

5.8.5 Licensee's Shoreline Permitting Policies

Appalachian permits the installation of piers, docks, boat landings, bulkheads, and other shoreline facilities on property it owns in fee or over which it holds flowage rights, provided they do not interfere with operation of the Project. Upon receipt of a request from a landowner, Appalachian will evaluate the request to determine any impact on project operation and act accordingly to grant, deny, or modify the request. It is the responsibility of the landowner to acquire any permits that may be required from federal, state, or local agencies having jurisdiction. No permits have been issued by Appalachian under the current license term.

5.8.6 Specially Designated Recreation Areas

5.8.6.1 Wild, Scenic, and Recreational Rivers

No portion of the Project has been designated under the National Wild and Scenic Rivers System.

5.8.6.2 Nationwide Rivers Inventory

No portion of the Project has been designated under the Nationwide Rivers Inventory System.

5.8.6.3 Scenic Byways

There are no National Scenic Byways in the immediate vicinity of the Project. The Blue Ridge Parkway is located approximately 30 miles south of the Project.

5.8.6.4 National Trails System and Wilderness Areas

The George Washington and Jefferson National Forest abuts the Project to the east and west. The George Washington and Jefferson National Forest contains nearly 1.8 million acres of public lands, representing one of the largest blocks of public land in the eastern United States. The Forest contains approximately 1,646,328 acres in Virginia, 123,384 acres in West Virginia, and 961 acres in Kentucky. Developed recreation opportunities are offered at over 200 sites in the Forest, resulting in nearly 3 million annual recreation visits. These opportunities vary from minimally developed sites such as ten-unit picnic areas with vault toilets and hand pumps, small scenic overlooks, and small non-fee campgrounds, to highly developed recreation complexes providing swimming beaches, camping spurs with utility hookups, warm showers, and flush toilets (USFS undated a).

The George Washington and Jefferson National Forest has approximately 2,100 miles of trails open to one or more non-motorized uses (hiking, horse-riding, and/or mountain biking). The Appalachian National Scenic Trail extends more than 325 miles across the Forest. The Appalachian Trail is located approximately 40 miles west of the Project (the “old” or original Appalachian trail crossed the western shore of the New River near the Byllesby development, where the New River Trail State Park is now located [McNeely 2017]). In addition, there are 12 National Recreation Trails in the Forest totaling 143 miles (USFS undated a).

Along with National Trails Systems, there are 23 designated Wilderness Areas totaling approximately 140,000 acres within the George Washington and Jefferson National Forest. These designated Wilderness Areas provide primitive types of recreation. There are also 32 special-interest areas in the Forest emphasizing dispersed recreation opportunities (USFS undated a).

5.8.7 Regionally or Nationally Significant Recreation Areas and Recreational Attractions in the Vicinity of the Project

5.8.7.1 Federal Recreation Sites in the Project Vicinity

Mount Rogers National Recreation Area (within the George Washington and Jefferson National Forest)

The Mount Rogers National Recreation Area is a United States National Recreation Area located in southwestern Virginia in Grayson County, approximately 15 miles west of the Project. The Mount Rogers National Recreation Area manages National Forest land near Mount Rogers within the George Washington and Jefferson National Forest. Activities in the Mount Rogers National Recreation Area include camping, picnicking, sight-seeing, bird watching, trout fishing, hunting, biking, bicycling, horseback riding, cross-country skiing, and swimming (USFS undated b).

5.8.7.2 State Recreation Sites in the Project Vicinity

Shot Tower Historic State Park

The Shot Tower Historic State Park is approximately 10 miles downstream of the Project and is managed as part of the New River State Park. The Shot Tower was constructed over 200 years ago to make ammunition for the firearms of early settlers and overlooks the New River. There is a parking lot, interpretive signs providing details of the park and visitors may ascend the tower (VDCR 2017b).

Crooked Creek Wildlife Management Area

The Crooked Creek Wildlife Management Area is located approximately 10 miles southeast of the Project. The 1,796-acre park includes forested and open land and encompasses portions of both Brooked Creek and the East Fork of Crooked Creek. Recreational opportunities include hunting, trapping, primitive camping, trout fishing, hiking, horseback riding, and birding (VDGIF 2017f).

New River Trail State Park

The New River Trail State Park is an approximately 1,668-acre state park located in Carroll, Grayson, Pulaski, and Wythe counties. The park parallels the New River for approximately 39 miles. The New River Trail is a 57-mile linear park that follows an abandoned railroad right-of-way and is primarily used for hiking, biking, and horseback riding. The park's Foster Falls area offers guided horseback trips; canoe and bike rentals; boat launches; gift shops; and a horse arena.

Fishing is also a popular activity at New River Trail State Park. Boat ramps are available at Allisonia, Foster Falls, and Austinville.

5.8.8 Non-Recreational Land Use and Management

Appalachian owns minimal land associated with the Project or located within the Project boundary. AEP manages Project lands under its control, including Project facilities, for the purpose of Project operations.

5.8.9 Known or Potential Adverse Effects and Proposed PM&E Measures

The majority of the recreation at the Project consists of fishing, boating, and hiking. The 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 or VDGIF. These Project-related facilities include boat launches, picnic areas, and portage areas along the river. In addition to Project-related recreational opportunities, the New River Trail State Park and George Washington and Jefferson National Forest are located in the immediate vicinity of the Project. Based on recently collected data in support of the Form 80 process, the Byllesby development received the most recreation use annually; however none of the recreation facilities at the Project were close to exceeding their recreational capacity and, therefore, the sites are meeting recreational demand.

For the benefit of natural, cultural, and recreation resources, Appalachian proposes to continue to operate the Project in the existing run-of-river mode and with the existing protections for and restrictions on land and shoreline development in the Project boundary and continued provision of the existing recreational facilities. Appalachian expects to continue monitoring of recreational facilities use and demand through the FERC Form 80 process, as applicable. Appalachian also proposes to update the Project's Recreation Plan with or following the final license application, as needed to address existing and proposed facilities and arrangements. Appalachian will consult with interested stakeholders (including VDCR) throughout the relicensing process regarding necessary recreational facility maintenance or potential enhancement measures. Any such measures would be developed in consultation with appropriate resource agencies and other relicensing stakeholders.

5.9 Aesthetic Resources

5.9.1 Existing Aesthetic Resources

The Byllesby and Buck developments are located in rural settings along the New River. Neither development is visible from any bridges, roads, or other public transport ways, other than the New River Trail State Park, which runs along the north and west boundaries of the Project, and State Route 737, which parallels the river between Byllesby and Buck. Development along the Project reservoirs and downstream is extremely limited, resulting in river banks dominated by mature tree growth. The river banks and stream bottoms are composed of rock outcroppings that contribute to the rugged theme of the New River in the Project area (Appalachian 1991a).

Overall, the powerhouses at both developments, as well as the primary spillways, have retained the same look since construction was completed in 1912. The powerhouses are both of brick construction with tall, slightly recessed window bays and simple corbelled cornices. The overall appearance is typical of industrial architecture of the time. Facilities related to both developments are well maintained, as are the surrounding grounds. The overall effect is an aesthetically pleasant visual experience for an industrial-oriented facility (Appalachian 1991a).

5.9.2 Known or Potential Adverse Effects and Proposed PM&E Measures

Appalachian does not anticipate that continued operation of the Project under the term of the new license, as presently proposed by Appalachian, would have any adverse effects on aesthetic resources.

5.10 Cultural Resources

In considering a new license for the Project, FERC has the lead responsibility for compliance with applicable federal laws, regulations, and policies pertaining to historic properties, including the National Historic Preservation Act of 1966 (NHPA), as amended[7]. Section 106 of the NHPA (Section 106)[8] requires federal agencies to take into account the effects of their undertakings on historic properties and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment.

The Section 106 process (defined at 36 CFR Part 800) is intended to accommodate historic preservation concerns with the needs of federal undertakings through a process of consultation with

[7] 54 USC §300101 et seq.

[8] 54 USC §306108

agency officials, State Historic Preservation Officers (SHPO), federally recognized Indian Tribes, and other parties with a potential interest in an undertaking's effects on historic properties. The goals of the Section 106 process are to:

- Identify historic properties that may be affected (directly and/or indirectly) by an undertaking;
- Assess the effects of an undertaking on historic properties; and
- Seek ways to avoid, minimize, or mitigate adverse effects on historic properties through consultation.

Historic properties are defined in 36 CFR Part 800 as any pre-contact or historic period district, site, building, structure, or individual object listed in or eligible for inclusion in the National Register of Historic Places (NRHP). This term includes artifacts, records, and remains that are related to and located within historic properties, as well as properties of traditional religious and cultural importance (often referred to as "traditional cultural properties" or TCPs) that meet the NRHP criteria.

The Secretary of the Interior has established the criteria for evaluating properties for inclusion in the National Register (36 CFR Part 60). In accordance with the criteria, properties are eligible if they are significant in American history, architecture, archaeology, engineering, or culture. The quality of significance is present in historic properties that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- Are associated with events that have made a significant contribution to the broad patterns of our history; or
- Are associated with the lives of persons significant in our history; or
- Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant or distinguishable entity whose components may lack individual distinction; or
- Have yielded or may be likely to yield information important in prehistory or history.

Historical and archaeological resources at the Project were evaluated during the previous relicensing, as described below in Sections 5.10.2 and 5.10.3. The reports on these evaluations were filed by Appalachian with FERC with the previous license application. Major findings from these evaluations are summarized below.

5.10.1 Area of Potential Effect

Area of potential effect (APE) is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. The Commission has not yet defined an APE for the Project. In the context of the relicensing process, FERC generally defines the APE as follows: "The APE includes all lands within the Project boundary. The APE also includes any lands outside the Project boundary where cultural resources may be affected by Project-related activities that are conducted in accordance with the FERC license."

Because the Project boundary encompasses all lands that are necessary for Project purposes, all Project-related operations, potential enhancement measures, and routine maintenance activities associated with the implementation of a license issued by the Commission are expected to take place within the Project boundary. The proposed APE is consistent with the potential scope of Project effects and the manner in which the Commission has defined the APEs for similar hydroelectric relicensings in the Commonwealth of Virginia.

5.10.2 Archaeological Resources

A Phase 1A Archaeological Investigation was conducted by Appalachian for the previous relicensing (Louis Berger & Associates, Inc. 1991). The purpose of this investigation was to present information on the potential of land associated with the Project to contain prehistoric or historical archaeological resources and to identify measures that may appropriately contribute to a management plan for known and potential cultural resources within the APE. A copy of this report is provided in Appendix I, which is being filed as Privileged in accordance with 18 CFR §388.112.

As summarized in the Phase 1A report, only one archaeological site, approximately 0.75 miles downstream of the Buck powerhouse on the east bank of the New River, has been previously recorded in the Project area. Additional sites have been recorded within lands managed by the USFS and in the vicinity of the Project.

At the Byllesby development, based on this evaluation, the potential for prehistoric archaeological sites is limited due to past disturbances, including Project construction. The New River is flanked by steep banks of bedrock with a low potential for archaeological sites in the immediate vicinity of the Byllesby development. The river banks downstream of the dam similarly have a low potential for archaeological sites due to periodic flooding and the poorly drained nature of the area that would not have made it favored for prehistoric populations (Louis Berger & Associates, Inc. 1991).

At the Buck development, based on this evaluation, the potential for prehistoric archaeological sites is also limited, particularly in the area adjacent to the powerhouse which has been previously disturbed by construction and maintenance activities. With respect to Mountain Island (in the middle of the channel, starting at and extending downstream of the dam), the potential for intact cultural deposits on the eastern end of Mountain Island is low due to dam construction and past disturbances, though the remaining portion of Mountain Island was determined to be moderate due to its undisturbed nature and higher elevation areas that may have offered prehistoric populations well-drained areas for occupation.

5.10.3 Historic Architectural Resources

In support of developing the 1991 license application and other relicensings, a comprehensive cultural resource evaluation of 19 hydroelectric power generating facilities of Virginia was conducted by Louis Berger & Associates, Inc. for Appalachian. The study was based on a program of historical research and limited field investigation and included a detailed assessment of several facilities (Louis Berger & Associates, Inc. 1990). A copy of this report is provided in Appendix I, which is being filed as Privileged in accordance with 18 CFR §388.112.

Based on this assessment and investigations performed for the previous relicensing, the Byllesby-Buck (New River) spillways, dams, and powerhouses have been determined to meet National Register Criteria for Evaluation as set forth in 36 CFR §60.4, specifically Criterion A, a finding with which the Virginia SHPO and FERC have previously concurred.

As summarized in the previous license application:

> Completed in 1912, the Byllesby-Buck project is directly associated with an important event in the history of hydroelectric industry in Virginia, the "debut" of the Appalachian Power Company as one of the two major power producers in the state. It is also a significant representative of hydroelectric project design and construction of its time, evidencing a high level of sophistication in design and employing features that would become standard in the industry during the 1920s (Appalachian 1991a). The Buck and Byllesby plants, and thus the New River project as a whole, possess a high degree of integrity of original design, workmanship, and materials. The recent reconstruction work on the spillway across the main river channel at Buck necessitated the removal of the original piers which supported the gates and flashboard sections, but the original Tainter gates and hoisting mechanisms were refurbished and reinstalled; and the piers were re-poured from original plans. The results preserve integrity of design and, in so doing, provide an excellent example of how repair and reconstruction, even on a large scale,

can be accomplished without diminishing qualities of significance. The physical integrity of the New River project also means that integrity of association remains present in the facility, that the linkage between the project and the original Appalachian Power Company remains direct and intact. In its determination of eligibility for listing on the NRHP, the Virginia SHPO maintained that the caretaker's house and transmission building adjacent to the Byllesby development should also be included, although these structures ·are outside the Project boundary (Appalachian 1991a).

5.10.4 Existing Discovery Measures

Articles 409 and 410 of the existing license for the Project includes measures to protect and manage historic properties as follows:

> Article 409. The licensee shall consult with the Virginia SHPO and develop and implement a cultural resources management plan to avoid and mitigate any impacts to the historical integrity of the project dams, spillways, and Powerhouses, and the Byllesby caretaker's house and transformer house, from routine maintenance and repair work conducted during project operation.
>
> Within two years of the effective date of this license, the licensee shall file a copy of the cultural resources management plan for Commission approval, and the written comments of the SHPO on the plan. The survey and the plan shall be based on the recommendations of the SHPO and adhere to the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation. ·
>
> The Commission may require revisions to the plan based on the filing. The licensee shall not implement the cultural resources management plan until informed by the Commission that the requirements of this article have been fulfilled.
>
> Article 410. If archeological or historic sites are discovered during project operation, the licensee shall:
>
> A. Consult with the Virginia SHPO;
> B. Prepare a cultural resources management plan and a schedule to evaluate the significance of the sites and to avoid or mitigate any impacts to any sites found eligible for inclusion in the National Register of Historic Places;
> C. Base the plan on the recommendations of the SHPO and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation;

D. File the plan for Commission approval, together with the written comments of the SHPO on the plan; and
E. Take the necessary steps to protect the discovered sites from further impact until notified by the Commission that all of these requirements have been satisfied.

The Cultural Resources Management Plan (CRMP), developed in accordance with Article 409, was filed by Appalachian on February 23, 1996, and approved by FERC on July 18, 1996. The approved CRMP describes how the Project should be managed with regard to historic preservation concerns and requires Appalachian to submit, every two years, copies of written consultations between Appalachian and the SHPO associated with the implementation of the CRMP during the previous two years. In addition to the biennial reporting, the CRMP requires Historic American Buildings Survey / Historic American Engineering Record photographic documentation of the Project facilities to be repeated every ten years for the term of the existing license in order to provide a photographic record of changes to the Project over time. Appalachian is in compliance with Articles 409 and 410 and proposes to continue to implement the CRMP, if updated and as applicable, under the term of the new license.

5.10.5 Identification of Indian Tribes and Traditional Cultural Properties

In a letter dated April 25, 2018, FERC initiated consultation for the relicensing with the Catawba Indian Nation, Delaware Nation, Eastern Band of Cherokee Indians, and Monacan Indian Nation. In a letter dated May 10, 2018, FERC initiated consultation with the Cherokee Nation and the United Keetoowah Band of Cherokee Indians in Oklahoma.

Responses from the above-listed Tribes were as follows:

- The Cherokee Nation indicated on August 2, 2018, they are interested in the Project and should be notified of all communication with the SHPO and cultural-related information.

- On August 2, 2018, the United Keetowah Band of Cherokee Indians in Oklahoma requested a tribal consultation phone conversation. FERC reached out to the United Keetowah Band of Cherokee Indians in Oklahoma in August and September of 2018, but received no response to date.

- On August 3, 2018, FERC received an email from the Monacan Indian Nation indicating the tribe is not opposed to the relicensing of the Project, nor does the tribe intend to initiate formal consultation at this time.

- FERC received an email from the Delaware Nation indicating that the Nation would like to be consulted on the Project.

- FERC reached out to the Catawba Indian Nation and the Eastern Band of Cherokee Indians in July, August, and September of 2018 and has received no response to date.

5.10.6 Known or Potential Adverse Effects and Proposed PM&E Measures

The generally good condition and overall integrity of the Project is attributable to its continued utilization as a producer of hydroelectric power. Appalachian does not propose any changes to the Project that would impact its historical integrity or affect potential archaeological resources. In applying the Criteria of Effect and Adverse Effect (36 CFR §800.9) for the existing license issued in 1994, the Virginia SHPO determined that proposed Project operations will have no effect upon historic properties. The existing CRMP provides measures for managing and identifying potential effects of actions on the historic character of the Project and for consultation with the SHPO to develop measures to mitigate adverse effects. Appalachian proposes to update (with the final license application) and continue to implement the CRMP under the term of the new license. Based on these factors, Appalachian does not anticipate any adverse effects to cultural resources or propose any additional PM&E measures for cultural resources at this time. Appalachian expects to consult with SHPO and FERC regarding any need to update the CRMP for the new license application.

5.11 Socioeconomic Resources

5.11.1 Existing Socioeconomic Resources

The Project is located in Carroll County, which is one of the 55 counties in Virginia (U.S. Census Bureau [USCB] 2017). The 2010 census reported that approximately 30,042 people reside in Carroll County, which encompasses approximately 475 mi^2, with a population density of 63.3 persons per mi^2. In 2016, the population was 29,531, which is a 1.7 percent increase over the six-year period. Hillsville is the largest town in Carroll County, which had an estimated population of 2,655 in 2016 (USCB 2017).

In 2015, the median household income for Carroll County was $35,000, which compares to the statewide median household income of $65,015 for the same period (USCB 2017). In 2015, the unemployment rate for Carroll County was 6.7 percent, compared to 6.5 percent in Virginia, and a national unemployment rate of 8.3 percent (USCB 2017).

There are 416 employer establishments in Carroll County, which employ over 4,000 people (USCB 2017). Retail trade is the most abundant employer establishment. The manufacturing sector employs the greatest number of people, followed by the retail trade, accommodation and food services, and health care and social assistance (USCB 2017).

5.11.2 Known or Potential Adverse Effects and Proposed PM&E Measures

Appalachian does not anticipate that continued operation of the Project under the term of the new license, as presently proposed by Appalachian, would have any adverse effects on socioeconomic resources. The Project provides a variety of socioeconomic benefits to the region through the generation clean, renewable energy, preservation of wildlife habitat, protection of cultural and aesthetic resources, and provision of recreation opportunities.

Section 6
Preliminary Issues, Project Effects, and Potential Studies List

6.1 Consultation to Date

To date, Appalachian has performed the following consultation activities:

- PAD information questionnaires were distributed to 55 potential Project stakeholders. (See Appendix A for distribution list.)
- VDEQ was consulted regarding the applicability of the State's Coastal Zone Policy to the Project.
- VDCR and USFWS were contacted regarding federal- or state-listed threatened or endangered species, critical habitat, sensitive natural communities, and species of special concern within the Project's vicinity.
- Additional consultation was performed with VDGIF regarding Project area resources.

Documentation associated with the consultation conducted by Appalachian in support of the PAD is provided in Appendix B.

6.2 Project Effects, Studies Needed, and Summary of Relevant Issues for the Project Relicensing

Appalachian has conducted research and consultation activities for the purpose of identifying stakeholder and agency issues relative to the resources of the Project area. Following identification of the potential issues, Appalachian has attempted to define the relationship of the issue to Project operations and identify additional information needs where applicable. These items are summarized below.

6.2.1 Geology and Soils

6.2.1.1 Potential Issues

The continued operation and maintenance of the run-of-river Project associated with power generation is not anticipated to have additional cumulative impacts to the geologic or soil resources.

Shoreline erosion is a common concern at hydroelectric project impoundments. Appalachian believes that the existing run-of-river mode of the Project, in combination with the vegetated and undeveloped nature of the shorelines in the Project boundary, and the erosion-resistant exposed bedrock along the shorelines provide protection against bank erosion. Requirements of the existing license and any additional permits or approvals that would be issued for maintenance drawdowns provide additional protection against shoreline erosion.

The upper New River has a long history of sedimentation issues as a result of the geology, soils, topography, and land use that are found within the basin. Based on available information, most of the sediment load that enters the Byllesby and Buck developments is already expected to pass through the Project and be deposited downstream (i.e., in Claytor Lake), and the rate of sedimentation of the reservoirs has stabilized in recent decades. Appalachian further notes the bedrock nature of the bypass reach below each dam, which are scoured of any deposited sediment during high flow events. Coordination of any necessary future dredging in areas around Project facilities would be done by Appalachian with USACE and VDEQ pursuant to standard license article 12 and additional permits and approvals issued by these agencies.

6.2.1.2 Proposed Studies

While the run-of-river mode of Project operation and existing protections of the Project license provide protection against and a means to monitor for shoreline erosion, Appalachian recognizes that aspects of the Project's geological setting may contribute to the potential for shoreline erosion. 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 reservoirs 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.

Appalachian does not proposed to conduct a sedimentation study for this relicensing, for the reasons summarized below.

- Watershed sedimentation modeling completed for the study conducted for the relicensing of the Claytor Project concluded that the run-of-river Byllesby-Buck reservoirs have little retention capacity, such that the transport-limited conditions of the New River are not removed until sediment reaches the Claytor Project, where it enters long-term storage.

- The recently completed sedimentation study for the upstream Fries Project confirms Appalachian's expectation that sedimentation of the small reservoirs associated with the run-of-river projects on the upper New River below Fields Dam has stabilized.
- As illustrated by the findings of the Fries Sedimentation Study (Kleinschmidt 2017), bathymetric mapping of the existing Byllesby and Buck reservoirs is unlikely to yield a meaningful comparison to historical studies conducted to estimate the reservoir storage volume.
- No sediment removal at the Project is proposed at this time by Appalachian. In the event sediment removal were to be proposed over the term of the new license, the terms and conditions of the new license and VWPP, in combination with other applicable statutes and regulations, would provide sufficient environmental protections.

6.2.2 Water Resources

6.2.2.1 Potential Issues

Existing uses of Project waters include various recreational activities (e.g. fishing and boating) and hydroelectric generation. The results of the studies conducted for the previous relicensing and available water quality data from upstream and downstream monitoring locations generally support a conclusion that due to the small size and short retention time of the Project reservoirs, the lack of thermal stratification in the reservoirs, and the run-of-river operation of the Project, operation of the Project does not affect ambient water quality (i.e., water temperature and DO levels) in this reach of the upper New River.

There are three sections of Project waters listed by VDEQ as impaired in the 2016 303(d) Water Quality Assessment Integrated Report. Water quality impacts were attributed to *E. coli* and fecal coliform associated with livestock grazing and feeding operations, unrestricted cattle access, and other unknown sources (VDEQ 2017a). None of these impacts are attributed to Project operations, and Appalachian does not believe that continued operation of the run-of-river Project has the potential for cumulative effects to water quality in the upper New River.

6.2.2.2 Proposed Studies

No recent water quality data is available from directly within the Byllesby and Buck reservoirs, bypass reaches, or tailraces. Appalachian proposes to conduct a single season (June through October) Water Quality Study to provide updated baseline data in support of the applications for the new license and VWPP. This survey would be used to gather baseline water quality data to determine compliance with applicable water quality standards and designated uses.

The scope of this study would be limited to the FERC-approved Project boundary. Appalachian proposes to monitor DO, water temperature, and water level continuously (i.e., 15-minute intervals) at a location upstream of the Byllesby reservoir, and at a location downstream of each powerhouse tailrace. In addition, once per calendar month, depth profiles (i.e., approximately 1-ft intervals) consisting of *in situ* water quality measurements of temperature, DO, pH, and specific conductance will be collected using a Hydrolab or similar data sonde at three locations spaced evenly across the forebay of each development. The water level recorders will be used to collect data for potential use in other flow-related studies, as well as to provide additional information (i.e., flow conditions) to facilitate evaluation of the water quality data collected and any anomalous data. Data analysis will be performed after all data has been collected.

6.2.3 Fish and Aquatic Resources (Including Related RTE Resources)

6.2.3.1 Potential Issues

Aquatic resources (freshwater fish, mussels, and macroinvertebrates) within the Project area are potentially affected by Project operations and maintenance.

The upper New River supports a cool-water fishery and is one of the best fishing rivers in Virginia according to the VDGIF (VDGIF 2017e). Potential fishery resource concerns at the Project primarily include impacts to aquatic habitat and the potential for fish stranding/mortality. No obligate migrant fish species (catadromous or anadromous) exist between or upstream of the Project dams; however, some species may exhibit local spawning migrations, such as Walleye or Muskellunge. Although the movement of these species is largely precluded by the dams, the areas upstream and downstream remain high-quality fisheries.

Intermittent releases at the Project dams create temporarily watered conditions in the bypass reaches. Fish from areas downstream may be attracted into the bypass reach by the available flow, creating the potential for stranding as flows recede with the cessation of releases from the dam. The ramping rate assessment conducted for the previous relicensing concluded that fish stranding is not a significant problem below the Buck spillway when the ramping procedures are followed in accordance with Article 406. The study found that the majority of collected fish appeared to be permanent residents of the bypass area in pools or flowing-water areas fed by leakage through the flashboards and rain events. In many areas of the bypass reach, particularly the area within about 1,600 ft of the dam, leakage or other flows continue to provide an escape route for species, limiting stranding (Appalachian 1997). In informal consultation with Appalachian, VDGIF expressed concern regarding anecdotal reports of past fish stranding and mortality events below Buck dam. Appalachian notes that replacement of several sections of existing wooden flashboards with inflatable Obermeyer crest gates at each development is expected to smooth Project operations by minimizing potential reservoir water level fluctuations and instances of inadvertent flow to the bypass reaches. This Project improvement is also expected to reduce the frequency of maintenance drawdowns associated with wooden flashboard failure and replacement.

Under current operations, except when the Project spills, the bypass reach receives only seepage flow from the dam and local-area drainage. There are currently no required minimum flows in the Buck bypass reach. If suitable aquatic habitat were present in the bypass reaches, periods of zero flow with significant frequency and duration may cause negative impacts to such aquatic habitat or species that occur in the bypass reaches. During the previous relicensing, FERC determined that the bypass reaches did not contain any unique or outstanding characteristics for fish habitat compared to other reaches of the river nearby. However, during informal consultation conducted in support of preparation of this PAD, VDGIF expressed the potential need for seasonal minimum flow in the bypass reach at Buck dam. In particular, VDGIF’s Upper New River Walleye Management Plan (Copeland 2017) includes negotiation of reductions in power production at the Project during the peak walleye spawning, hatching, and larval season (early March to early May) to reduce flow fluctuation impacts on walleye spawning success and survival as one of the management strategies established by this plan. Appalachian notes, however, as stated in Section 5.4.3, natural reproduction of Walleye in the upper New River is still low, with the population in this reach sustained by VDGIF through stocking efforts.

6.2.3.2 Potentially Applicable Studies Not Proposed by Licensee

Because aquatic species compositions in this reach of the New River are well documented from past historical and recent studies, Appalachian does not propose to conduct broad field surveys for this relicensing, nor does Appalachian believe such surveys to be necessary for the evaluation of Project effects or potential PM&E measures for aquatic resources.

Appalachian believes that the potential for state-listed aquatic species to occur in the Project area is well established (or refuted) by the recently conducted studies for the Fries Project. These species are unlikely to occur in the Project bypass reaches. As the Project is already operated in a run-of-river mode and with existing protections for shoreline riparian and littoral habitat, additional protection or mitigation opportunities for odonates and herpetofauna are limited. Based on these factors and because no operational changes are proposed that would affect existing habitat for these species, Appalachian does not proposed to conduct aquatic surveys for odonates, crayfishes, or eastern hellbender within the Project boundary. Furthermore, mussel salvage and relocation was recently (2018) performed at both, Byllesby and Buck dams during drawdown operations for Obermeyer crest gate installation. Approximately five kilometers of affected river were searched above the Byllesby dam, and approximately 2.9 km of affected river, in addition to islands, were searched above Buck dam. Provided that mussel salvage efforts during the drawdowns were recently performed in the Project area, as well as several other recent surveys performed upstream and downstream of the Byllesby and Buck dams, no mussel surveys are currently proposed within the Project boundary.

The previous licensing of the Byllesby-Buck Project concluded that the potential for substantial entrainment effects was very low. Since there have been no significant changes in Project equipment or operations since that time, Appalachian does not propose to conduct an entrainment study for this relicensing.

6.2.3.3 Proposed Studies

Based on the issues identified in the section above, targeted studies proposed by Appalachian are as follows:

Bypass Reach Aquatic Habitat and Flow Assessment

The protection measures required by the existing Project license are based on the findings of the 1997 ramping rate assessment conducted by Appalachian and FERC's previous finding that the [Buck] bypass reach does not provide any unique or outstanding characteristics of fish habitat relative to nearby reaches. Appalachian expects that relicensing participants will be interested in confirming the adequacy of the existing ramping rate for protection of aquatic resources that may occur in the bypass reaches and determining whether there is a need for seasonal minimum flow releases at either dam.

Critical to these evaluations will be more-detailed information than is presently available about aquatic habitat in the bypass reaches and whether these short reaches provide significant suitable habitat for various life stages of target management species. Appalachian proposes, therefore, to perform a desktop aquatic habitat assessment of each Project bypass 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 then consult with resource agencies and relicensing participants to develop a list of primary game and forage species that may utilize the bypass reach and identify depth and substrate requirements for target species.

An understanding of travel times and water surface elevation responses for different base flow and spillway release flow combinations at target channel locations will be needed to confirm the adequacy of the existing ramping rate. Appalachian proposes to identify areas and/or pools of management interest through the desktop habitat assessment described above, supplemented with limited field reconnaissance to confirm site conditions. Water level loggers (pressure transducers that measure water stage change with high precision, surveyed to a common datum) could be installed in target (preferably calm water) locations for collection of water level surface elevation measurements (e.g., 15-minute intervals) over the designated study period. The level loggers would capture water surface elevations during periods of no releases and during periods of spill at the dams. When compared to Appalachian's operations records of releases at the dams, this data can be used to confirm that spillway operations are achieving the desired ramping rate. Collection of level logger and discharge measurements during controlled test gate openings at the spillway will be used to develop a stage-discharge rating curve for a select location.

A variety of gate opening and inflow scenarios could be assessed to determine bypass reach flow and water level conditions that may provide temporarily or permanently wetted aquatic habitat and habitat connectivity, and prevent stranding of target species.

The results of this flow assessment will be presented in a study report and reviewed with resource agencies and relicensing stakeholders to determine if any further analyses or evaluations are warranted.

Inflatable Obermeyer Crest Gate Operational Effectiveness Evaluation

Appalachian has noted that replacement of several sections of existing wooden flashboards with inflatable Obermeyer crest gates at each development is expected to smooth Project operations by minimizing potential reservoir water level fluctuations, reservoir drawdowns, and instances of inadvertent flow to the bypass reaches. Installation of the new gates/replacement of the flashboard sections is scheduled for completion in 2018 at Byllesby and in 2019 at Buck. Appalachian proposes to conduct an Operational Effectiveness Evaluation to confirm that operation of the Project dams with the inflatable Obermeyer crest gates has these desired effects. Appalachian proposes to conduct this evaluation utilizing an operations model that has been developed for the Project.[9] Using this model, Appalachian will be able to simulate Project operations with the Obermeyer crest gates installed, including instances of spills to the bypass reach, reservoir level changes, and powerhouse generation for a hypothetical period of time. The level loggers to be installed in the bypass reach 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. This data can be used to validate the operations

[9] This evaluation would utilize HDR's proprietary Computer Hydro Electric Operations and Planning Software (CHEOPS™) hydropower system simulation model for this evaluation. CHEOPS has previously been employed to evaluate the physical and operational changes considered during the FERC relicensing of over 75 individual hydropower developments, including the Claytor Project.

model. Data used for model input and the parameters of individually modeled operating scenarios will be presented in a study report.

The results of this evaluation will be presented in a study report and reviewed with resource agencies and relicensing stakeholders to determine if any further analyses or evaluations are warranted.

6.2.4 Wildlife and Botanical Resources (Including Related RTE Resources)

6.2.4.1 Potential Issues

The Project has been in continuous operation for over 100 years, and the existing terrestrial environment has developed in response to the current and proposed Project operations. There are no anticipated significant cumulative impacts to wildlife or botanical resources associated with the Project. The continued operation and maintenance of the Project associated with power generation and current and possible future recreational sites is not anticipated to have significant cumulative impacts to terrestrial wildlife or botanical resources. Short-term minimal effects from normal maintenance, temporary construction (i.e. future recreational sites) and ongoing operations may temporarily impact some generalist terrestrial wildlife species; however, these species will likely move to adjacent habitat, returning once the activities are complete.

The VDGIF noted that Virginia spiraea and bald eagle may be issues of concern at the Project. USFWS consultation stated that the federally listed Indiana bat and Northern Long-eared bat may potentially occur within the Project boundary. Additionally, the USFWS consultation stated Virginia spiraea may potentially occur at the Byllesby facility.

6.2.4.2 Proposed Studies

Because botanical and wildlife species are likely well-established under the current and proposed operations of the Project facilities, the existing Wildlife Management Plan has provided a means for monitoring habitat over the term of the existing license, and Appalachian does not currently propose any activities at or changes to the Project that would impact habitat, no formal study is being proposed for wildlife and botanical resources. In place of this study, Appalachian proposes to develop a high-level base map, in GIS, displaying general vegetation cover type information of lands within the Project boundary, including forested areas that have potential to include roosting habitat for listed bat species, for inclusion in Exhibit E of the license application. This cover type map would be verified in the field during any required habitat assessments for sensitive plant species, were such assessments to be required.

For the reasons discussed below Appalachian does not propose to conduct surveys for protected or rare species at this time.

In comments filed on the PAD for the Fries Project, USFWS suggested that Virginia spiraea surveys be conducted to determine whether or not this species occurs within the Project boundary, and, if the species is found, a management plan should be developed and measures should be taken to ensure that recreational use of the area or other project-related activities or operations do not negatively impact this species. Appalachian believes that the survey conducted in 2017 (described in Section 5.6.2), which was previously provided to USFWS and VDCR, provides sufficient and recent baseline information about potential habitat and the lack of occurrences of this species in the Project boundary. In the event that activities were proposed at the Project during the term of the new license that could impact Virginia spiraea, or were this species presence to be observed and documented, the existing FERC license and any other required federal approvals for such activities provide a framework for future consultation, survey, or management activities to avoid impacts to this and other protected species.

There are no plans for improvements or activities at the Project that would require the clearing of potentially suitable roosting habitat or trees that may support maternity colonies for protected bat species (Indiana bat and northern long-eared bat). In the event such activities were proposed to be undertaken in the future, Appalachian would consult or coordinate with USFWS in advance of the proposed activities.

As discussed in Section 5.5.2 and previously reported to USFWS and VDCR, bald eagles and bald eagle habitat are known to occur in the vicinity of the Project. No activities are, however, presently proposed by Appalachian that would disturb bald eagle during its nesting season, and no nests are known to occur within the Project boundary. In the event such activities were proposed to be undertaken in the future, Appalachian would expect to follow USFWS’s Bald Eagle Management Guidelines.

6.2.5 Wetlands and Riparian Habitat

6.2.5.1 Potential Issues

The Project does not regulate river flows. It is not anticipated that wetland or riparian habitats, beyond those already impacted as a result of the original Project construction, will be affected by the Project’s continued operation and maintenance. During informal consultation with Appalachian conducted in support of development of this PAD, VDGIF noted extensive wetland habitat in both reservoirs and the need for mapping/documentation of this habitat as it benefits waterfowl and other species.

6.2.5.2 Proposed Studies

Appalachian does not expect any Project effects to the existing wetland habitat as no modifications to the Project's current operations are presently proposed.

Appalachian does, however, appreciate the significance of the wetland habitat that occurs at the Project. Appalachian proposes to conduct a Wetland and Riparian Habitat Characterization of the Project boundary. This survey will consist of field investigations to confirm, classify, and characterize wetland habitats and communities within the Project boundary. Wetlands mapped will be classified using the USFWS's wetland classification system (Cowardin et al. 1979), unless otherwise recommended by resource agencies. During the wetland survey, investigators will identify the dominant plants present within a wetland habitat to the species level. During the field habitat investigations, the soil matrix down to a depth of approximately 18 inches (or maximum possible depth up to 18 inches) will be characterized and analyzed 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.

6.2.6 Recreation and Land Use

6.2.6.1 Potential Issues

The Project is accessible by a small secondary road. The lands on both sides of the Project are steep, but there are some flat parcels along the river suitable for recreation. The former Norfolk & Western Railroad right-of-way extends along the west shore of the Project and has been converted to the New River Trail State Park. A majority of the land to the west of the Project is owned by the USFS and consists of the George Washington and Jefferson National Forest. 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 or VDGIF. Pursuant to Article 411, Appalachian has filed a Recreation Report concurrently with Form 80 filings every six years under the current license term. The most recent Recreation Report was filed on March 19, 2015.

During informal consultation with Appalachian conducted in support of development of this PAD, the VDGIF indicated that they had identified potential recreation improvements at the Project and would like to further discuss with Appalachian priorities for improvements through a relicensing Recreation Study. Additionally VDCR recommended close coordination with the New River Trail State Park manager to ensure safe portage for the boating and paddling community is addressed.

6.2.6.2 Proposed Studies

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.

6.2.7 Aesthetic Resources

6.2.7.1 Potential Issues

No issues have been identified relevant to aesthetic resources.

6.2.7.2 Proposed Studies

No studies are being proposed.

6.2.8 Cultural and Tribal Resources

6.2.8.1 Potential Issues

The Project will undergo cultural resources consultation, including identification of the APE, under the Section 106 process. The Section 106 process (defined at 36 CFR Part 800) is intended to accommodate historic preservation concerns with the needs of federal undertakings through a process of consultation with agency officials, the SHPO, federally recognized Indian Tribes, and other parties with a potential interest in an undertaking’s effects on historic properties.

6.2.8.2 Proposed Studies

Because a Phase 1A Archaeological Investigation was conducted for the previous relicensing, the potential for prehistoric archaeological sites to occur in the Project boundary is low, and the Project structures have already been determined to be eligible for the NRHP. Appalachian does not propose to conduct any additional cultural resource surveys at the Project for this relicensing, unless erosion assessments indicate a need to do so. Appalachian proposes to update the CRMP developed in accordance with license Article 409 and expects this updated plan to continue to provide appropriate measures for protection and as-needed consultation for the protection of cultural and tribal resources over the term of the new license.

6.2.9 Socioeconomic Resources

6.2.9.1 Potential Issues

No issues have been identified relevant to socioeconomic resources.

6.2.9.2 Proposed Studies

No studies are being proposed. Appalachian expects that the relevant information to be included in the license application exhibits will provide sufficient data for FERC's analysis of any socioeconomic impacts of relicensing the Project.

6.3 Potential Studies or Information Needs List

Based on the information provided in Section 6.2 and throughout this PAD, Appalachian will potentially undertake the following list of studies or surveys to supply additional information regarding specific resources of the Project area. It is understood that some of these studies and information-gathering activities may not be necessary depending on the successful negotiation of PM&E measures. Appalachian will further refine these studies based on comments received on this PAD, from the FERC scoping meeting, and filed study requests of the stakeholders. Appalachian will present these refined studies in the Proposed Study Plan (PSP):

- Shoreline Stability Assessment
- Water Quality Study
- Bypass Reach Aquatic Habitat and Flow Assessment
- Inflatable Obermeyer Crest Gate Operational Effectiveness Evaluation
- Wetland and Riparian Habitat Survey
- Recreational Needs Assessment

Appalachian respectfully requests that resource agencies, Indian Tribes, and other licensing parties that may request a study consider FERC's study request criteria set forth in 18 CFR §5.9(b) and outlined below:

- Describe the goals and objectives of each study proposal and the information to be obtained;
- If applicable, explain the relevant resource management goals of the agencies or Indian Tribes with jurisdiction over the resource to be studied;
- If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
- Describe existing information concerning the subject of the study proposal and the need for additional information;
- 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;
- 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
- 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.

Section 7

Comprehensive Plans

In accordance with 18 CFR §5.6(d)(4)(III and IV), HDR, on behalf of Appalachian has reviewed the July 2017 FERC List of Comprehensive Plans applicable to Virginia and adopted by FERC under Section 10(a)(2)(A) of the FPA, 16 USC §803(a)(2)(A). Of the 46 comprehensive plans relevant to Virginia, eight are considered by Appalachian as applicable to the Project:

- National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.

- 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 State Water Control Board. 1986. Minimum instream flow study – final report. Annadale, Virginia. February 1986.

Based on a review of the comprehensive plans listed above, Appalachian believes that the Project as currently operated is consistent with each of these plans as applicable to the Project and Project boundary. Appalachian anticipates additional consultation with the relicensing parties to confirm consistency.

In addition to the FERC List of Comprehensive Plans, the VDCR identified three additional Comprehensive Plans or guidance documents that are also applicable to the Project:

- Virginia Department of Conservation and Recreation, Division of Planning and Recreational Resources. Virginia Scenic Rivers Program. Richmond, Virginia.
- Virginia Department of Conservation and Recreation, Division of Planning and Recreational Resources. Trails, Greenways, and Blueways. Richmond, Virginia.
- Virginia Department of Conservation and Recreation, Division of Planning and Recreational Resources. Virginia State Park Master Planning and State Park Design and Construction. Richmond, Virginia.

In addition to the Comprehensive Plans or guidance documents referenced by the VDCR, the VDGIF identified (personal communication) one relevant management plan that will be applicable to the Project:

- Virginia Department of Game and Inland Fisheries. Upper New River Walleye Management Plan, 2017 to 2022. Blacksburg, Virginia.

Appalachian anticipates additional consultation with the VDGIF to confirm consistency with this plan of proposed Project operations and any proposed or recommended PM&E measures.

Section 8
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APPENDICES

APPENDIX A

PAD QUESTIONNAIRE AND DISTRIBUTION LIST

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).

hdrinc.com

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 (P-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'l 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 Department 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 01035

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

Janet Norman
US Fish and Wildlife Service
177 Admiral Cochrane Drive
Annapolis, MD 21401

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

Matthew Link
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218

Scott Kudlas
Virginia Department of Environmental Quality
PO Box 1105
Richmond, VA 23218

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

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

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

Virginia Department of Game and Inland Fisheries
7870 Villa Park Drive
PO Box 90778
Henrico, VA 23228-0778

John Copeland
Virginia Department of Game and Inland Fisheries
2206 South Main Street, Suite C
Blacksburg, VA 24060

Robbie Ruhr
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219

DISTRIBUTION LIST

Byllesby-Buck Hydroelectric Project (P-2514)

Rene Hypes
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Richmond, VA 23219

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

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

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

Ben Hermerding
Virginia Council on Indians
PO Box 2454
Richmond, VA 23218

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

Donald J. Orth
Fish and Wildlife Conservation
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061

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

Monacan Indian Nation
PO Box 1136
Madison Heights, VA 24572

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
PO Box 1480
1 N Jefferson Avenue, Suite D
West Jefferson, NC 28694

Laura Walters
New River Conservancy
6718 Dunkard Road
Dublin, VA 24084

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

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
799 Washington Street
PO Box 807
Harpers Ferry, WV 25425-0807

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

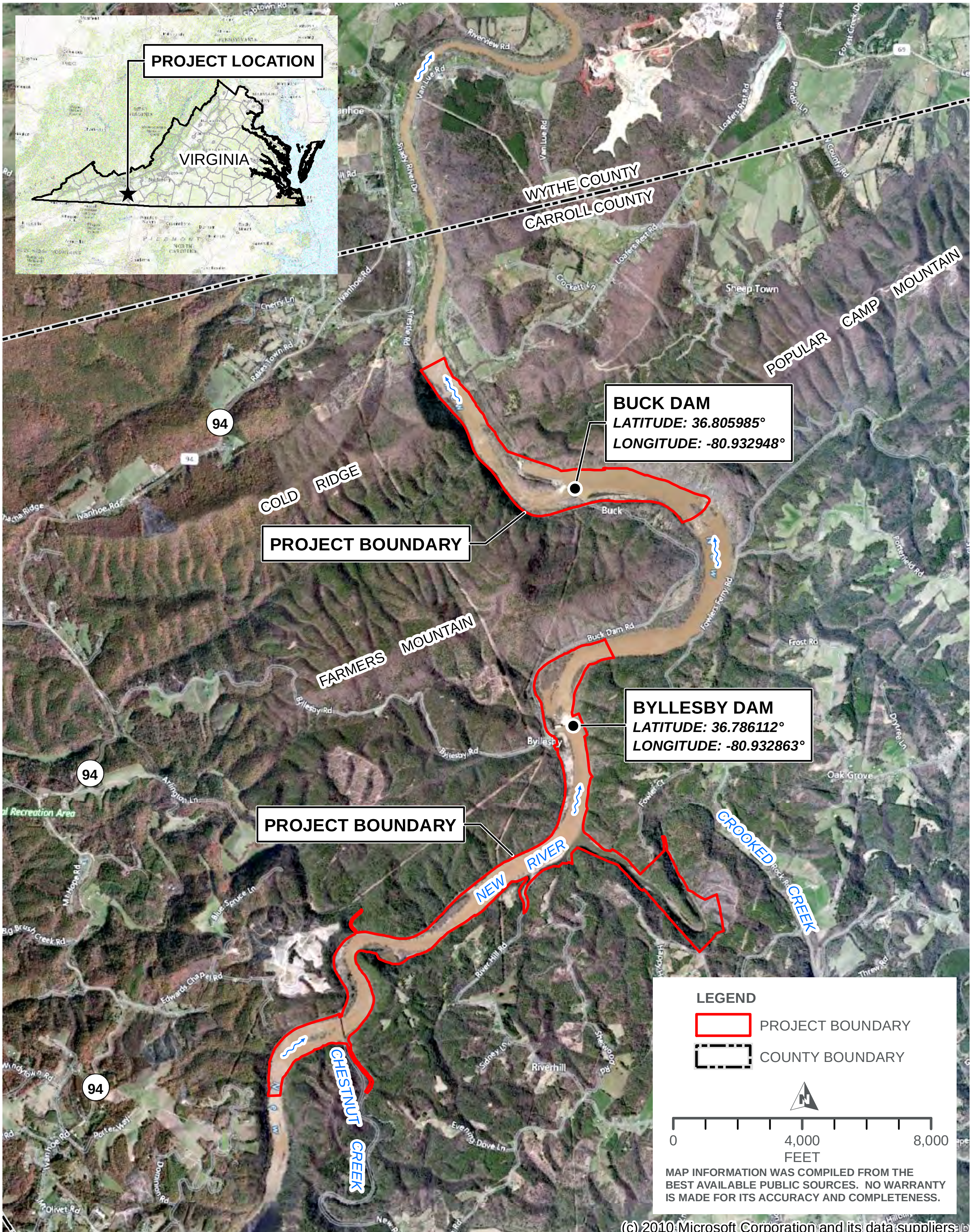
Resource Area	Specific Issue

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

APPENDIX B

CONSULTATION CORRESPONDENCE AND PAD QUESTIONNAIRE RESPONSES

Byllesby-Buck Relicensing (P-2514)
Correspondence Log

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
April 25, 2018	Letter (20180425-3030)	Federal Energy Regulatory Commission (FERC)	Catawba Tribal Leaders (Chief Bill Harris, Deborah Dotson, Chief Richard Sneed, Chief Dean Branham)	Invitation to participation in the relicensing process
May 10, 2018	Letter (20180510-3019)	FERC	Cherokee Tribal Leaders (Chief Bill John Baker and Chief Joe Bunch)	Invitation to participation in the relicensing process
August 2017	Letter	Bureau of Indian Affairs (BIA) (Harold Peterson)	HDR (Sarah Kulpa)	Byllesby-Buck Questionnaire Response
August 2017	Letter	New River Conservancy (NRC) (George Santucci)	HDR (Sarah Kulpa)	Byllesby-Buck Questionnaire Response
August 2017	Letter	Virginia Tech (Donald Orth)	HDR (Sarah Kulpa)	Byllesby-Buck Questionnaire Response
August 2017	Letter	Virginia Department of Environmental Quality (VADEQ) (Drew Hammond)	HDR (Sarah Kulpa)	Byllesby-Buck Questionnaire Response
August 15, 2018	Letter (20180815-0016)	Cherokee Nation	FERC	Confirmation the Nation would like to participate in the relicensing process as a consulting party
August 15, 2017	Letter	HDR (Sarah Kulpa)	Project Stakeholders[1]	Pre-Application Document Questionnaire

[1] Project Stakeholders refers to 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 (VADEQ), 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 NGO's.

DATE	TYPE (FERC accession number, if applicable)	FROM	TO	SUBJECT
August 15, 2017	Letter	HDR (Sarah Kulpa)	VADEQ (Bettina Sullivan)	Coastal Zone Consistency Determination
August 15, 2017	Letter	HDR (Sarah Kulpa)	U.S. Fish and Wildlife Service (USFWS) (Martin Miller)	Request for Threatened and Endangered Species Information
August 15, 2017	Letter	HDR (Sarah Kulpa)	Virginia Department of Conservation and Recreation (VDCR) (Faye McKinney)	Request for Threatened and Endangered Species Information
August 23, 2017	Email	VDCR (Robbie Rhur)	HDR (Sarah Kulpa)	Contacts for Recreation and Scenic Resources and Response to Threatened and Endangered Species
September 1, 2017	Letter	VADEQ	HDR (Sarah Kulpa)	Response to Coastal Zone Consistency Determination
September 13, 2017	Letter	VDCR (Robbie Rhur)	HDR (Sarah Kulpa)	Response to Pre-Application Document Questionnaire
September 20, 2018	Letter	FERC (Allyson Conner)	FERC e-library	Update on initiating consultation with tribes.
September 23, 2017	Letter	VADCR	HDR (Sarah Kulpa)	Review of Biotics Data System for occurrences of natural heritage resources.
October 24, 2017	Conference Call	American Electric Power (AEP) and HDR	Virginia Department of Game and Inland Fisheries (VDGIF) (John Copeland, Brian Watson, Bill Kittrell)	PAD Information Request
November 1, 2017	Email	VDGIF (John Copeland)	HDR (Sarah Kulpa)	PAD Information
November 1, 2017	Email	VDGIF (John Copeland)	HDR (Sarah Kulpa)	Potential recreational access (old AT)
November 6, 2017	Email	HDR (Sarah Kulpa)	VDGIF (John Copeland, Brian Watson, Bill Kittrell)	Sent October 24, 2017 Call Summary

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.

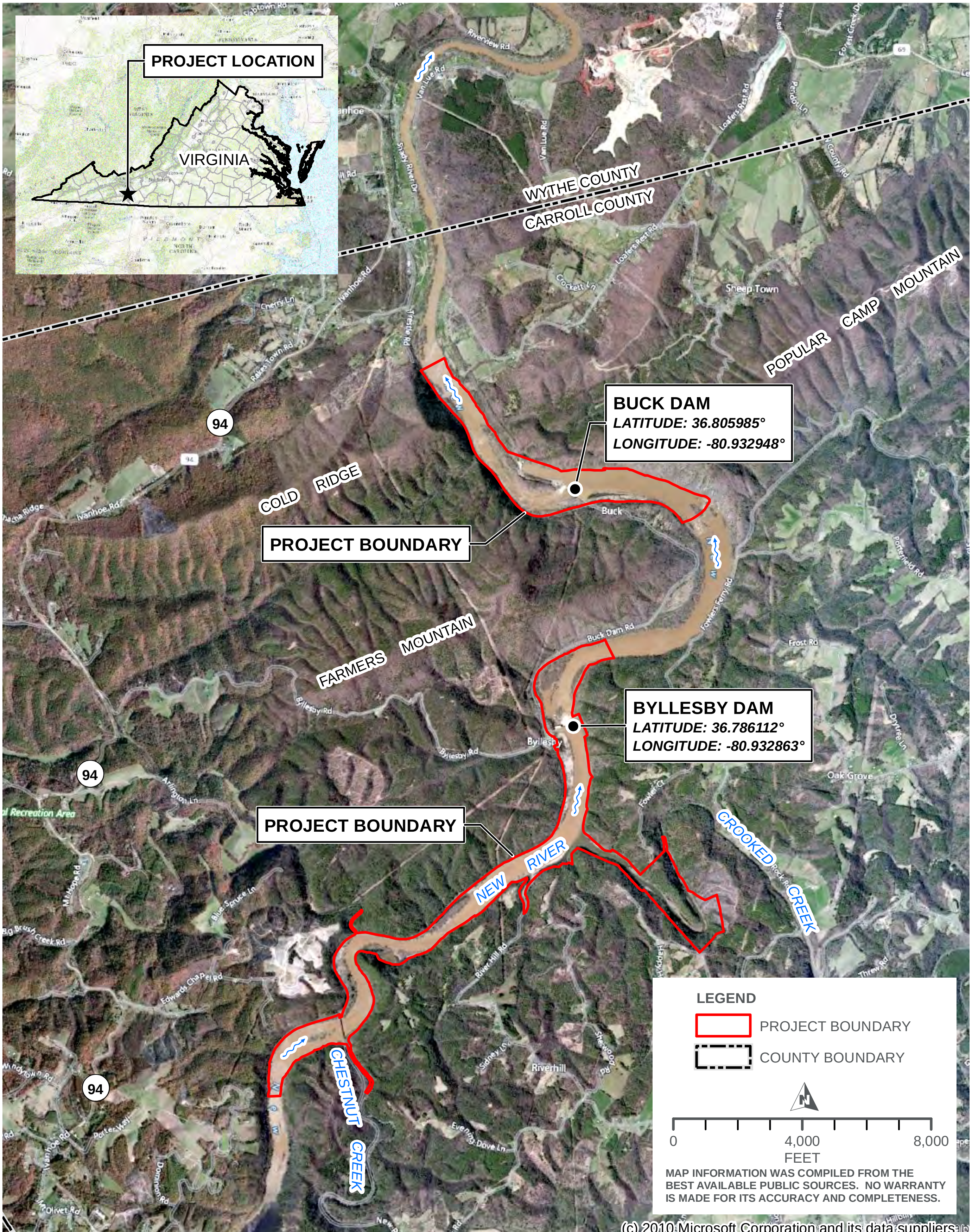
Sincerely,
HDR, Inc.

Sarah E Kulpa

Sarah Kulpa
Project Manager

Attachment

cc: Elizabeth Parcell, on behalf of Appalachian



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

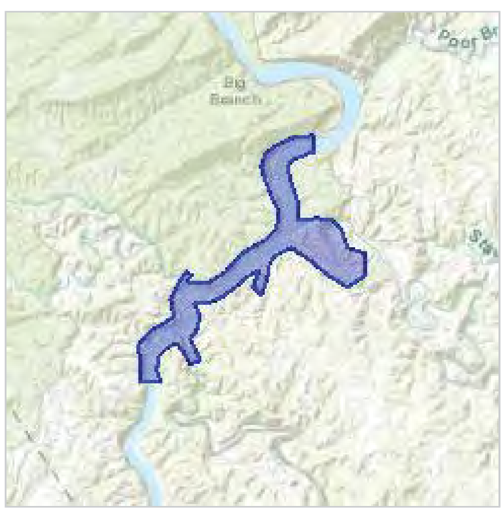
Project Type: DAM

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.

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.

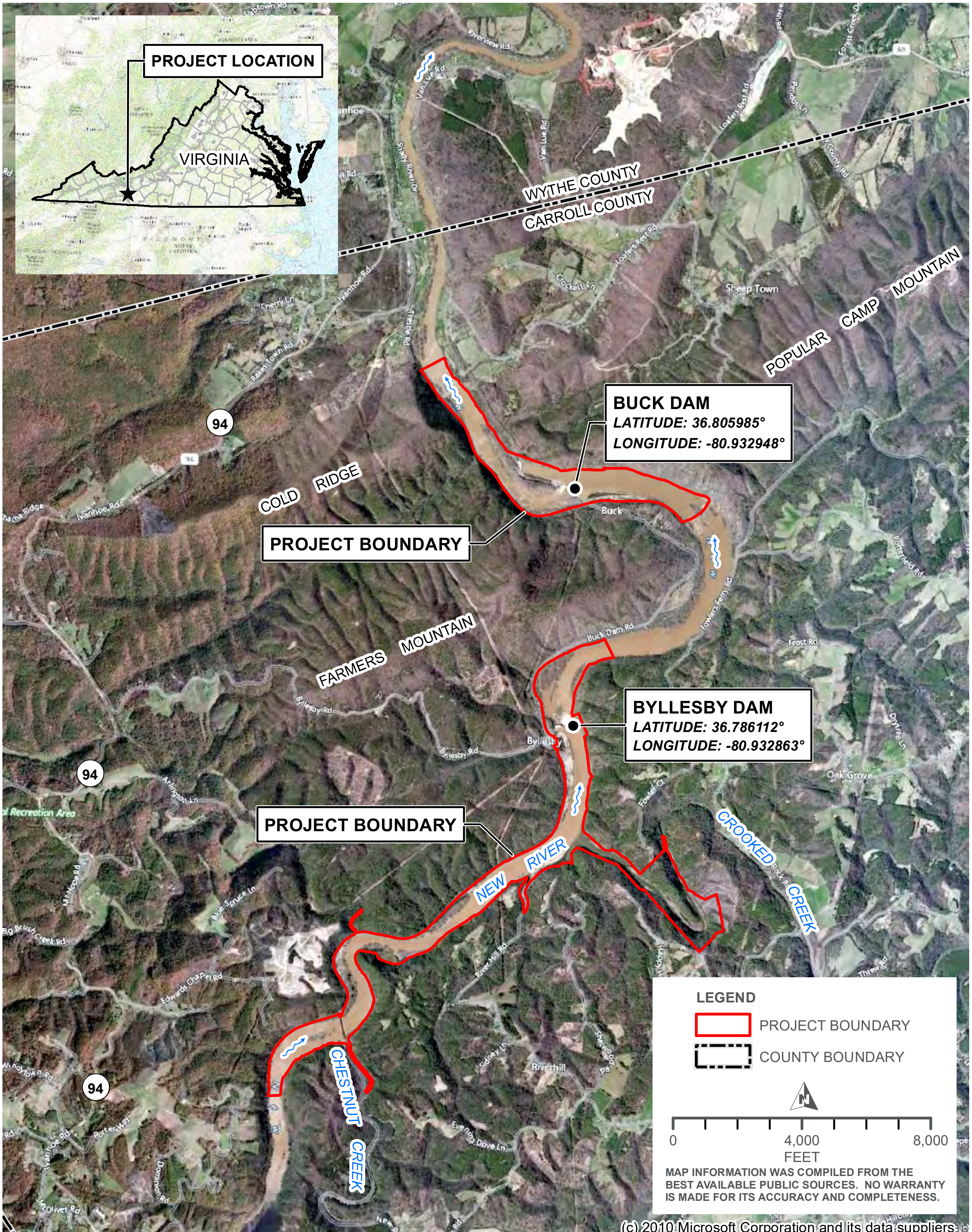
Sarah E Kulpa

Sarah Kulpa
Project Manager

hdrinc.com

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

Attachment
cc: Elizabeth Parcell, on behalf of Appalachian



HDR

APPALACHIAN POWER

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

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 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).*

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 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)* 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 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	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	DONALD J. ORTH DONALD J. ORTH
Organization	VirginiaTech College of Natural Resources and Environment
Address	Donald J. Orth, Thomas H. Jones Professor; Department of Fish and Wildlife Conservation, Virginia Polytechnic Institute and State University, 106 Cheatham Hall (0321), Blacksburg, VA 24061
Phone	540/231-5919; Cell: 540/230-4738; Fax: 540/231-7580
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.

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.

MacVane, Kelly

From: Kulpa, Sarah
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

ONEHDRED
1917-2017

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

MacVane, Kelly

From:	Kulpa, Sarah
Sent:	Wednesday, August 23, 2017 2:38 PM
To:	Rhur, Robbie (DCR)
Cc:	ebparcell@aep.com
Subject:	RE: project submittal with DCR

Very helpful, thanks again, Robbie.

Sarah Kulpa
D 704.248.3620 **M** 315.415.8703

ONEHDR 1917-2017

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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

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

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

MacVane, Kelly

From:	Kulpa, Sarah
Sent:	Friday, September 8, 2017 3:56 PM
To:	Link, Matthew (DEQ)
Cc:	ebparcell@aep.com
Subject:	RE: Byllesby-Buck Hydroelectric Project (FERC Project No. 2514) Relicensing Pre-Application Document Information Questionnaire
Attachments:	Byllesby-Buck Project PAD Questionaire.doc; Niagara Project PAD Questionaire.doc

Hi Matthew,

Thanks for your reply. Word version of the questionnaire attached for Byllesby/Buck as well as Niagara.

Thanks in advance for your input.

Sarah Kulpa
D 704.248.3620 **M** 315.415.8703

ONEHDRED
1917-2017

hdrinc.com/follow-us

From: Link, Matthew (DEQ) [mailto:Matthew.Link@deq.virginia.gov]
Sent: Friday, September 08, 2017 3:41 PM
To: Kulpa, Sarah
Subject: Byllesby-Buck Hydroelectric Project (FERC Project No. 2514) Relicensing Pre-Application Document Information Quesitonaire

Sarah,

I've received the questionnaire from you to fill out and return regarding the referenced project. I was hoping you'd have an electronic version of the document you can send me. Please let me know if you do and I can fill it out and send it back. Otherwise I'll fill it out by hand, scan it, and email it to you. Thanks and have a great weekend.

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

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.

MacVane, Kelly

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

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.

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).

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

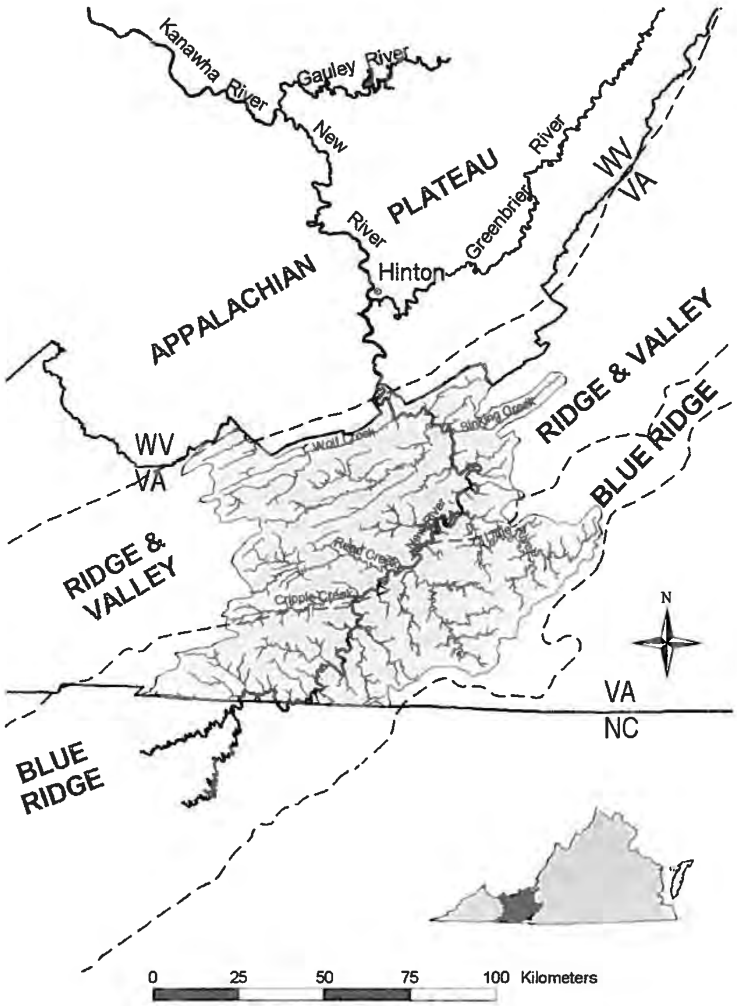

FIG. 1. Basinwide map of the New-Kanawha River drainage, including physiographic provinces and tributaries.

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

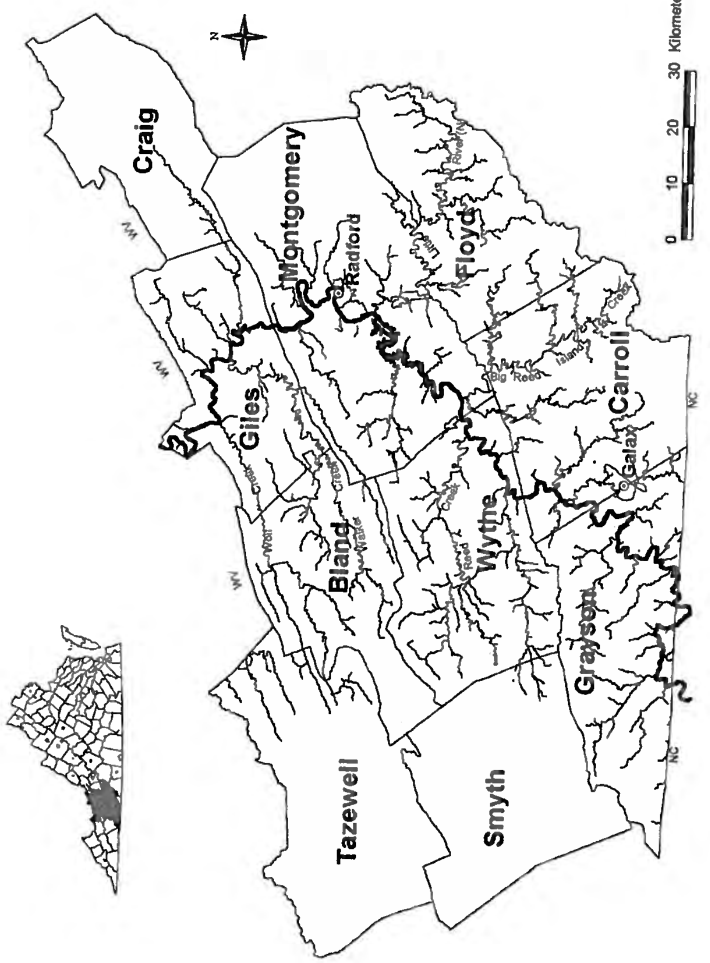

FIG. 2. Counties and major towns in the New River drainage, Virginia.

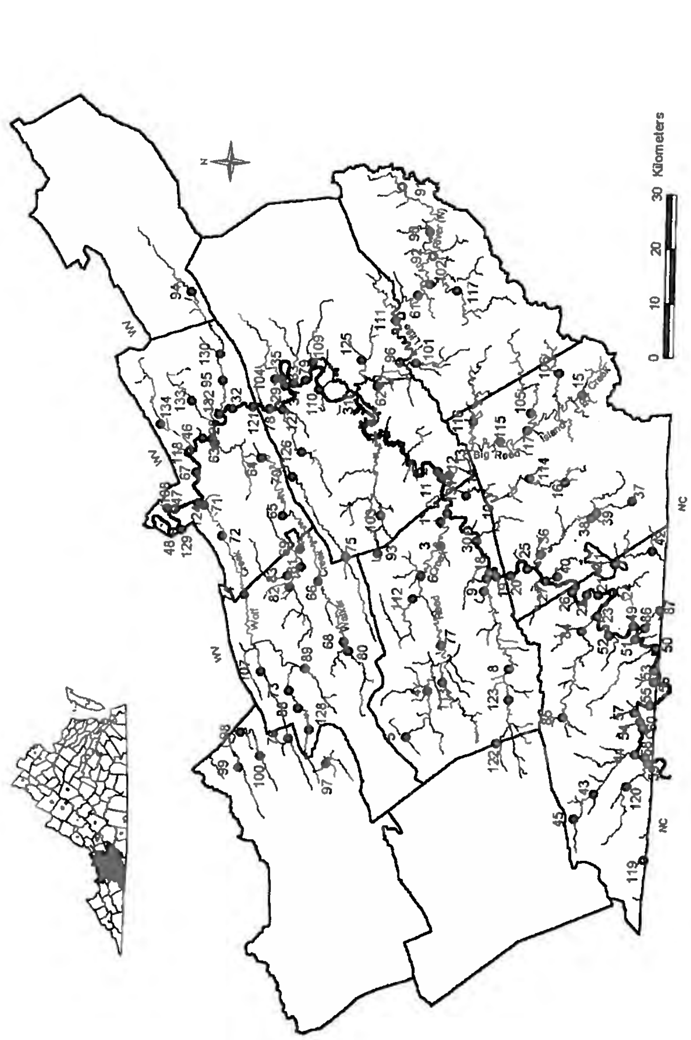

FIG. 3. Survey sites in 1997-1998 for freshwater mussels in the New River drainage, Virginia. Sites are numbered sequentially based on sampling order.

(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.

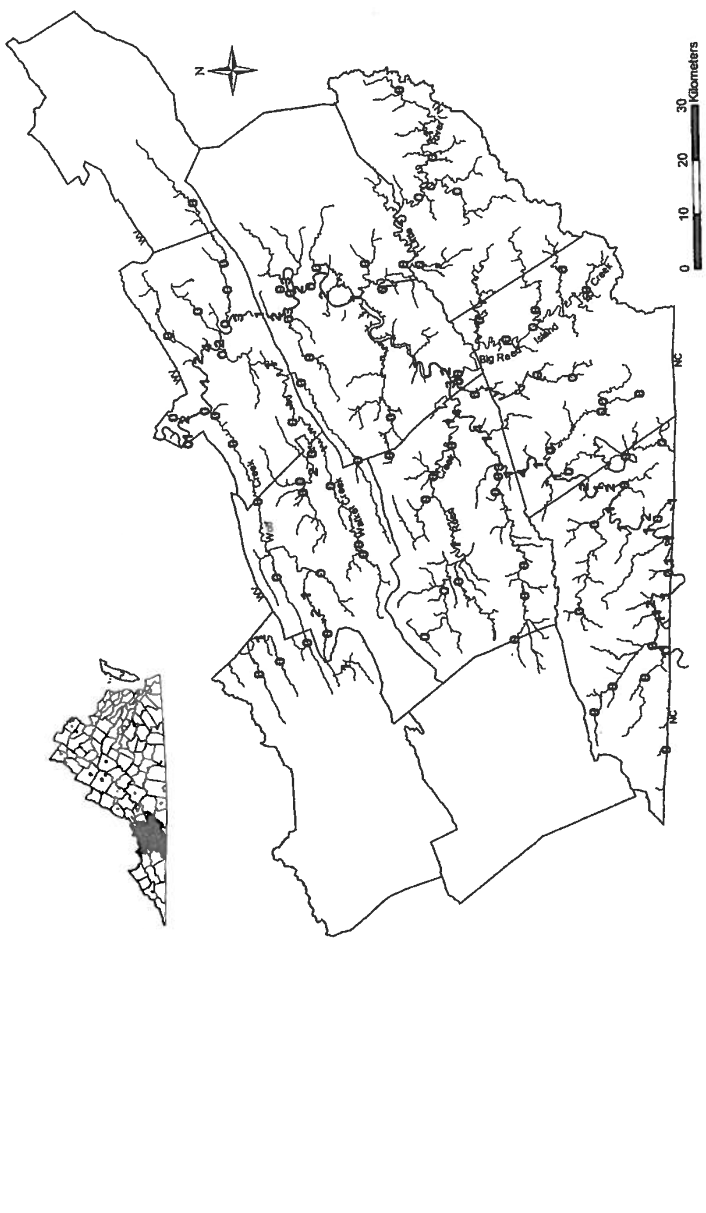

FIG. 4. Number of freshwater mussel species at each sampling site in the New River drainage, Virginia.

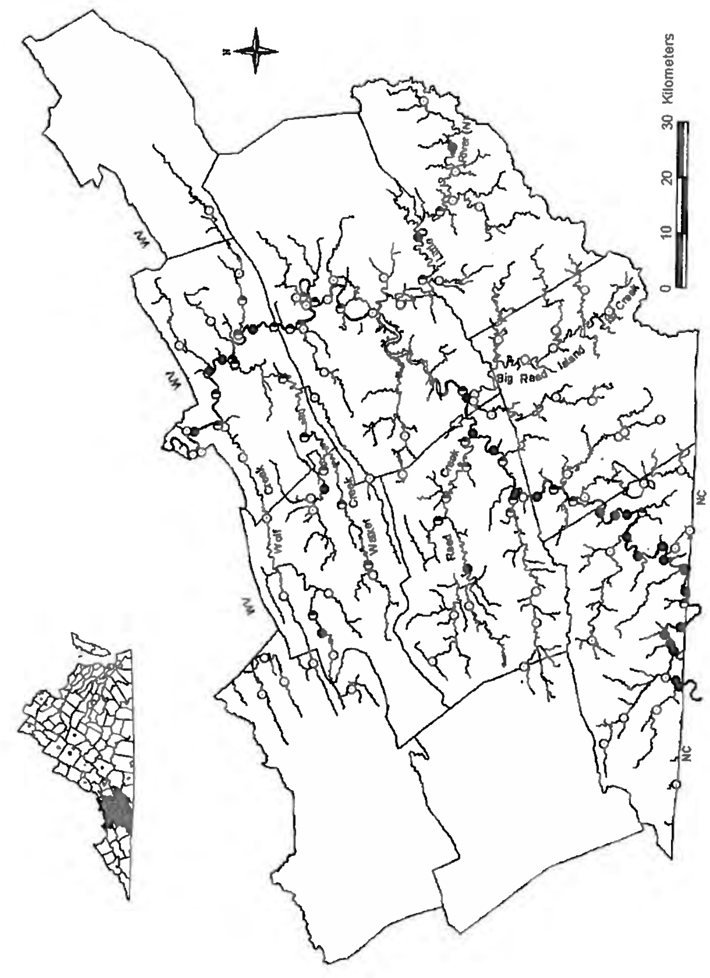

FIG. 5. Distribution of *Elliptio dilatata* (Rafinesque) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

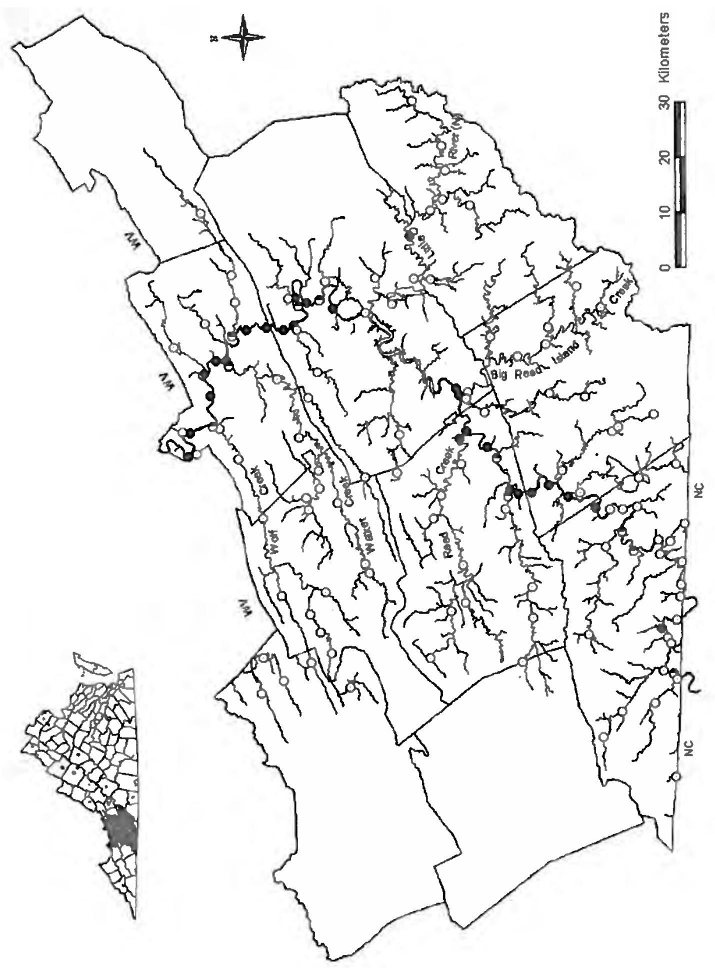

FIG. 6. Distribution of *Cyclonaias tuberculata* (Rafinesque) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

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.

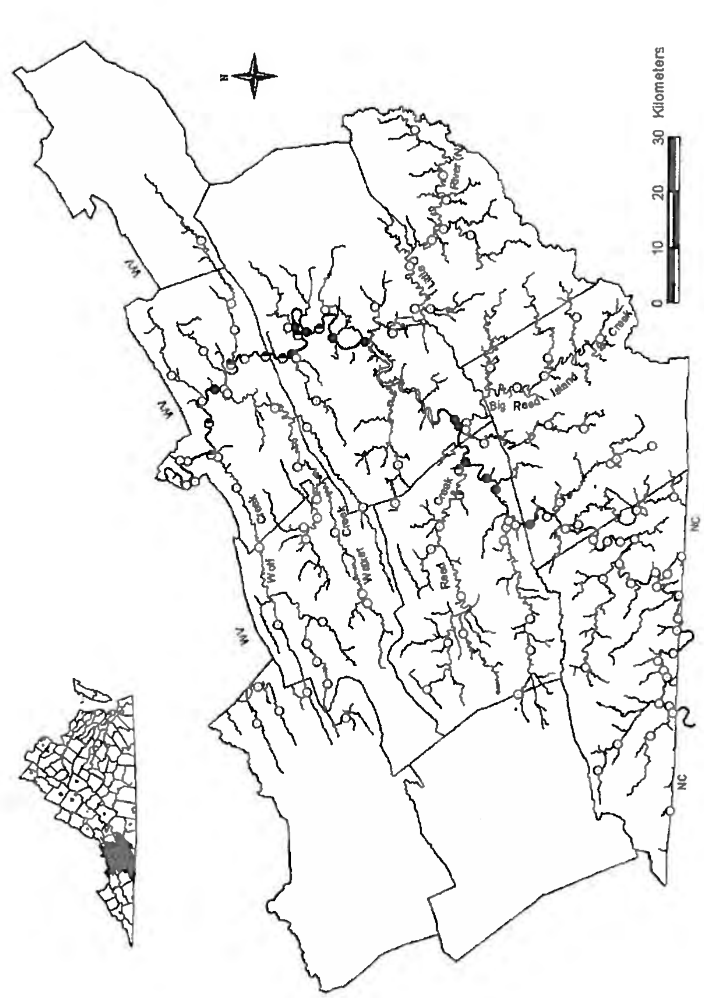

FIG. 7. Distribution of *Lampsilis ovata* (Say) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

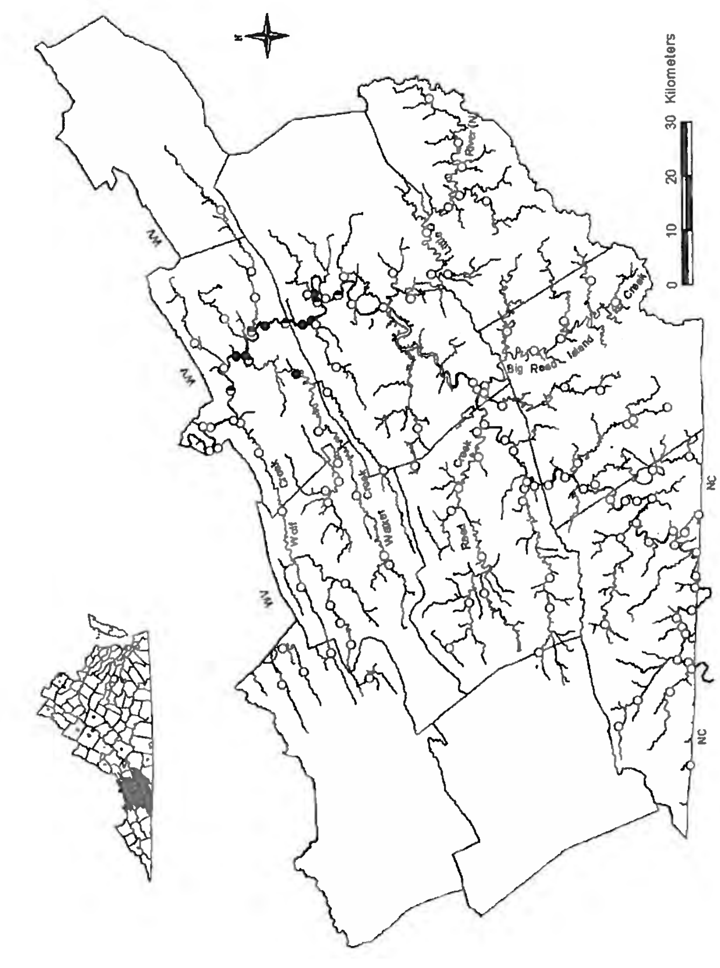

FIG. 8. Distribution of *Lampsilis fasciola* Rafinesque – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

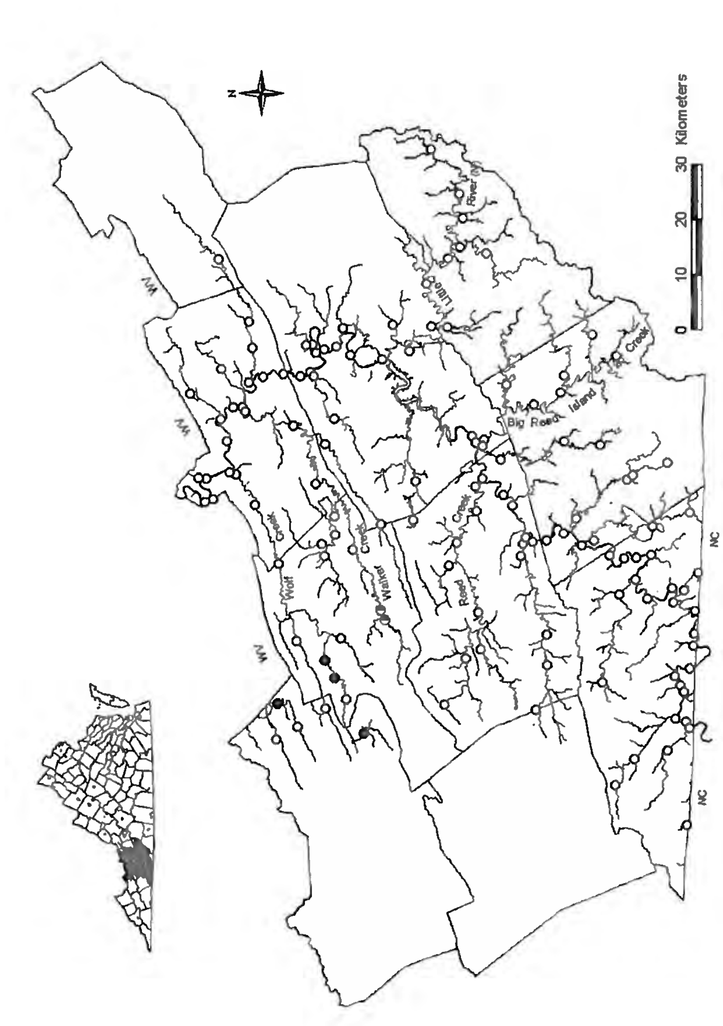

FIG. 9. Distribution of *Lasmigona holstonia* (Lea) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

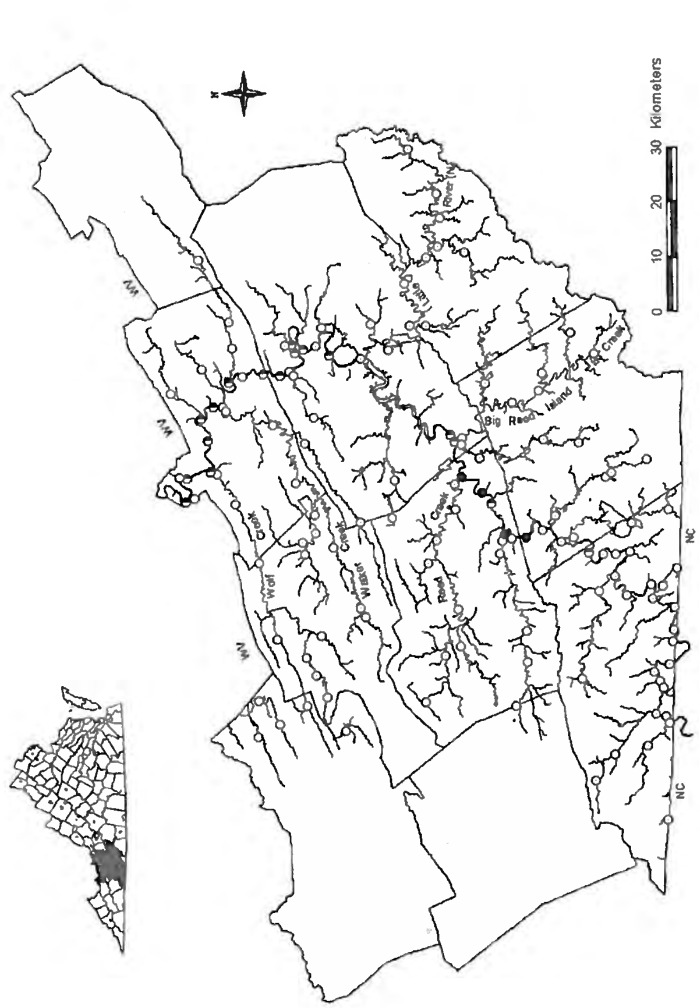

FIG. 10. Distribution of *Tritogonia verrucosa* (Rafinesque) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

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).

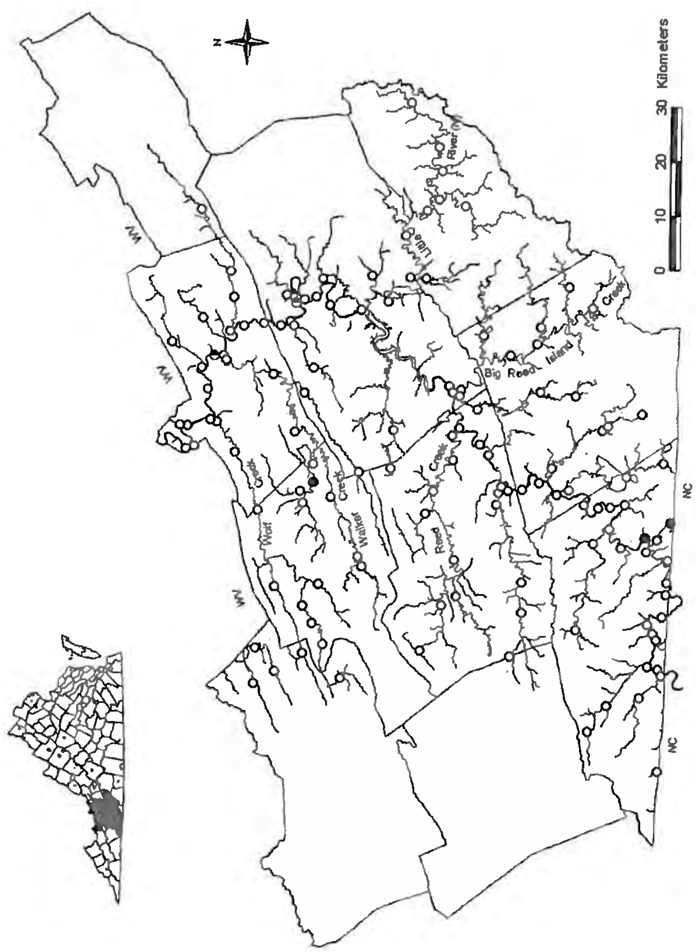

FIG. 11. Distribution of *Lasmigona subviridis* (Conrad) – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

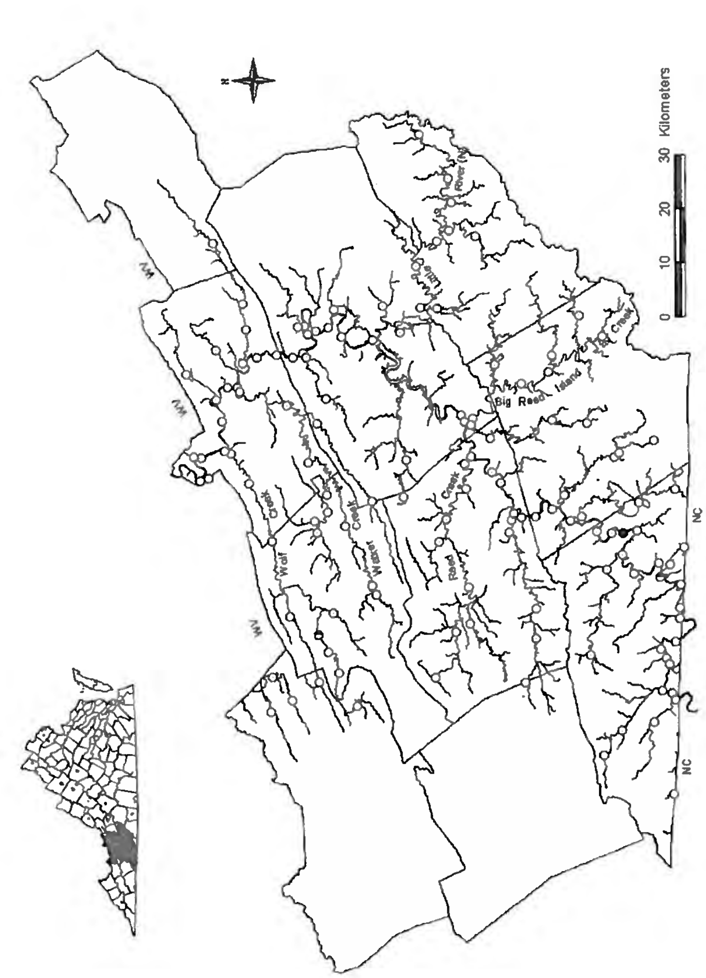

FIG. 12. Distribution of *Alasmidonta marginata* Say – live specimens (closed circles), relic shells (half circles), and no live specimens or relic shells (open circles) in the New River drainage, Virginia.

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 ligamentina	August – May[1]	bluegill[2] (I)	*Lepomis macrochirus*
		black crappie[2] (I)	*Pomoxis nigromaculatus*
		green sunfish[2] (N)	*Lepomis cyanellus*
		largemouth bass[2] (I)	*Micropterus salmoides*
		smallmouth bass[2] (I)	*Micropterus dolomieu*
		rockbass[2] (I)	*Ambloplites rupestris*
		white bass[2] (I)	*Morone chrysops*
		white crappie[2] (I)	*Pomoxis annularis*
		yellow perch[2] (I)	*Perca flavescens*
Alasmidonta marginata	July – June[1]	northern hogsucker[2] (N)	*Hypentelium nigricans*
		rockbass[2] (I)	*Ambloplites rupestris*
		warmouth[2] (I)	*Lepomis gulosus*
		white sucker[2] (N)	*Catostomus commersoni*
Cyclonaias tuberculata	May – August[1]	black bullhead[1] (IP)	*Ameiurus melas*
		channel catfish[1] (N)	*Ictalurus punctatus*
		flathead catfish[1] (N)	*Pylodictis olivaris*
		yellow bullhead[1] (IP)	*Ameiurus natalis*
Elliptio dilatata	May – August[1]	banded sculpin[1] (N)	*Cottus carolinae*
		black crappie[1] (I)	*Pomoxis nigromaculatus*
		flathead catfish[1] (N)	*Pylodictis olivaris*
		gizzard shad[1] (I)	*Dorosoma cepedianum*
		rainbow darter[1] (NI)	*Etheostoma caeruleum*
		rockbass[1] (I)	*Ambloplites rupestris*
		yellow perch[1] (I)	*Perca flavescens*
Lampsilis fasciola	September – June[3]	largemouth bass[3] (I)	*Micropterus salmoides*
		smallmouth bass[2] (I)	*Micropterus dolomieu*
Lampsilis ovata	August – July[1]	bluegill[1] (I)	*Lepomis macrochirus*
		largemouth bass[1] (I)	*Micropterus salmoides*
		smallmouth bass[1] (I)	*Micropterus dolomieu*
		white crappie[1] (I)	*Pomoxis annularis*
		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)	*Cottus bairdi*
Tritogonia verrucosa	April – August[1]	flathead catfish[1] (N)	*Pylodictis olivaris*
		yellow bullhead[1] (IP)	*Ameiurus natalis*

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.

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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	Mussels 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

MacVane, Kelly

From: Copeland, John (DGIF) <John.Copeland@dgif.virginia.gov>
Sent: Wednesday, November 1, 2017 5:14 AM
To: Kulpa, Sarah
Cc: Elizabeth B Parcell; Kittrell, Bill (DGIF); Copeland, John (DGIF); Watson, Brian (DGIF); Pinder, Mike (DGIF)
Subject: FW: Old AT section near Byllesby Dam
Attachments: NRSPresentation516.pdf; MAPTECH Historical Map - MaxMeadows30sw.jpg

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.

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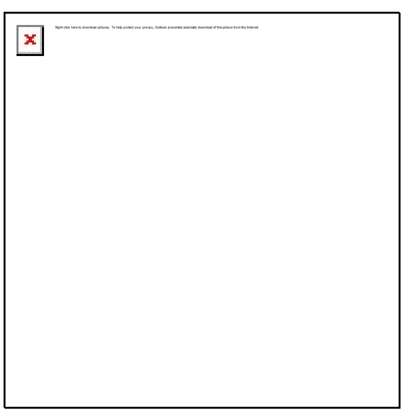
(304) 753-9904

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



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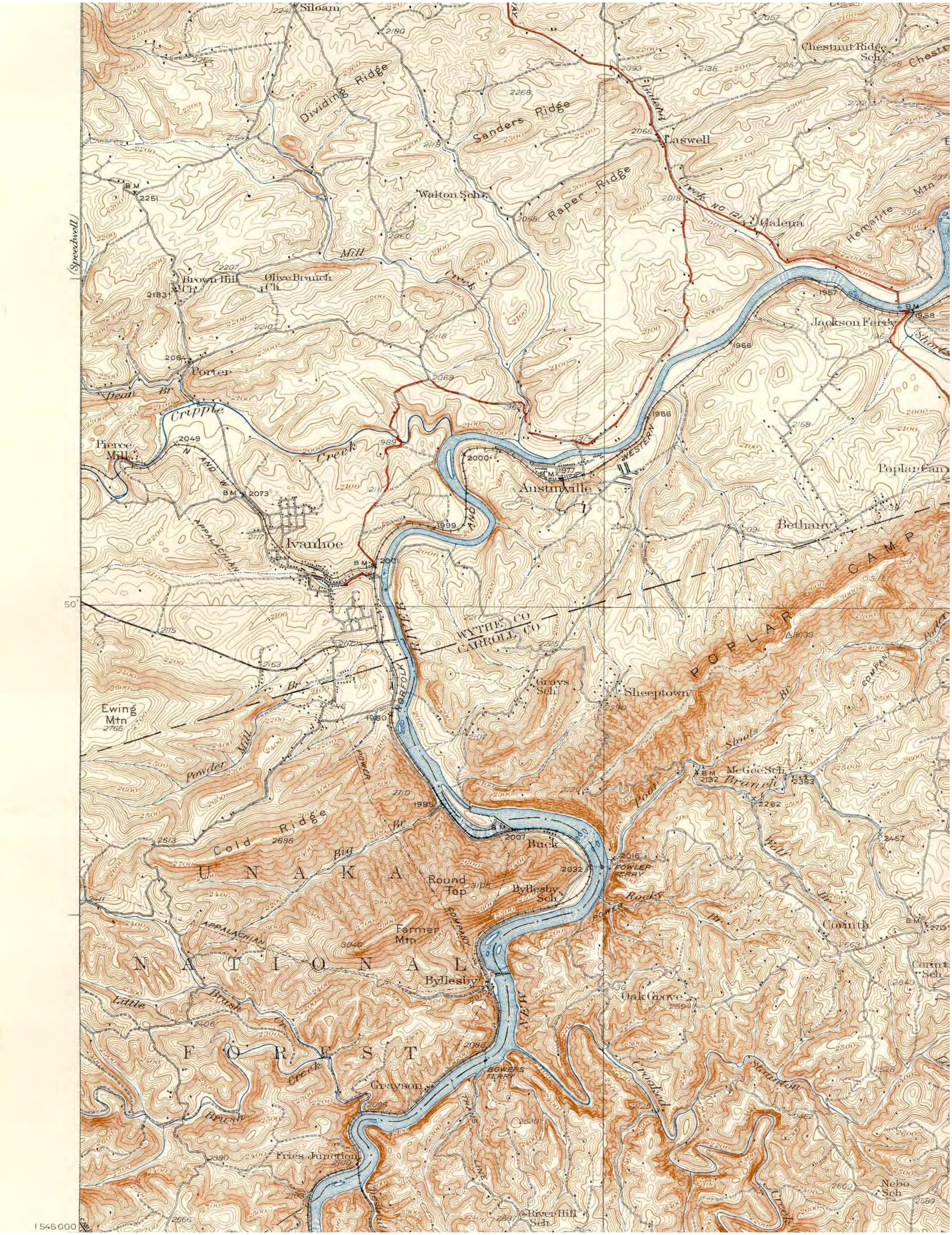
Advisor, New River Valley Chapter of the Virginia Master Naturalist Program


Siloam
Dividing Ridge
Sanders Ridge
Raper Ridge
Laswell
Chestnut Ridge Sch
Hematite Mtn
Galena
Walton Sch
(Speedwell)
Brown Hill Ch
Olive Branch Ch
Mill
Creek
Jackson Ferry
Porter
Dean Br
Cripple
Creek
Pierce Mill
N AND W
APPALACHIAN
Ivanhoe
Austinville
WESTERN
Poplar Cam
Bethany
POPLAR
CAMP
WYTHE CO
CARROLL CO
NORFOLK
Grays Sch
Sheeptown
Ewing Mtn
Powder
Mill
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McGee Sch
Branch
Cold Ridge
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FOWLER FERRY
Rocky
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Round Top
Byllesby Sch
Farmer Mtn
Corinth
N A T I O N A L
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NEW
Oak Grove
Little
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Creek
BOWERS FERRY
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Fries Junction
River Hill Sch
Nebo Sch
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The Old Appalachian Trail in the New River Valley
1931 - 1955

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

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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

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[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.

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[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

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[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]

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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

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[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

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[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
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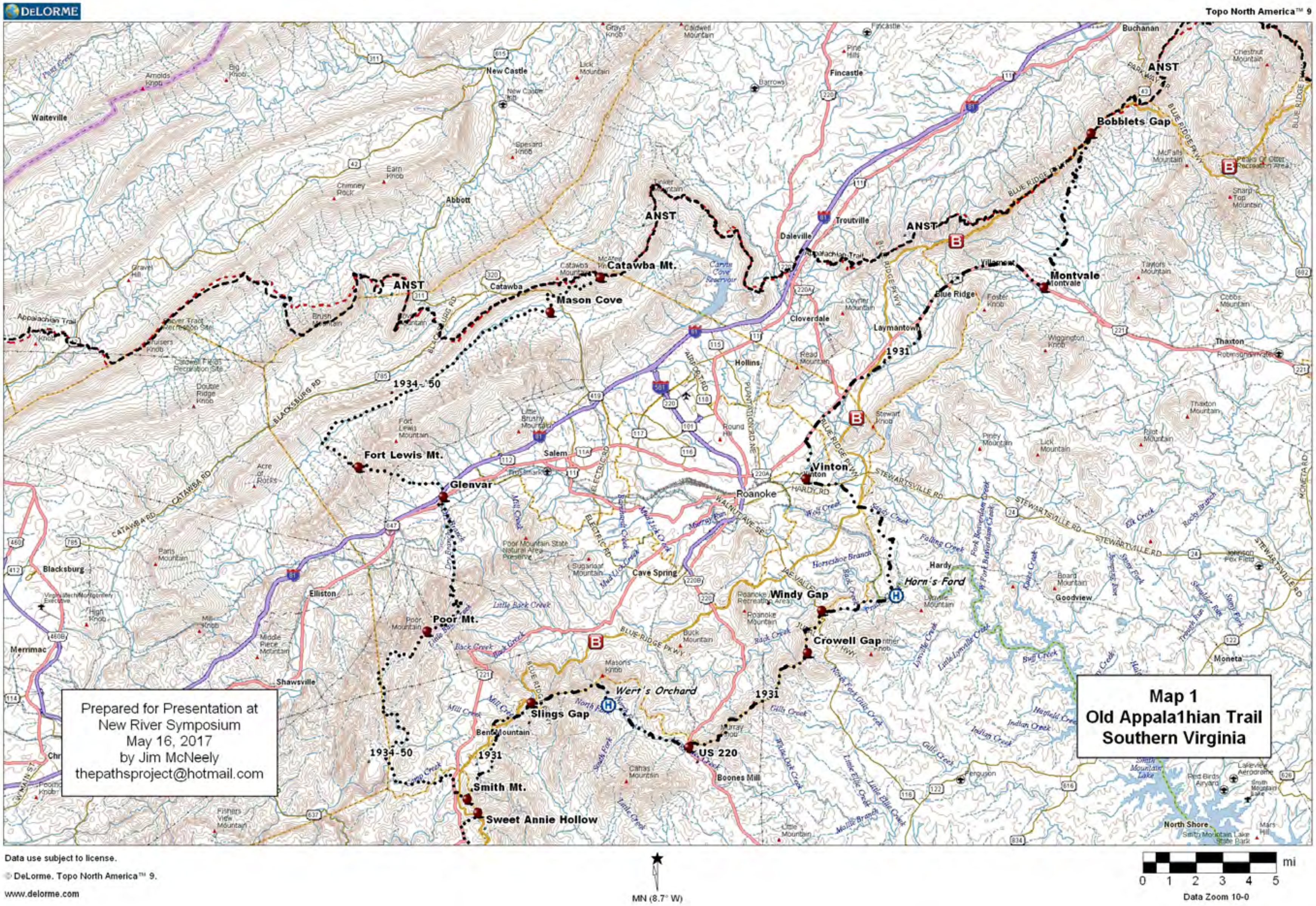
Peterstown, WV 24963
(304) 753-9904
thepathsproject@hotmail.com
May 16, 2017

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
Map 1
Old Appala1hian Trail
Southern Virginia
Prepared for Presentation at
New River Symposium
May 16, 2017
by Jim McNeely
thepathsproject@hotmail.com
ANST
Bobblets Gap
Montvale
Catawba Mt.
Mason Cove
1934-50
1931
Fort Lewis Mt.
Glenvar
Vinton
Roanoke
Salem
Windy Gap
Horn's Ford
Crowell Gap
Poor Mt.
Wert's Orchard
Slings Gap
US 220
Smith Mt.
Sweet Annie Hollow
Appalachian Trail
Blacksburg
Troutville
Daleville
Cloverdale
Hollins
Fincastle
New Castle
Catawba
Buchanan
Boones Mill
Shawsville
Elliston
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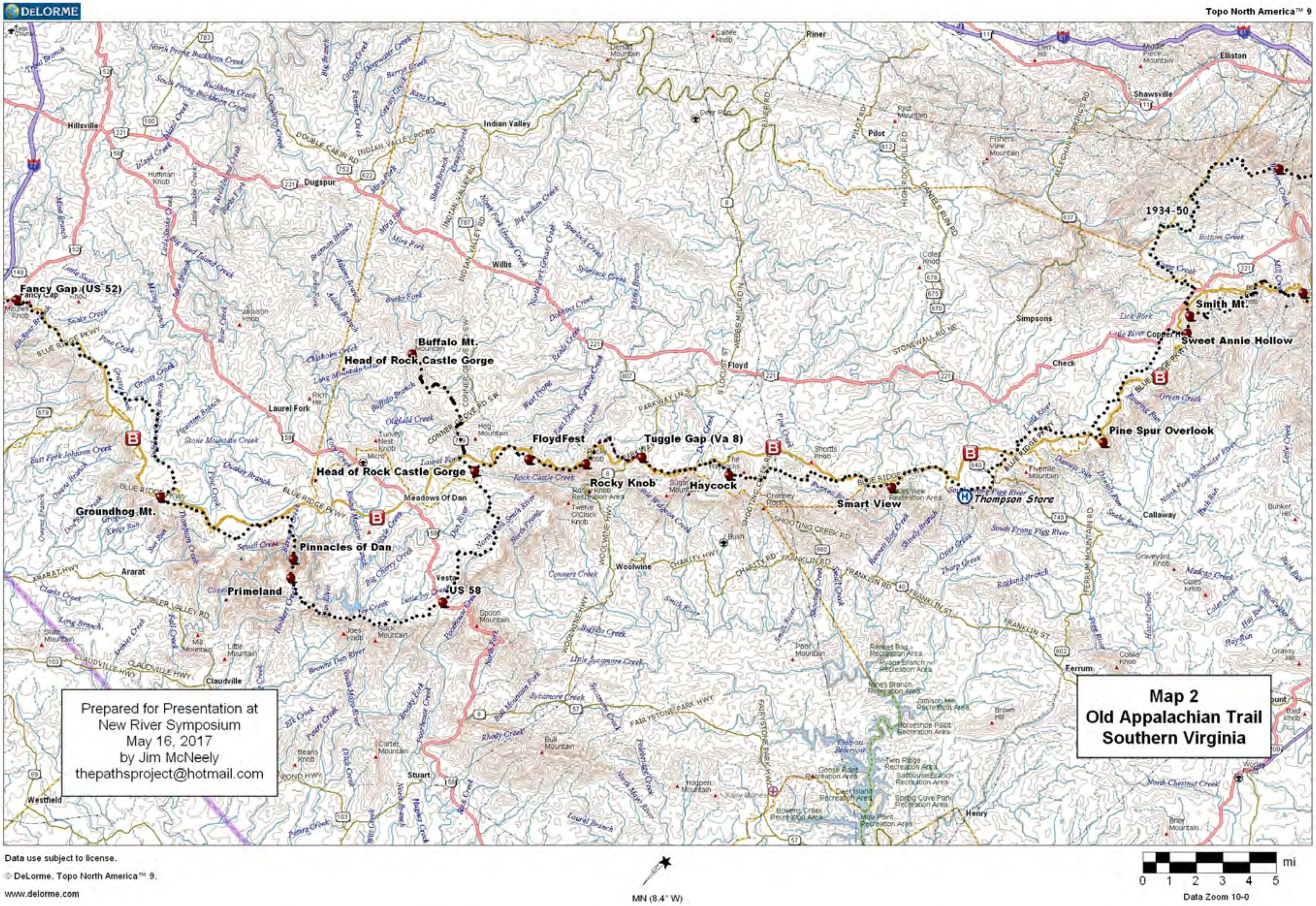
DELORME
Topo North America™ 9
Fancy Gap (US 52)
Buffalo Mt.
Head of Rock,Castle Gorge
Head of Rock Castle Gorge
FloydFest
Tuggle Gap (Va 8)
Rocky Knob
Haycock
Smart View
Thompson Store
Pine Spur Overlook
Sweet Annie Hollow
Smith Mt.
1934-50
Groundhog Mt.
Pinnacles of Dan
Primeland
US 58
Hillsville
Dugspur
Indian Valley
Willis
Floyd
Check
Simpsons
Riner
Pilot
Shawsville
Elliston
Laurel Fork
Meadows Of Dan
Ararat
Claudville
Stuart
Woolwine
Callaway
Ferrum
Westfield
Henry
BLUE RIDGE PKWY
Prepared for Presentation at
New River Symposium
May 16, 2017
by Jim McNeely
thepathsproject@hotmail.com
Map 2
Old Appalachian Trail
Southern Virginia
Data use subject to license.
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MN (8.4° W)
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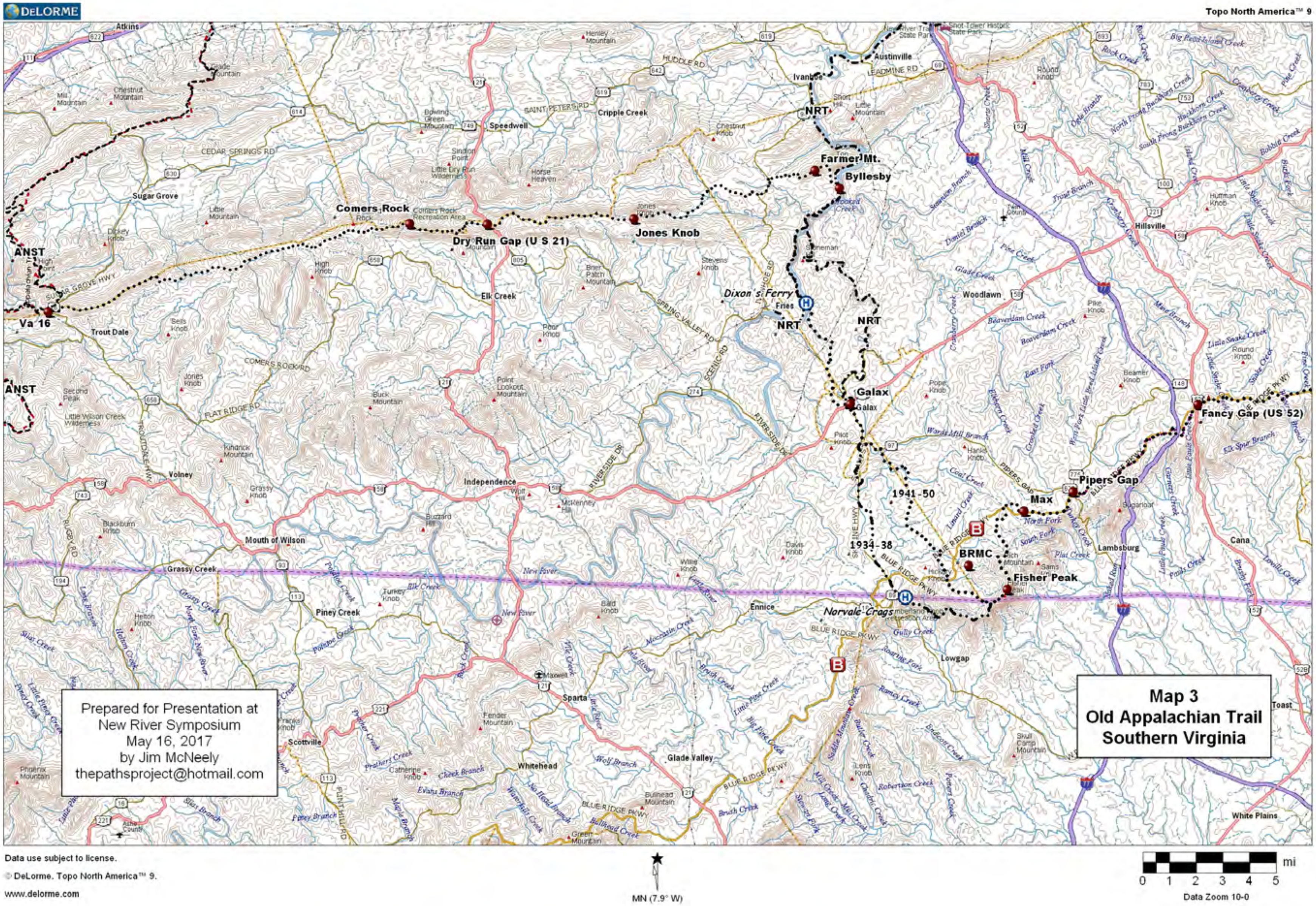
Data Zoom 10-0



DELORME
Topo North America™ 9
Map 3
Old Appalachian Trail
Southern Virginia
Prepared for Presentation at
New River Symposium
May 16, 2017
by Jim McNeely
thepathsproject@hotmail.com
Comers Rock
Dry Run Gap (U S 21)
Jones Knob
Farmer Mt.
Byllesby
Dixon's Ferry
NRT
Galax
Fancy Gap (US 52)
Pipers Gap
Max
BRMC
Fisher Peak
1941-50
1934-38
Norvale Crags
ANST
Va 16
Data use subject to license.
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MN (7.9° W)
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Data Zoom 10-0

MacVane, Kelly

From:	Kulpa, Sarah
Sent:	Thursday, December 21, 2017 12:39 PM
To:	MacVane, Kelly
Subject:	FW: Buck/Byllesby PAD information
Attachments:	New River Walleye Management Plan 2017 to 2022.pdf; Weberg et al. 2015 - SEN.pdf; Final_Dissertation.pdf

Sarah Kulpa
D 704.248.3620 **M** 315.415.8703

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From: Copeland, John (DGIF) [mailto:John.Copeland@dgif.virginia.gov]
Sent: Thursday, December 21, 2017 12:31 PM
To: Elizabeth B Parcell
Cc: Copeland, John (DGIF); Kittrell, Bill (DGIF); Kulpa, Sarah
Subject: RE: Buck/Byllesby PAD information

In response to your inquiry regarding materials for the Buck/Byllesby Reservoir PAD, I am sending what I can send in the context of my vacation time this week and during the next 2 weeks.

I will be back to work on January 8 if you need me to supply additional information then.

1. The Upper New River walleye management plan is attached.
2. A list of VDGIF recreational access issues (including Buck campground) discussed during a site visit to the Project in March 2017 are contained in the email below.
3. I will have to do some digging to find the muskie habitat data I mentioned that was collected by Joe Williams in the early 1990's. Summaries are likely contained in federal aid reports and in paper form in files in our office here in Blacksburg. I do not have time to do it until January. This data is basic information, like pool widths, lengths, and depths, and some qualitative description of muskie habitat features like woody debris. I am attaching a copy of Travis Brenden's dissertation from Virginia Tech. He spent a lot of time with Joe Williams sampling muskie upstream and downstream from Claytor Dam. He did some habitat delineation work too. You might find some relevant information on the sections around the Project.
4. I noted in earlier correspondence that some electrofishing data exists on Byllesby Reservoir collected by George Palmer in spring 2004, 2005, and 2009. I also do not have time to compile that data into spreadsheets until January.

One additional item I'm including here is an aquatic vegetation survey from Buck Dam to Claytor Lake that was published by a graduate student I worked with on Claytor Lake from 2011 to 2013. He went upstream to document the aquatic vegetation in the river as well.

I wish you all a great holiday season. We can talk again in the New Year!

VDGIF Recreational Access Issues Discussion from March 16, 2017
From: Copeland, John (DGIF)
Sent: Wednesday, April 05, 2017 08:44
To: Stinson, Betsy (DGIF); Bowling, Shannon (DGIF); Hampton, Tom (DGIF); Southwick, Ron (DGIF); Boyette, Benjamin (DGIF); Kittrell, Bill (DGIF)
Cc: Copeland, John (DGIF); Culbertson, Jason (DGIF)
Subject: DRAFT Minutes from Buck/Byllesby Road Trip - 16 March 2017

Since the New River is flooding, I can finally get these minutes out. If you see anything I missed, please drop me an email and I'll add those items to a final draft of this email.

Below are a few items I jotted down from our conversation after we warmed up at the China Wok after lunch:

1. Byllesby Pool Access Ramp Area (existing DGIF ramp)
    a. Making the parking lot hard surface would aid maintenance, improve handicapped access, and eliminate or at least limit destructive "donut driving".
    b. Parking at this access is limited, resulting in constituents leaving for other locations, so there is a need for a larger parking lot.
    c. Bank fishing enhancement of some kind is needed, but flooding conditions on a regular basis will require creativity on our part.
    d. Portajohns are needed.
    e. A dusk to dawn light would limit "unauthorized activities" at this location.

2. Byllesby Access (additional possibilities)
    a. Access could be facilitated at the dam near the existing gravel parking lot.
    b. There is a need for handicapped fishing access near the dam.
    c. There is a need for more clear signage around Byllesby Dam about where anglers can and cannot access areas to fish.

3. Other notes regarding the Byllesby Pool
    a. The existing wetland habitat is great.
    b. Bald eagle habitat and a bald eagle nesting survey will be needed.

4. Buck Dam
    a. The old U.S. Forest Service campground on the Buck Pool creates an opportunity for possible recreational access. **[Note: I discussed this topic last year with Rex Hill, retired CPO and current Carroll County Board of Supervisors member. He is very much interested in recreation being enhanced in this area, so he will support those efforts as a local government representative.]**
    b. Loafer's Rest Access (on River Right below Buck Dam) was created in cooperation with Appalachian Power Company to address trespass issues with anglers crossing their dam to get to the turbine tailrace for fishing. The lease on this access expires in 2023, so it will need to be an item addressed in relicensing.

5. Other issues needing clarification
    a. If waterfowl hunting opportunities are facilitated on Buck and Byllesby Reservoirs, we need clarification from Department of Conservation and Recreation State Parks about carrying guns on State Park property.

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

From: Elizabeth B Parcell [mailto:ebparcell@aep.com]
Sent: Friday, December 15, 2017 11:31 AM
To: Copeland, John (DGIF)
Subject: RE: Buck/Byllesby PAD information

John,

I can't remember your schedule for the remainder of the year. (Guess I need to start tracking you on my calendar- just kidding.) We would love to have the following documents if you get a chance.

.

1. Upper New River walleye management plan
2. List of VDGIF Recreational Access Issues (including Buck Campground)
3. Muskie habitat survey data

Liz

From: Copeland, John (DGIF) [mailto:John.Copeland@dgif.virginia.gov]
Sent: Wednesday, November 01, 2017 5:09 AM
To: Kulpa, Sarah
Cc: Elizabeth B Parcell; Kittrell, Bill (DGIF); Copeland, John (DGIF); Watson, Brian (DGIF); Pinder, Mike (DGIF)
Subject: [EXTERNAL] Buck/Byllesby PAD information

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

APPENDIX C

EXISTING PROJECT BOUNDARY (EXHIBIT G)

NOTES AND RESERVATIONS

1. Wherever, as an element of the Project Boundary, there appear the words "Approximate Location of Contour 2003.8", or "Approximate Location of Contour 2079.6", the meaning is that they are the surface levels of ponds having an elevation of 2003.8 feet at the Buck dam and an elevation of 2079.6 feet at the Byllesby dam, both of which are intended, or are believed to be intended, to be controlling.

2. The elevations shown hereon are based upon a bench mark, being a concrete monument east of Norfolk and Western Railway Company's right of way at Byllesby Station and west of west end of Appalachian's Byllesby dam across New River, which bench mark has an elevation of 2030.2285 feet and was based upon United States Geological Survey Bench Mark Elevation 2007.313 feet as it existed in 1932, being a bronze tablet stamped "K48-1926" in the south end of Appalachian's Buck dam across New River; said U.S.G.S. Bench Mark having undergone general adjustment through the medium of Southeastern Supplementary Adjustment of 1936 (U.S. G.S.) resulting in its having an elevation of 2007.232 feet. The last mentioned bench mark has since been destroyed.

3. In the cases of all parcels owned in fee by Appalachian Power Company, adjoining the project boundary and not to become part of the project area, there are reserved in favor of Appalachian Power Company, its successors and assigns, the right of access across any part of the adjoining portions of the project area to the waters of the reservoirs and/or of New River and the right to use said waters for domestic purposes, including the watering of livestock.

4. The project area is also subject to public utility easements and such other uses as are now being made or exist therein, if any.

5. All statements and interpretations as to ownership of lands and nature and extent of ownership of rights indicated on this exhibit are correct in the opinion of Appalachian Power Company but are not warranted.

6. From the project area and in favor of Appalachian Power Company, its successors and assigns, there are reserved the perpetual rights of way and easements for all power lines and related equipment, whether for transmission or distribution and whether or not now existing, which are necessary, useful or convenient for or in the business of said company, its successors or assigns, or may become so from time to time in the future. None of such power lines or equipment are or are to become part of the project works. The approximate locations of those of such power lines as now exist are shown on this exhibit.

The rights of way and easements so reserved comprise all rights, privileges and appurtenances in or to the project area, or any part thereof, requisite for the continuing full enjoyment of said rights of way and easements, including, but not restricted to, the continuing right to construct, reconstruct, relocate, augment, repair, maintain, patrol, inspect or otherwise operate the said power lines and equipment and the facilities comprising the same, including any poles, towers, wires and cables and any other fixtures or portions of said power lines or equipment or facilities, and including appurtenant communication lines; also the continuing right to cut and remove any trees, overhanging branches or other obstructions which may endanger the safety of or interfere with said power lines or equipment or any part thereof, in the course of construction or after the completion thereof; also the continuing right and privilege of removing, at any time, any or all of the said power lines or equipment or the facilities comprising part of any of said power lines or equipment. PROVIDED that if any of the said power lines or equipment or appurtenances thereto not now existing should substantially interfere with the operation of any of said project works, the said company covenants and agrees, for itself, its successors and assigns, forthwith to remove or relocate the same or to take such other steps as may be necessary to eliminate such interference.

7. There are included as part of the project perpetual rights of way and easements for the following power lines and equipment located outside but adjacent to the project boundary, at or in the vicinity of the Byllesby Hydro Plant, to-wit:

   (a) All or any portion of the generator 13.2 KV main power cables, conduits, manholes, etc., together with all small power and control cables, conduits, etc., for the control of the turbo generator units and hydro plant auxiliaries installed in or between the Transformer House and the Byllesby Hydro Plant;

   (b) The concrete cell structure located in said Transformer House including the 13.2 KV bus, the 13.2 KV ACB's disconnecting switches, power and control cables, etc., the 4 KV bus, 4 KV ACB's disconnecting switches, power and control cables, etc., installed therein.

   (c) All or any part of the switchboards together with all related relay and control equipment, control cables, conduits, etc. located in said Transformer House and used for control of the hydro plant equipment including the 35,000 KVA, 13.2/69 KV Transformer Bank No.1, the 88/34.5 KV Transformer Bank No. 2, the 88/69 KV Transformer Bank No. 3, and the 69 KV Capacitor Bank.

   (d) The 75 KVA, 4000/230/115 v. Transformer House Service Transformer Bank, the 75 KVA, 4000/230/115 v. Back-up Transformer House Service Transformer Bank, the 15 KVA 4000/230/115 v. Hydro Plant Lighting Transformer, and the power cables, conduits, etc., related thereto.

   (e) The 35,000 KVA, 13.2/69KV Transformer Bank No.1, the 69KV connection between the Transformer and the 69KV Bus, and all related support structures, switches, power and control cables, conduits, etc.

Which are necessary, useful or convenient for or in the operation of the project, or may become necessary from time to time in the future.

Said rights of way and easements shall comprise all rights, privileges and appurtenances in or to Appalachian Power Company's land adjoining the project area requisite for the continuing full enjoyment of said rights of way and easements, including, but not restricted to, the continuing right to construct, reconstruct, relocate, augment, repair, maintain, patrol, inspect and otherwise operate the said power lines and equipment and the facilities comprising the same, including any poles, towers, wires and cables and any other fixtures or portions of said power lines or equipment; also the continuing right to cut and remove any trees, overhanging branches or other obstructions which may endanger the safety of or interfere with said power lines or equipment or any part thereof, whether in the course of construction or after the completion thereof; also the continuing right and privilege of removing, at any time, any or all of the said power lines or equipment or the facilities comprising part of any of said power lines or equipment. PROVIDED, that if any of the said power lines or equipment or appurtenances thereto not now existing should substantially interfere with Appalachian Power Company's operations on said land, the then owner of these rights of way and easements, covenants and agrees by the acceptance of such rights of way and easements, to remove or relocate the same or to take such other steps as may be necessary to eliminate such interference.

8. Parcel No. 1 - The project is subject to the reservations set forth in the deed from The Bertha Mineral Company to New River Power Company, dated June 1, 1911, which are the right of way for a road along or near Big Branch on either or both sides thereof for the use of The Bertha Mineral Company, its successors and assigns, and the right to discharge water from mining operations conducted by it, its successors, assigns, and lessees on the easterly side of New River or on land situated to the east of New River, into said river at a point below the lower end of Mountain or Bent Island.

9. Parcel No. 3, Tracts No. 1, 2, 3, 4, 5, 6 and Parcels No. 22 and 27 – It is believed that rights to overflow these lands accrued to project owner by prescription.

10. Parcels No. 4 and 28 - The consideration paid for the fee in these parcels include full compensation for any effect whatsoever which the construction, operation and maintenance of the Buck and Byllesby dams and power houses and the raising or diverting of the waters of New River may have on the adjoining lands.

11. Parcel No. 13, Tracts Nos. 3 and 4 - These tracts are subject to an exception of the minerals in 5 acres at the mouth of Chestnut Creek with mining privileges and rights of way for wagon roads or railways which appeared in the deed from G.W. Kernodle et ux.

12. Parcel No. 14 - This parcel is subject to an exception of the minerals with mineral rights and privileges which appeared in the deed from Creed Felts et ux.

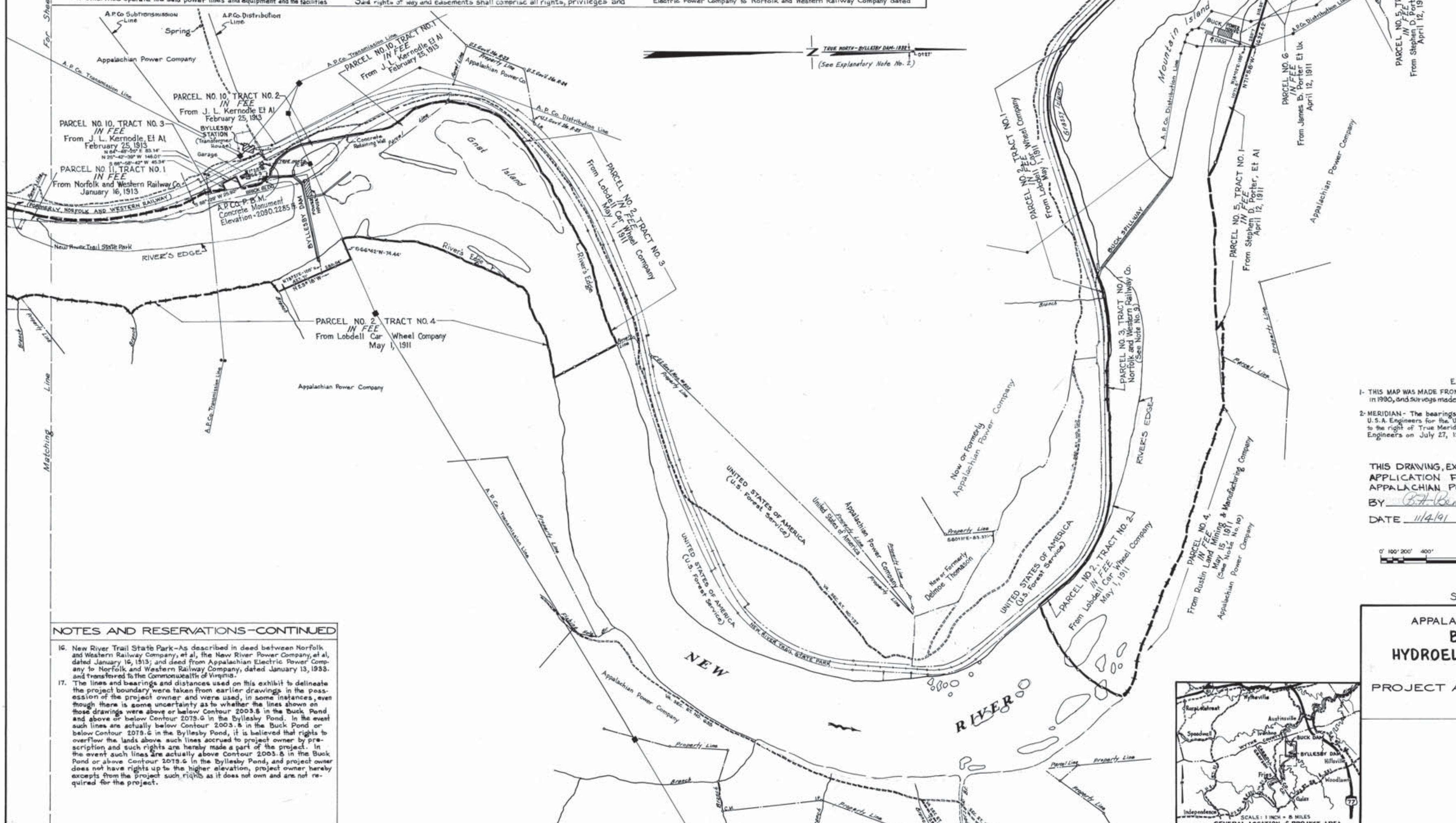
13. Parcels Nos. 16 and 33 and Parcel No. 32, Tracts Nos. 1 and 2 - These parcels were acquired in fee and were then sold by the deed from Appalachian Electric Power Company to Norfolk and Western Railway Company dated January 13, 1933, but the project is the beneficiary of that certain reservation set forth therein reading as follows:

   "All appurtenant riparian and/or water rights in and to New River and Chestnut Creek and the waters thereof; also the appurtenant beds of New River and Chestnut Creek and/or any rights of the grantor in and to such beds; also the right to overflow and/or affect so much of the said four parcels, including any embankments constructed thereon by the grantee, as may be overflowed and/or affected in any way by the dam and reservoir of the grantor located at and upstream from Byllesby, Virginia."

14. Parcel No. 20, Tracts No. 1 and 3 - The flowage rights acquired give the company the right to back water on any of the lands of the grantor by a dam or dams to be constructed in New River, of any height that may be desired.

15. Parcel No. 26, Tracts No. 1 and 2, and Parcel No. 21 - The flowage rights acquired give the company the right to erect in New River in Carroll County any dam or dams, at such point or points, and of such height, as it may deem advisable, and back the waters of said river and its tributaries over and upon these lands without any claim for damages resulting therefrom or that may be suffered by reason of the construction, operation and maintenance of such dams or any of them or the works of the company to be constructed and operated in connection therewith; and the sums paid to the land owners were accepted in full discharge and satisfaction of all compensation they may be entitled to by reason of such construction, operation and maintenance of said dams or works whether such damages result from the raising of or diverting said waters in whole or in part, or otherwise.

NOTES AND RESERVATIONS CONTINUED BELOW



LEGEND

	PROJECT BOUNDARY, INCLUDING THE APPROXIMATION OF ANY CONTOUR WHICH CONSTITUTES SUCH BOUNDARY.
	PROJECT BOUNDARY, BEING AN APPROXIMATION OF CONTOUR 2003.8 (BUCK DAM RESERVOIR) OR CONTOUR 2079.6 (BYLLESBY DAM RESERVOIR), CROSSING FEE LANDS OF APPALACHIAN POWER CO.
	PROJECT BOUNDARY, BEING AN APPROXIMATION OF CONTOUR 2003.8 (BUCK DAM RESERVOIR) OR CONTOUR 2079.6 (BYLLESBY DAM RESERVOIR), LIMITING SOME BUT NOT ALL PROJECT RIGHTS.
	PROJECT BOUNDARY, BEING AN APPROXIMATION OF CONTOUR 2003.8 (BUCK DAM RESERVOIR) OR CONTOUR 2079.6 (BYLLESBY DAM RESERVOIR) CROSSING LANDS OVER WHICH FLOWAGE RIGHTS ACCRUED BY VIRTUE OF PRESCRIPTION.
	ELECTRIC POWER LINES OF A.P.CO
	PARCEL LINES
	PROPERTY LINES
C.M. I.P.	CONCRETE MONUMENT OR IRON PIN
A.P.CO. P.B.M.	A.P.CO. PERMANENT BENCH MARK
	VIRGINIA SECONDARY HIGHWAY

EXPLANATORY NOTES

1- THIS MAP WAS MADE FROM surveys and mapping prepared for Appalachian Power Company in 1990, and surveys made in 1932 and updated as necessary.

2- MERIDIAN - The bearings shown on this map are based on the meridian used by U.S.A. Engineers for the Unaka National Forest Reserve Survey which varies 0°27 min. to the right of True Meridian as established from Polaris (Eastern Elongation) by A.P.Co. Engineers on July 27, 1932 at 11:30 P.M.

THIS DRAWING, EXHIBIT G, IS PART OF THE APPLICATION FOR LICENSE MADE BY APPALACHIAN POWER COMPANY.

BY B.H. Bennett

DATE 11/4/91

SCALE OF FEET

0' 100' 200' 400' 800' 1200' 1600' 2000' 2400'

EXHIBIT G

SHEET 1 OF 2 SHEETS REVISION No. 1 6/97

APPALACHIAN POWER COMPANY

BYLLESBY / BUCK

HYDROELECTRIC PROJECT NO. 2514

VIRGINIA

PROJECT AREA AND BOUNDARY MAP

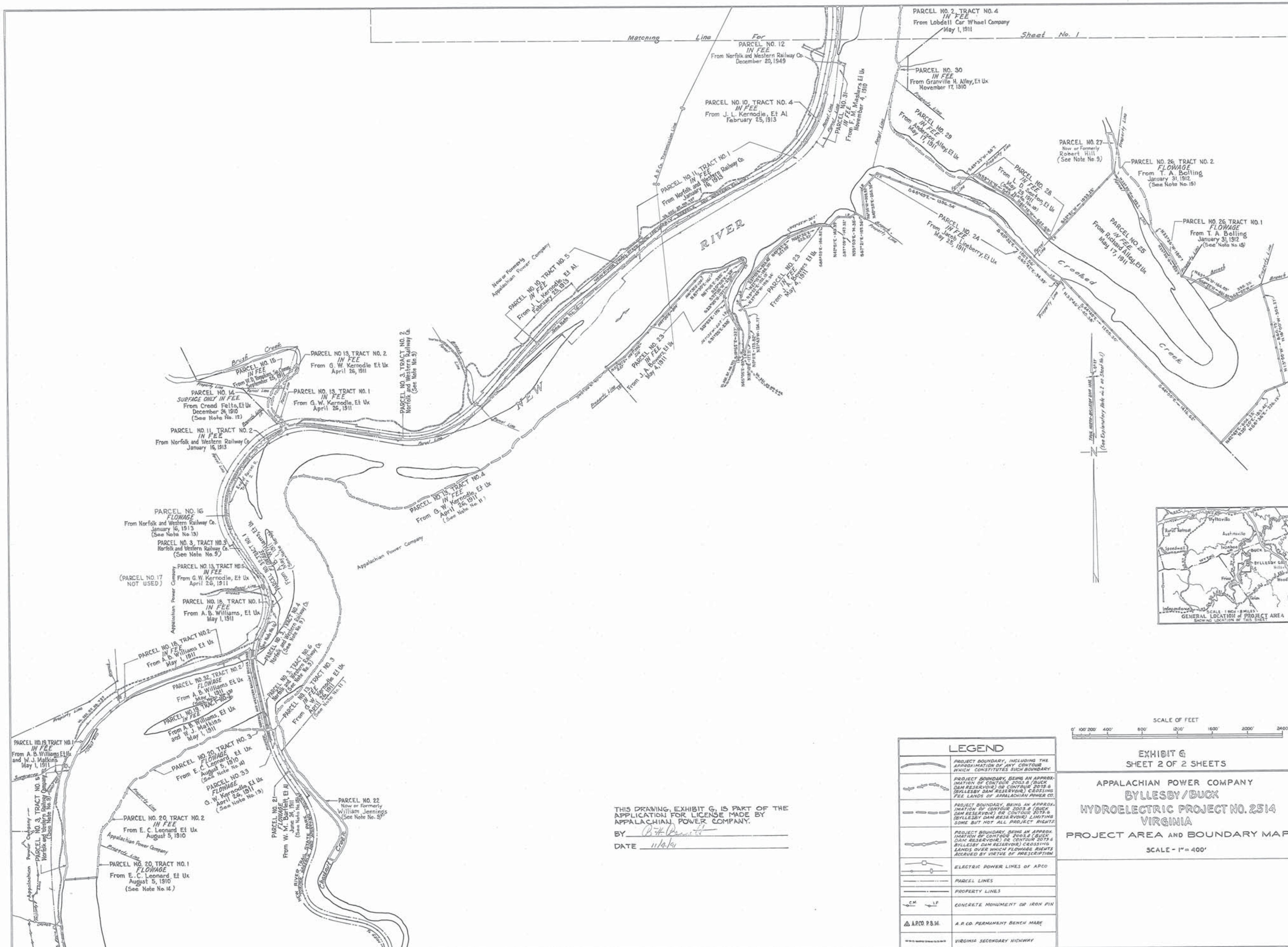
SCALE - 1" = 400'

NOTES AND RESERVATIONS—CONTINUED

16. New River Trail State Park—As described in deed between Norfolk and Western Railway Company, et al, the New River Power Company, et al, dated January 16, 1913; and deed from Appalachian Electric Power Company to Norfolk and Western Railway Company, dated January 13, 1933. and transferred to the Commonwealth of Virginia.

17. The lines and bearings and distances used on this exhibit to delineate the project boundary were taken from earlier drawings in the possession of the project owner and were used, in some instances, even though there is some uncertainty as to whether the lines shown on those drawings were above or below Contour 2003.8 in the Buck Pond and above or below Contour 2079.6 in the Byllesby Pond. In the event such lines are actually below Contour 2003.8 in the Buck Pond or below Contour 2079.6 in the Byllesby Pond, it is believed that rights to overflow the lands above such lines accrued to project owner by prescription and such rights are hereby made a part of the project. In the event such lines are actually above Contour 2003.8 in the Buck Pond or above Contour 2079.6 in the Byllesby Pond, and project owner does not have rights up to the higher elevation, project owner hereby excepts from the project such rights as it does not own and are not required for the project.

FERC No. 2514-003 -17



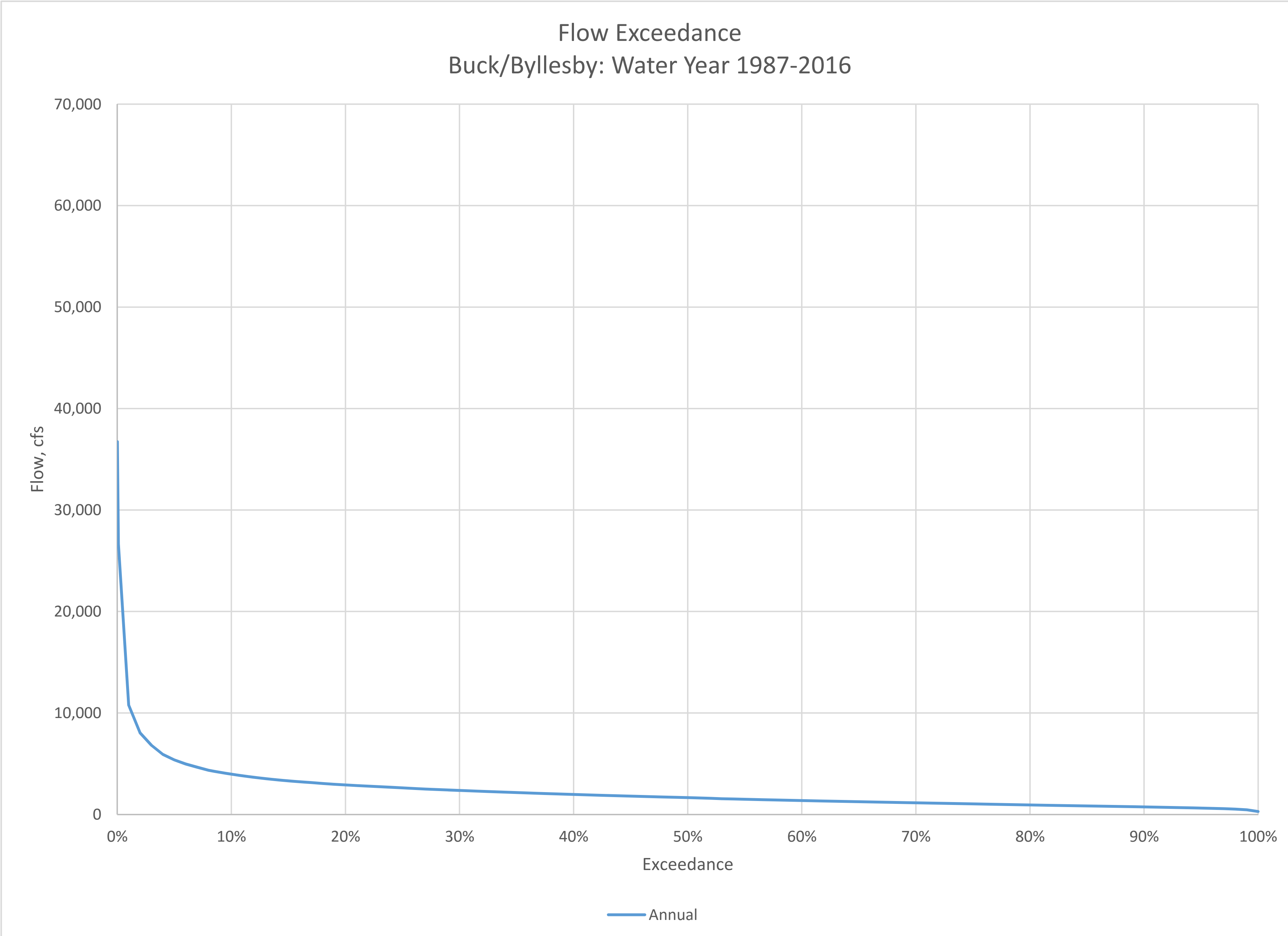
FERC No. 2514-003 – 15

APPENDIX D

SINGLE-LINE ELECTRICAL DIAGRAM AND EXISTING EXHIBIT F PROJECT DRAWINGS (CEII)

APPENDIX E

FLOW DURATION CURVES



Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
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Flow, cfs
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70%
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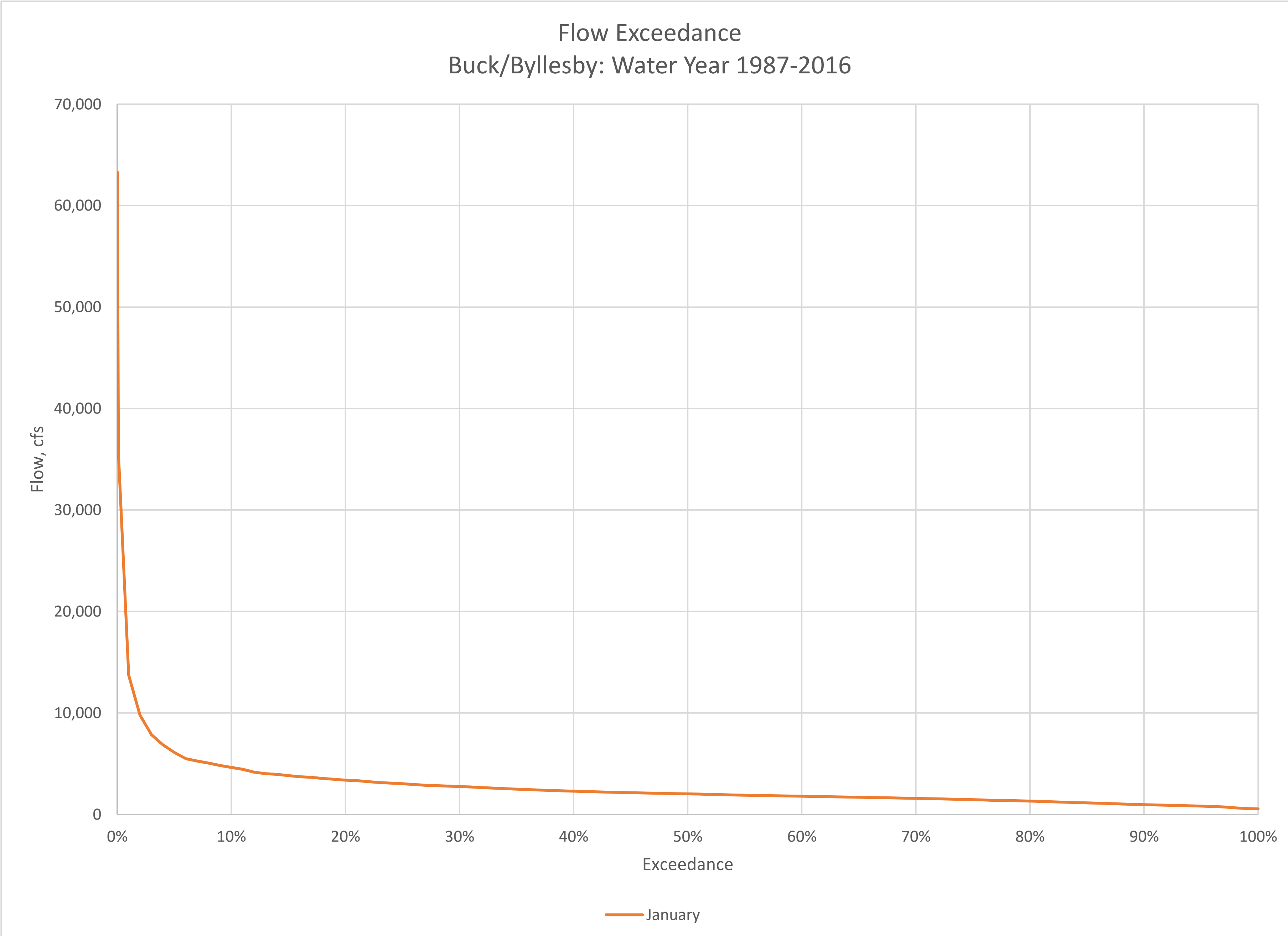
90%
100%
Exceedance
Annual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50%
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70%
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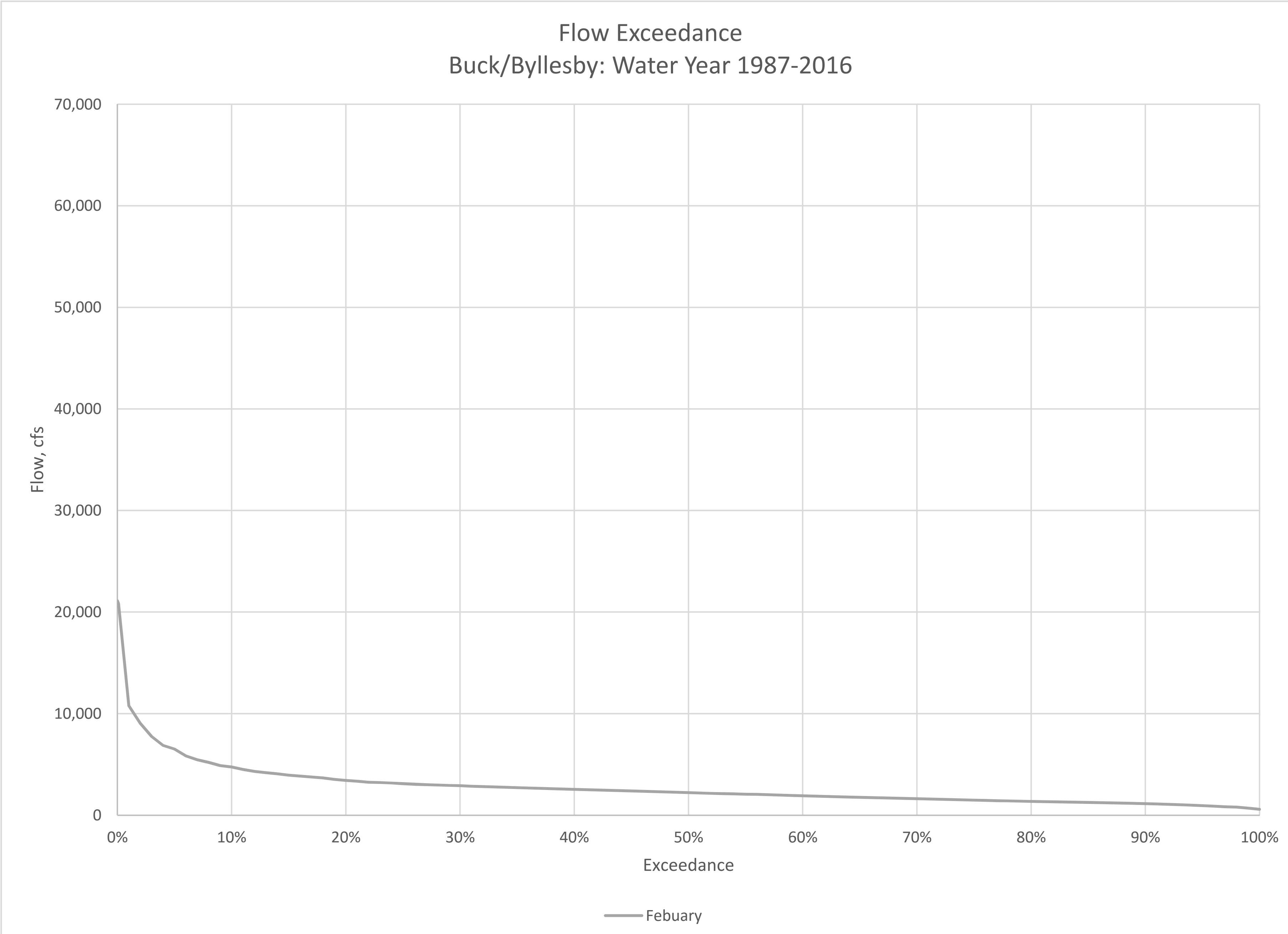
100%
Exceedance
January


Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
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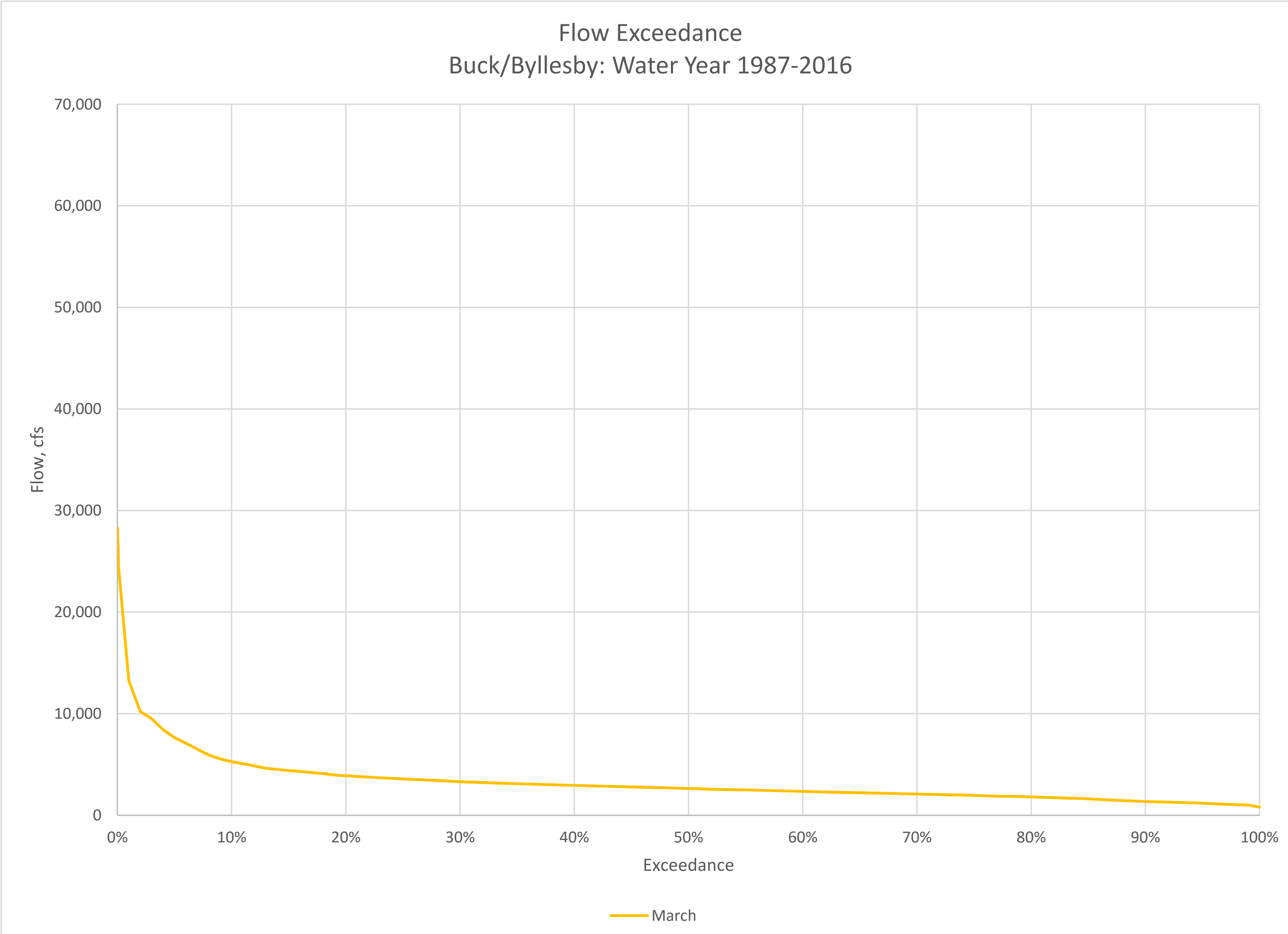
Exceedance
Febuary


Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
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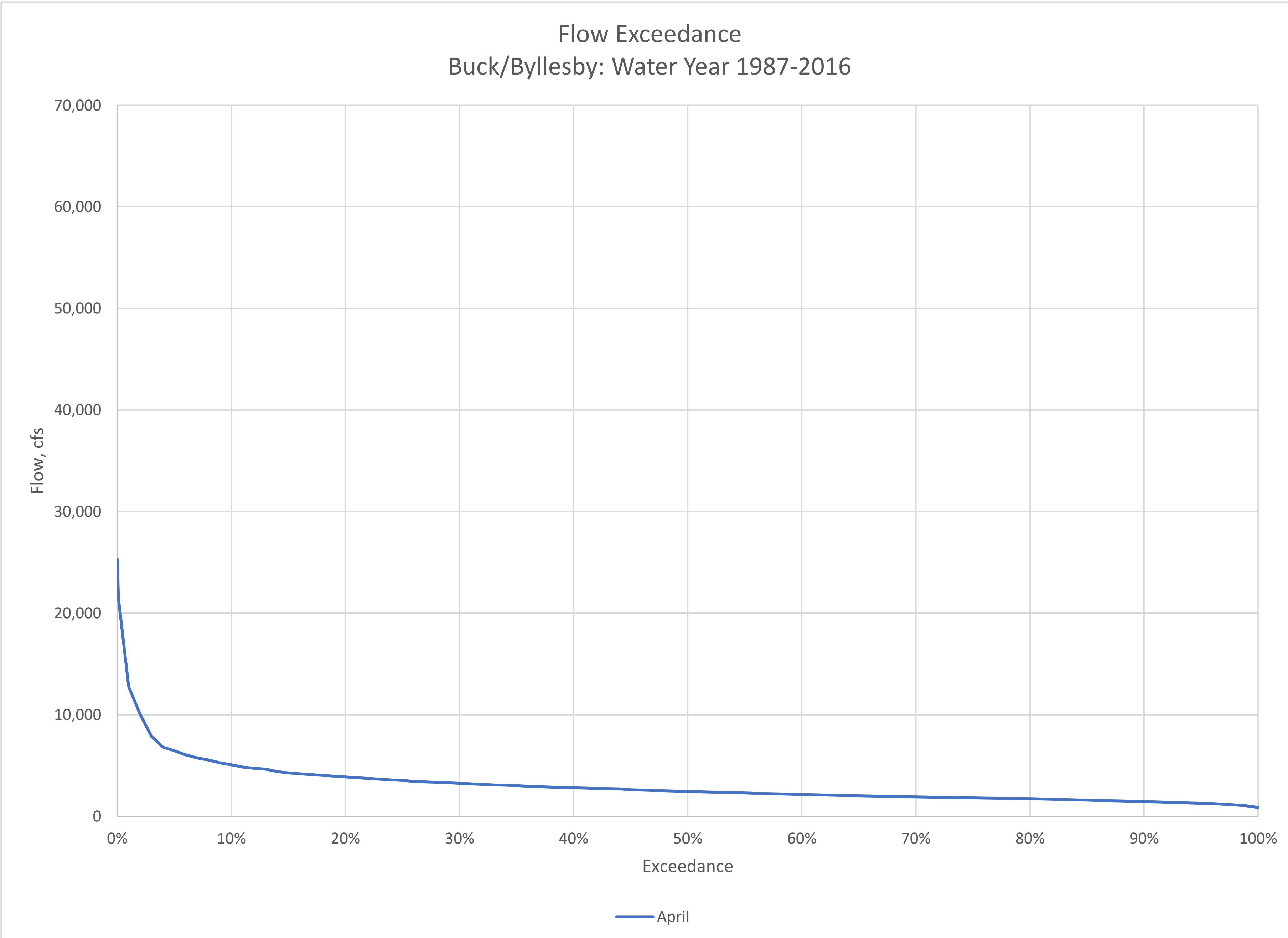
Exceedance
March



Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
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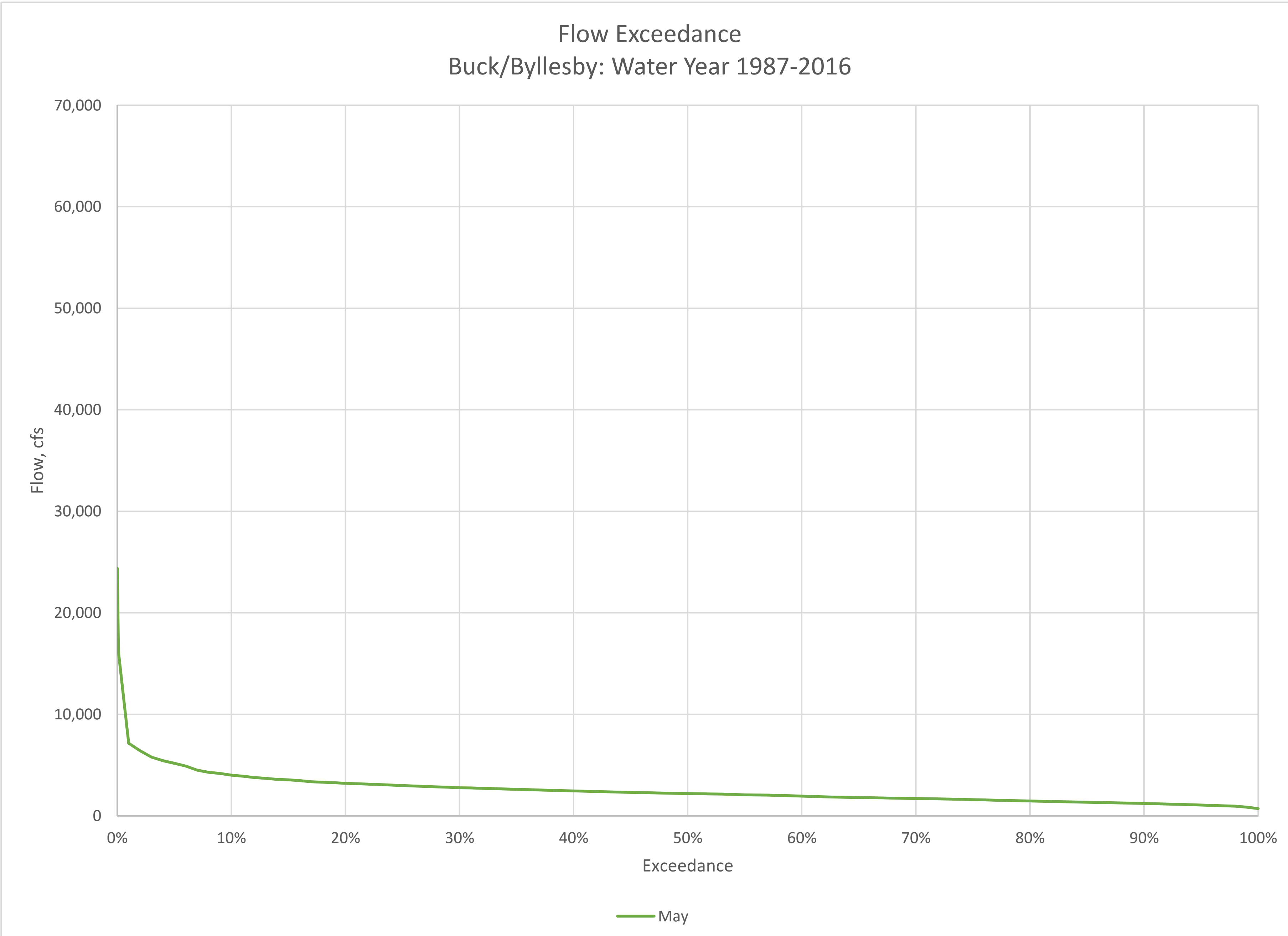
Exceedance
April



Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
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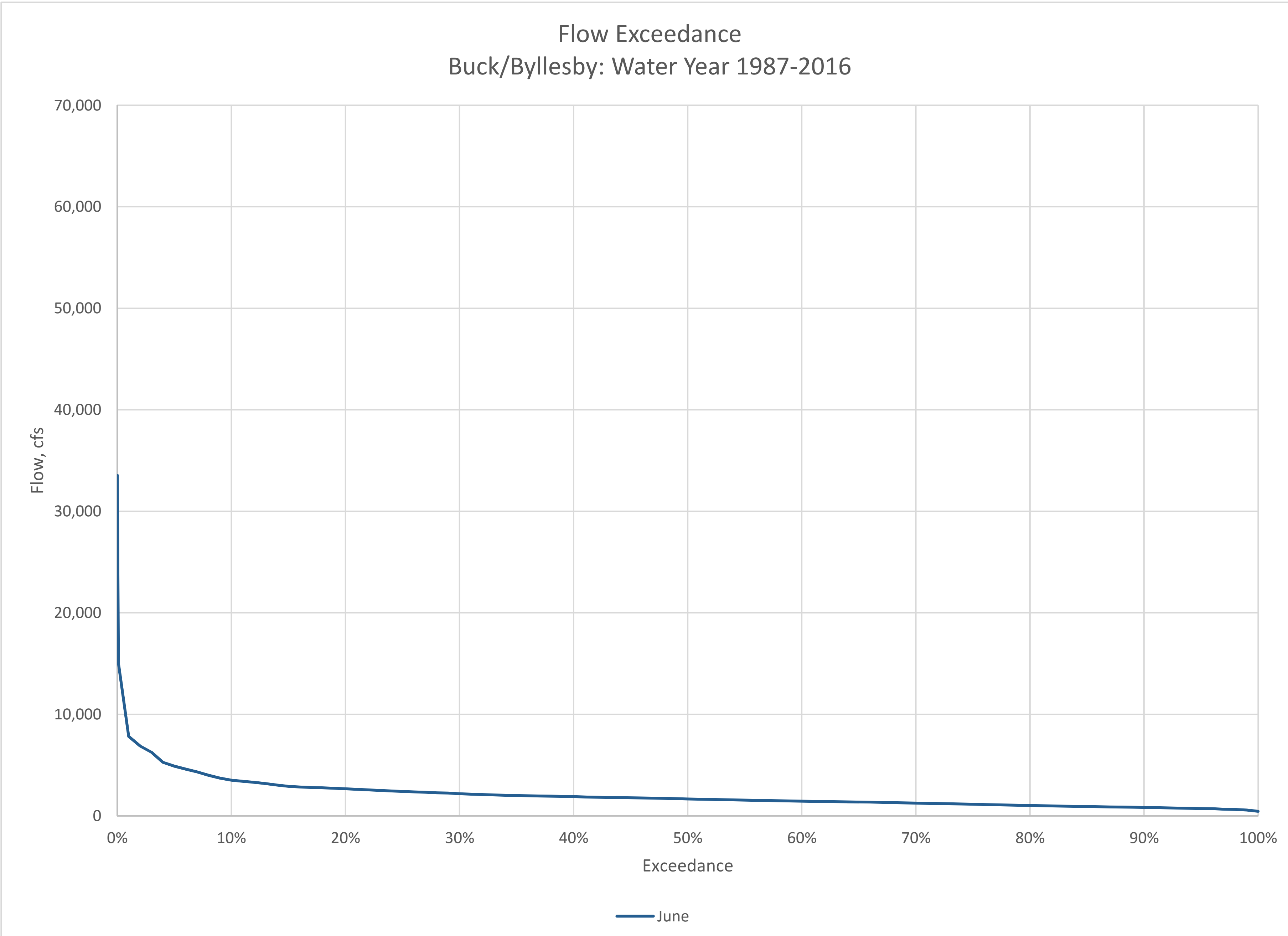
Exceedance
May


Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
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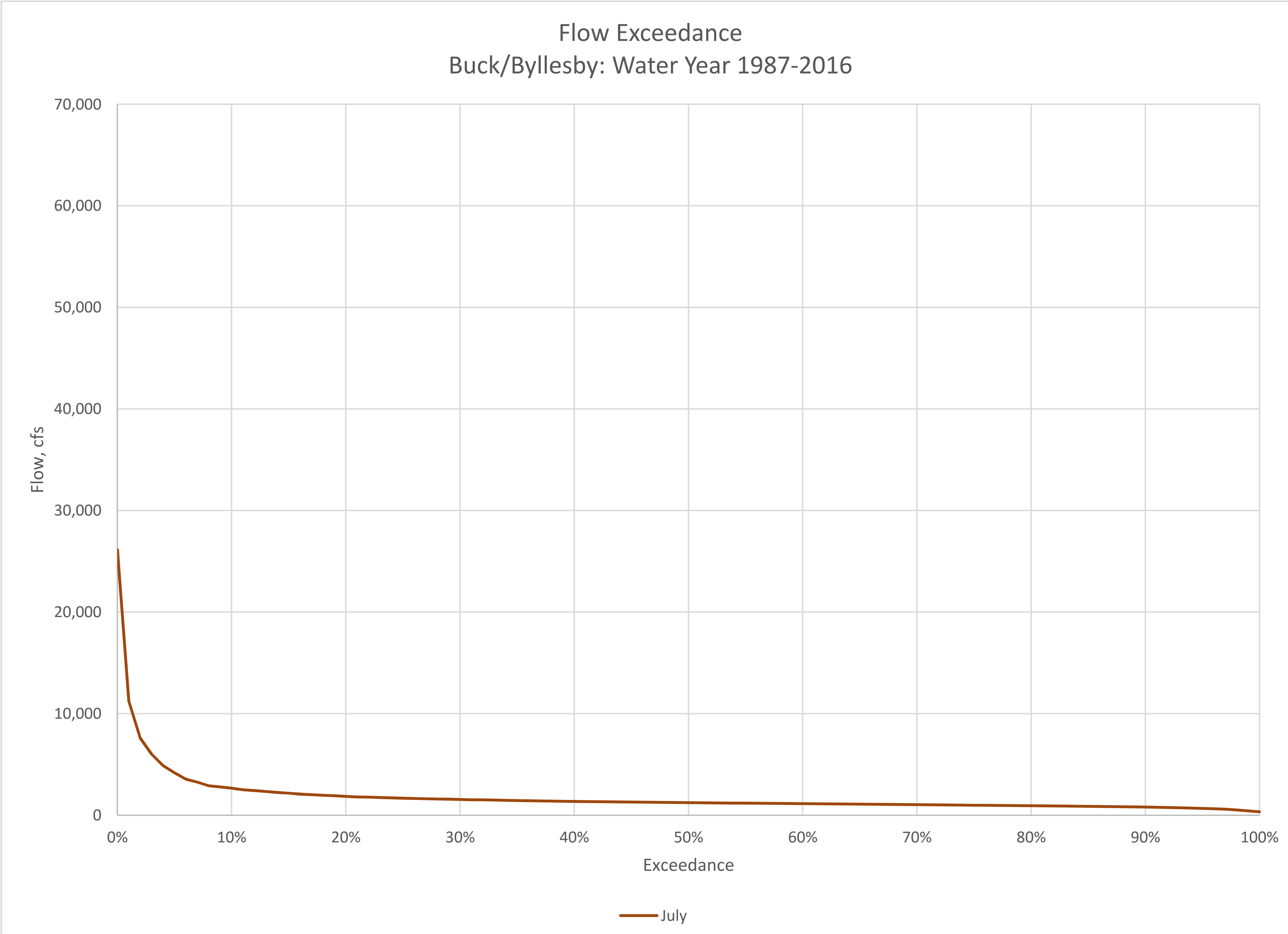
Exceedance
June


Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
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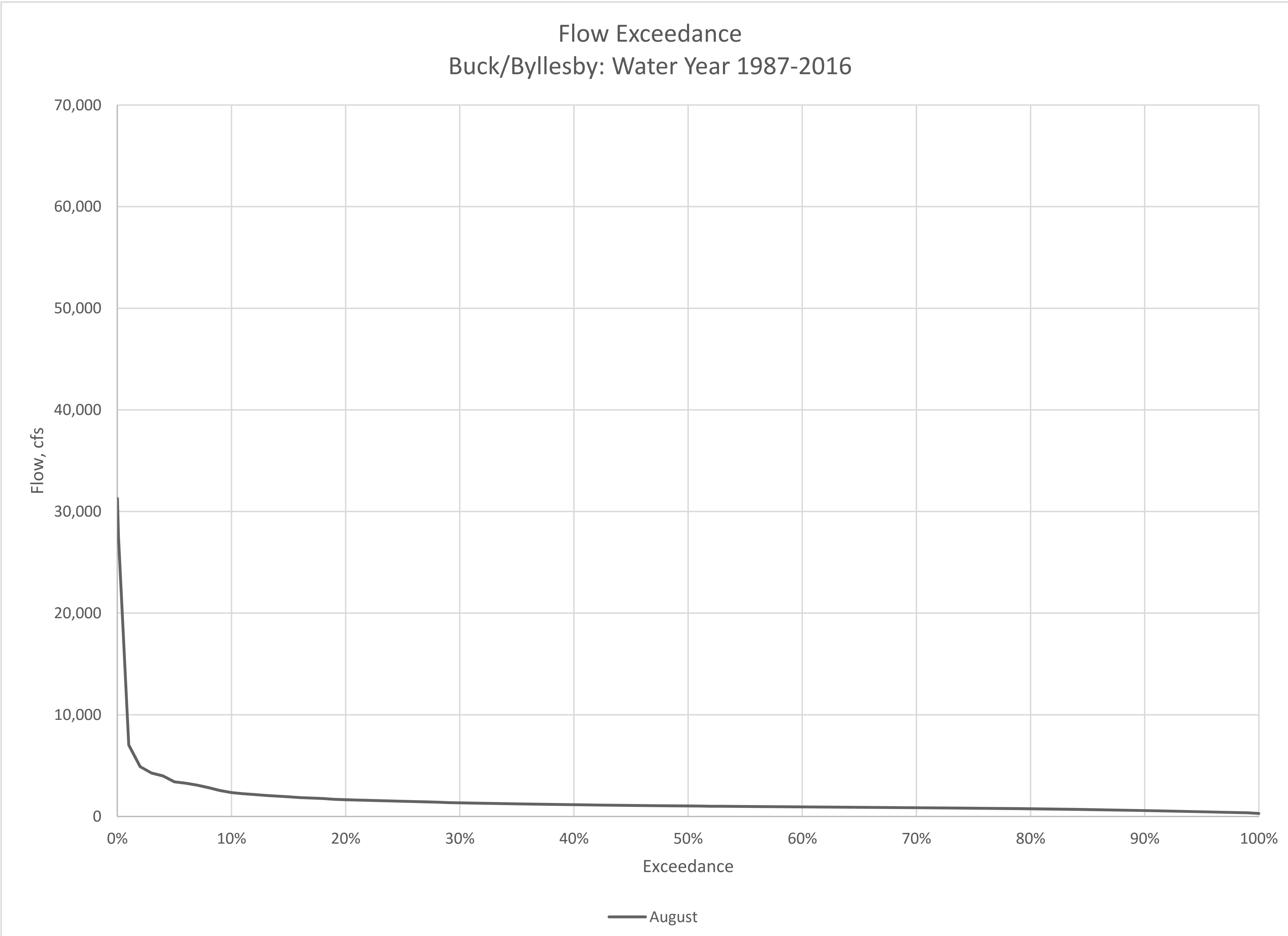
Exceedance
July


Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
70,000
60,000
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Flow, cfs
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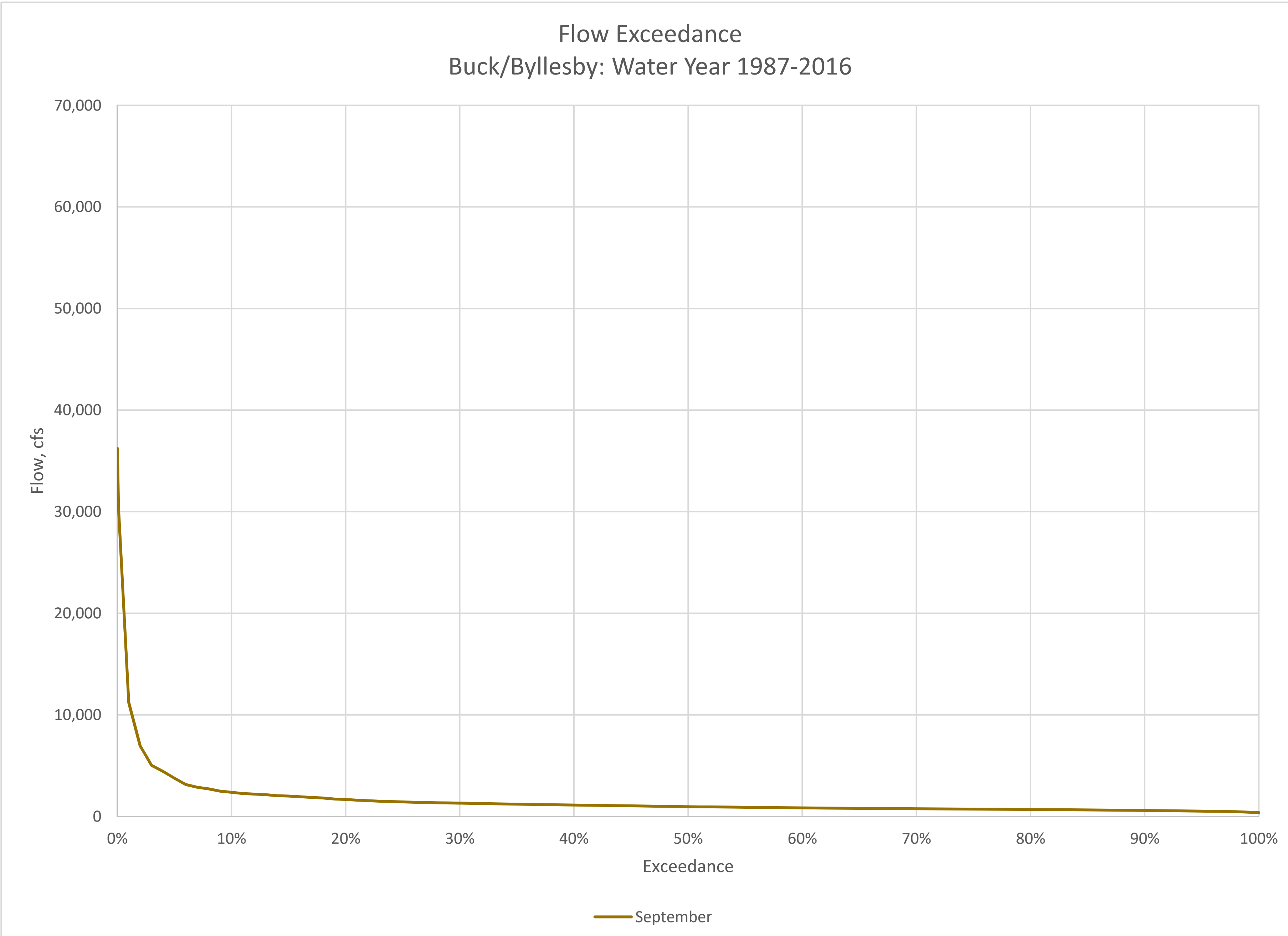
Exceedance
August


Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
70,000
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10,000
0
Flow, cfs
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20%
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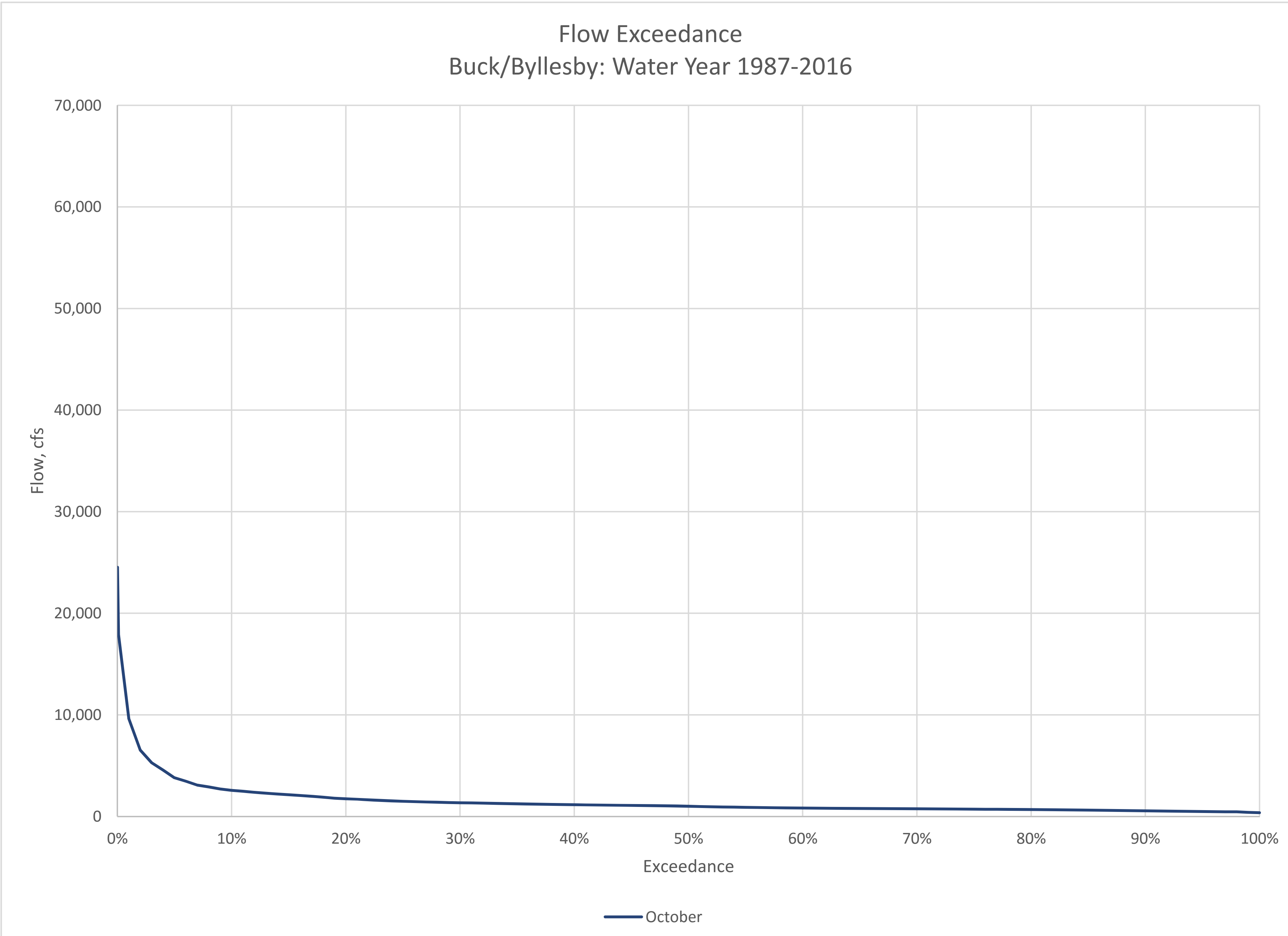
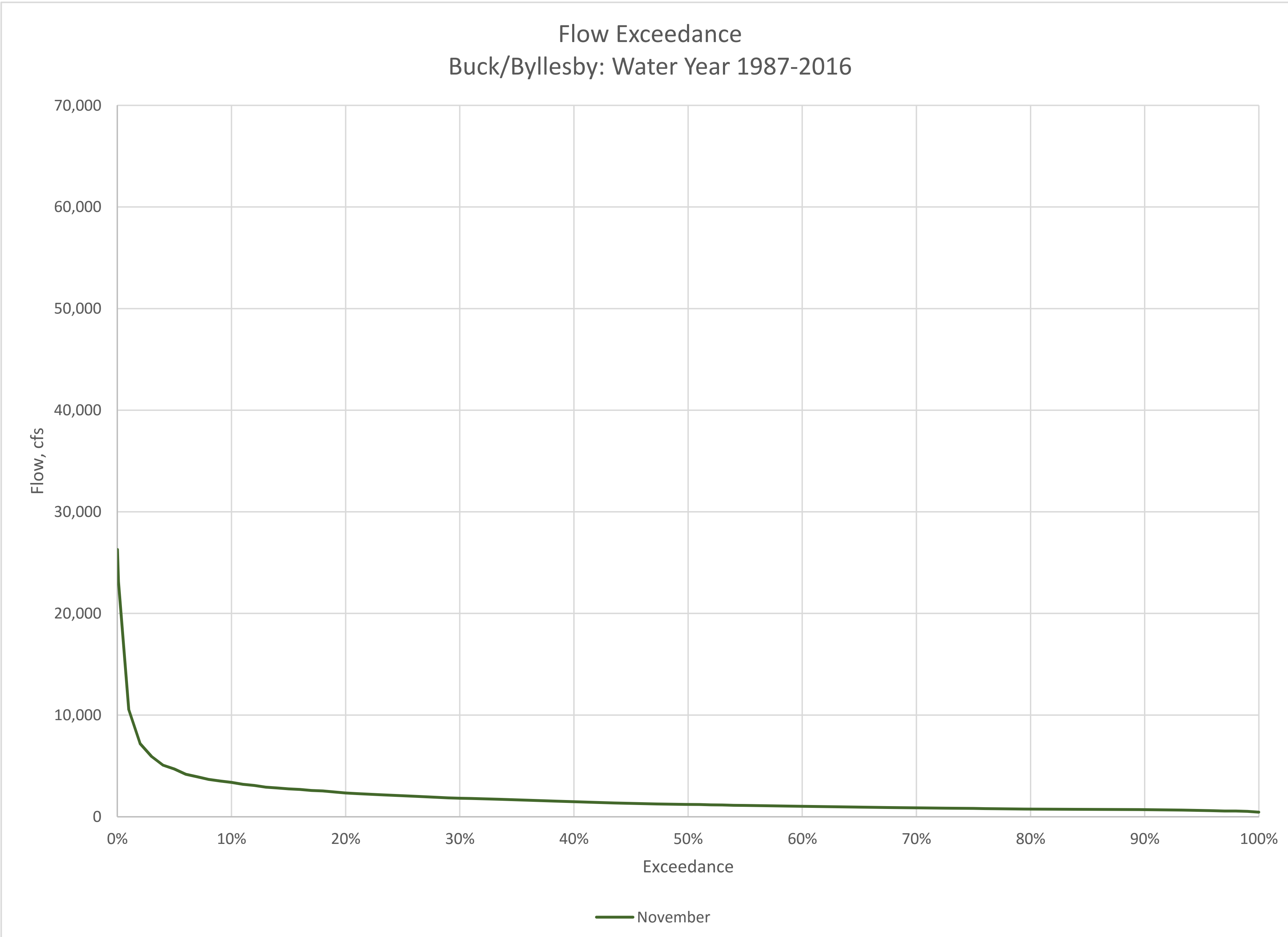
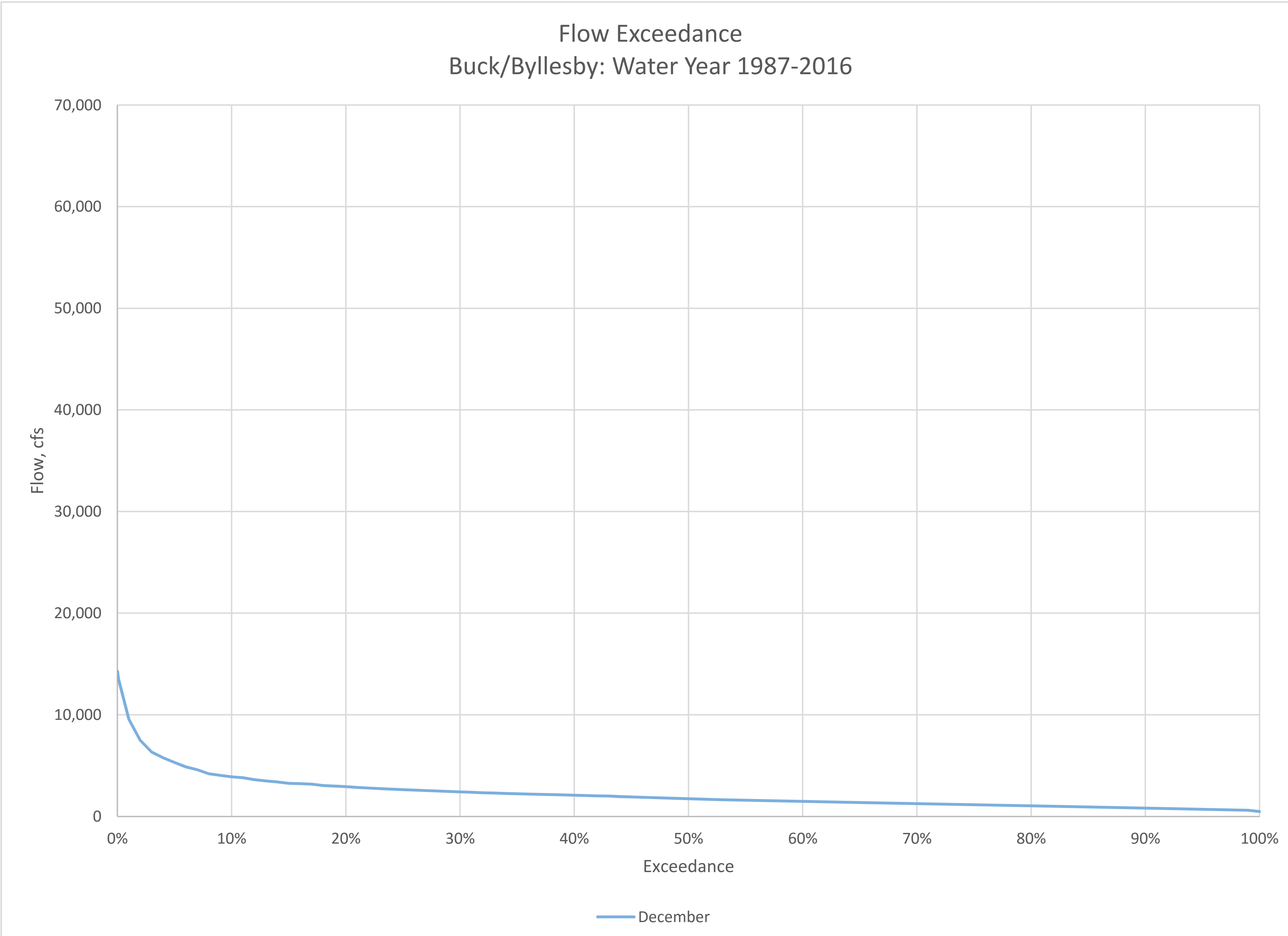
60%
70%
80%
90%
100%
Exceedance
September



Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Flow, cfs
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance
October


Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Flow, cfs
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance
November


Flow Exceedance
Buck/Byllesby: Water Year 1987-2016
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Flow, cfs
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Exceedance
December

APPENDIX F

FISHERIES INFORMATION FROM PRIOR LICENSE

THE STATUS OF FISH POPULATIONS IN THE VICINITY OF BYLLESBY/BUCK HYDROELECTRIC PROJECT

Appalachian Power Company
40 Franklin Road, S.W.
Roanoke, VA 24011

and

American Electric Power Service Corporation
1 Riverside Plaza
Columbus, OH 43215

April 10, 1991

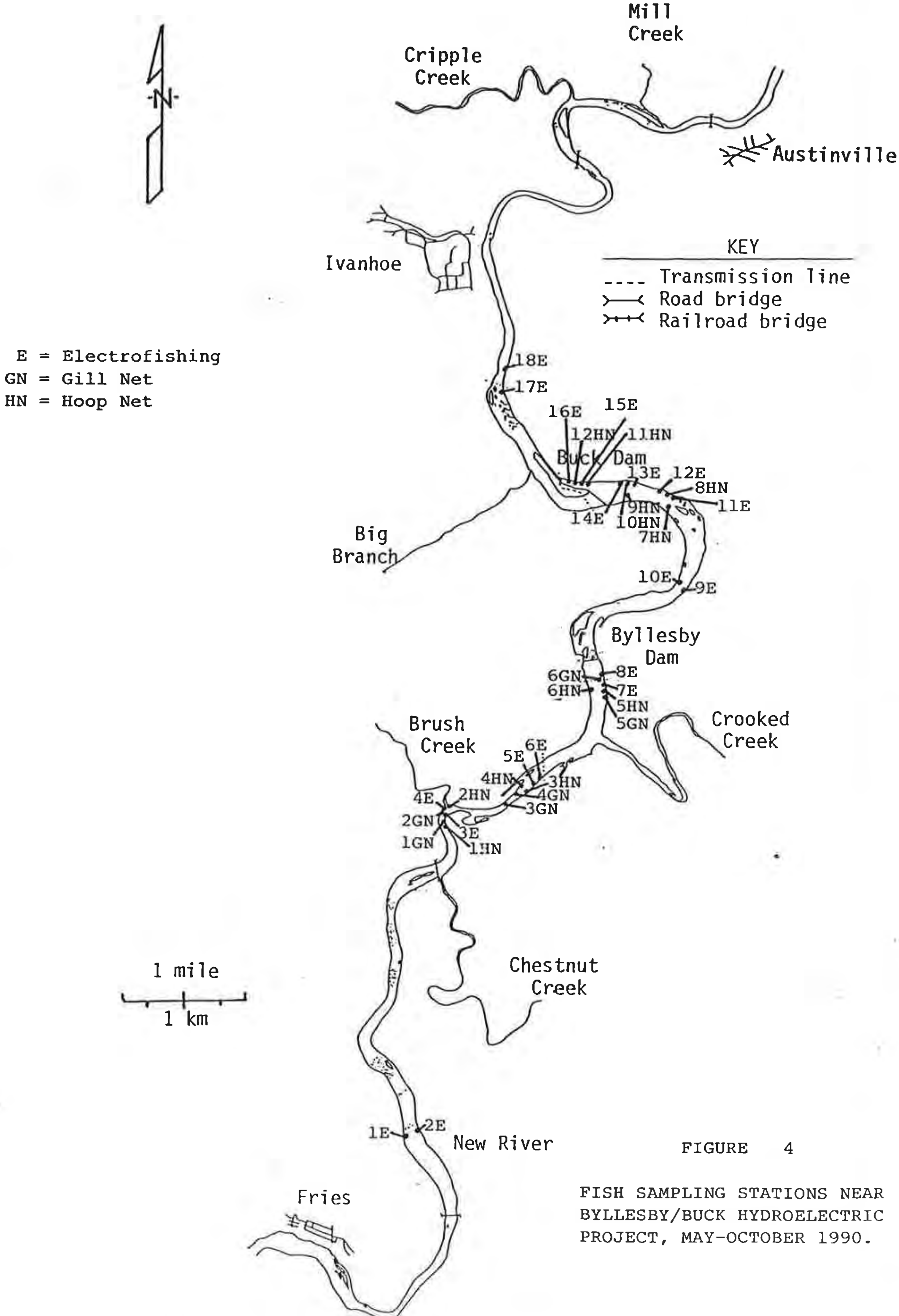


FIGURE 4

FISH SAMPLING STATIONS NEAR BYLLESBY/BUCK HYDROELECTRIC PROJECT, MAY-OCTOBER 1990.

Table 1. Descriptions of Byllesby/Buck fish sampling stations on the New River, June - October 1990.

Method/Station Electrofishing	Description	Depth (m)
1	some overhanging bank vegetation; sand/pebble substrate with some woody structure along bank	0.5-1.0
2	little to no bank vegetation overhanging water; sand/cobble substrate with some boulder structure and heavy aquatic macrophyte presence, very little woody debris	0.6-1.0
3	no overhanging vegetation; steeply sloping bank; bedrock/cobble substrate with some woody structure	2.0
4	gently sloping bank, which is undercut and grassy, providing overhanging cover; silt substrate and no woody or rocky structure	1.0
5	vertical rock bank; little to no overhanging brush or trees; vertical rock wall meets boulder/silt substrate with little woody debris	2.0-3.0
6	bank is vertical rock cliff with little to no overhanging vegetation; silty substrate slopes gently and sampling depth averages 1.0 m for first half of transect, in second half vertical rock wall extends into water to meet boulder/silt substrate at 3 m depth; no woody structure	1.0-3.0
7	steep, rocky bank with some overhanging vegetation; moderately steeply sloping substrate of boulder/cobble/silt and considerable rocky structure	1.5-2.0
8	steep, rocky bank; little to no overhanging vegetation; moderately steep sloping substrate of boulder/cobble/silt; considerable rocky structure present	1.5-2.0
9	some overhanging brush and trees; bedrock substrate with sandy pockets, boulders with artificial structure in the form of a boat and submerged car body	1.0
10	considerable overhanging brush and trees; sand substrate with some woody debris along bank	0.6-1.0
11	steep, rocky bank with little overhanging vegetation; cobble/boulder substrate with considerable rocky structure	1.5

Table 1 (continued)

Method/Station	Description	Depth(m)
Electrofishing		
12	steep and rocky bank; some overhanging trees present; cobble/boulder substrate with considerable rocky structure	1.5
13	steep, rocky bank with moderate amount of over-hanging vegetation; cobble/boulder substrate with rocky structure and some woody debris	2.0
14	steep and rocky bank; moderate amount of overhanging vegetation; cobble/boulder substrate with rocky structure	2.0
15	steep, rocky bank with little overhanging vegetation; cobble/boulder substrate with considerably rocky structure and little woody debris	2.0
16	steep, rocky bank; little overhanging vegetation; cobble/boulder substrate with considerable rocky structure, little woody debris	2.0
17	little overhanging vegetation; substrate mainly cobble/boulder, no woody debris	0.5-0.75
18	considerable overhanging vegetation; substrate mainly sand with some boulders, very little woody debris	1.0
Gill Nets		
1	set diagonally in mid-channel, with the upstream end approximately 25 m off east bank and net angling downstream across lake; flat, silt bottom	3.5-5.0
2	set approximatley 100 m downsteram from Station 1 at a reverse angle (from upstream-west downstream toward east); flat, silt bottom	3.5-5.0
3	set diagonally in mid-channel, with upstream end approximately 20 m off west bank and net angling downstream toward east; gently sloping silt substrate	3.5-9.0
4	set parallel to Station 3 approximately 100 m downstream; same bottom type	3.5-9.0
5	set diagonal to flow with upstream end approximately 40 m off east bank and net angling downstream toward mid-channel; flat silty bottom	4.0

Table 1 (continued)

Method/Station	Description	Depth(m)
Gill Nets		
6	set parallel to Station 5 approximately 150 m downstream; same bottom type	4.0
Hoop Nets		
1	set 8 m off east bank on a gradual slope; silt substrate	2.0-3.5
2	set 5 m off west bank on flat bottom near mouth of Brush Creek; cobble/boulder substrate	2.0-3.5
3	set 5 m off east bank; gently sloping cobble/boulder substrate	3.0-3.5
4	set 10 m off west bank; flat and silty substrate	2.0-3.5
5	set 4 m off rocky east bank; boulders and rock ledges present	4.0
6	set approximately 40 m off west bank on very gradual-sloping silt bottom	2.0-4.0
7	set approximately 40 m off southwest bank on a silt flat	3.0
8	set 5 m off northeast bank on a fairly steeply sloping bottom; cobble/boulder substrate with considerable rocky structure	3.0
9	set approximately 50 m off southwest bank on a silt flat	3.0-3.5
10	set 5 m off northeast bank on a fairly steeply sloping bottom of cobble/boulder/rocky ledge	3.0
11	set 5 m off northeast bank; bottom steeply sloping; cobble/boulder/rock ledge substrate	2.5-3.0
12	set 5 m off northeast bank 50 m downstream of Station 11; bottom steeply sloping, cobble/boulder/rock ledge substrate	2.5-3.0

Table 4. Number of each fish species collected on each survey near the Byllesby/Buck Hydroelectric Project, New River, May - October 1990.

Species	May	June	July	August	September	October
Muskellunge	0	1	0	1	1	4
Stoneroller	0	0	0	0	1	0
Common Carp	16	12	17	8	14	9
Bluehead Chub	0	0	3	9	0	4
Bigmouth Chub	0	0	0	6	1	7
Golden Shiner	0	0	0	6	5	0
White Shiner	0	0	1	0	16	12
Spottail Shiner	0	0	2	10	8	0
Silver Shiner	0	0	1	0	0	6
Rosyface Shiner	0	0	23	44	59	41
New River Shiner	2	0	1	19	1	0
Spotfin Shiner	7	15	30	13	36	22
Mimic Shiner	3	1	0	13	0	0
Shiner Species	0	9	0	0	0	0
Bluntnose Minnow	5	10	4	4	0	0
White Sucker	0	0	3	14	5	4
Northern Hog Sucker	8	3	7	22	33	23
Silver Redhorse	1	0	0	0	0	0
Redhorse Species	0	1	0	0	0	0
Channel Catfish	35	21	51	12	7	15
Flathead Catfish	17	10	12	17	8	13
Rock Bass	75	71	55	35	48	68
Redbreast Sunfish	49	47	28	43	34	36
Pumpkinseed	0	1	0	2	0	2
Bluegill	9	12	1	4	5	4
Hybrid Sunfish	2	1	0	0	0	0
Smallmouth Bass	67	58	120	106	127	128
Spotted Bass	46	27	55	116	117	99
Largemouth Bass	0	0	0	0	0	2
Black Crappie	0	0	0	0	2	1
Greenside Darter	2	0	0	1	2	0
Johnny Darter	0	0	0	4	0	2
Yellow Perch	0	1	0	0	0	0
Logperch	6	5	0	12	19	29
Appalachia Darter	0	0	0	5	0	0
Sharpnose Darter	0	0	0	0	0	1
Sculpin	0	1	0	0	0	1
Total No.	350	307	414	526	549	533
No. of Species	16	18	18	25	22	24

Table 6. Mean catch per unit effort (CPUE) for electrofishing (number of fish) near the Byllesby/Buck Hydroelectric Project, New River, May - October 1990. For species with significantly different catches among locations (identified by asterisks) CPUE values followed by the same letter are not significantly different (P>0.10).

	Electrofishing CPUE (No./Minute)									
Species	Riffle/Run Upstream	Byllesby Upper Pool	Byllesby Middle Pool	Byllesby Lower Pool	Riffle/Run Between Dams	Buck Upper Pool	Buck Middle Pool	Buck Lower Pool	Riffle/Run Downstream	P-Value**
Stoneroller	0	0	0	0	0	0	0	0	0.02	0.42
Common Carp*	0A	0.02A	0.02A	0.04A	0.02A	0A	0.04A	0.01A	0.17B	0.02
Bluehead Chub*	0.13B	0A	0A	0A	0.02AB	0A	0A	0.04AB	0.04AB	0.09
Bigmouth Chub	0.13	0	0	0	0	0.08	0	0	0.02	0.18
Golden Shiner	0	0	0	0	0	0.02	0.07	0.11	0	0.99
White Shiner	0	0	0.03	0.04	0	0.08	0.02	0.06	0.28	0.22
Spottail Shiner*	0A	0A	0A	0.02A	0A	0A	0A	0A	0.34B	0.03
Silver Shiner	0	0	0	0	0.01	0	0	0	0.10	0.53
Rosyface Shiner	0.20	0.10	0	0.17	0.59	0.43	0.58	0.16	0.56	0.15
New River Shiner	0.01	0.03	0	0	0	0	0.01	0.10	0.29	0.34
Spotfin Shiner	0.10	0.39	0.13	0.22	0.09	0.19	0.31	0.09	0.58	0.34
Mimic Shiner	0.04	0.14	0.05	0	0	0.02	0	0	0	0.11
Bluntnose Minnow	0.06	0.10	0.02	0.03	0	0.04	0.02	0	0.02	0.41
White Sucker	0	0	0	0.05	0	0.22	0	0.07	0	0.36
Northern Hog Sucker	0.12	0.20	0	0.04	0.31	0.23	0.13	0.25	0.19	0.15
Silver Redhorse	0	0	0	0.01	0	0	0	0	0	0.42
Channel Catfish	0	0.02	0	0.02	0	0	0	0	0	0.53
Flathead Catfish	0.03	0	0.06	0.02	0.03	0.02	0.02	0.01	0.01	0.51
Rock Bass*	0.43B	0.05A	0.03A	0A	0.63B	0.57B	0.16AB	0.09A	0.21B	<0.01
Redbreast Sunfish*	0.12A	0.93C	0.54BC	0.71C	0.06A	0.48BC	0.31B	0.34B	0.13A	<0.01
Pumpkinseed	0	0	0	0.02	0.01	0.02	0	0.02	0.01	0.67
Bluegill*	0.02A	0.23B	0.04A	0.06A	0.01A	0A	0.01A	0.03A	0.04A	0.05
Hybrid Sunfish	0	0.03	0	0	0	0.01	0	0	0	0.42
Smallmouth Bass*	0.24A	1.28C	0.67AB	1.04BC	0.74AB	1.67C	1.66C	1.16BC	0.51A	<0.01
Spotted Bass*	0.34A	1.07AB	0.59AB	0.77AB	0.85AB	0.73AB	1.26B	0.85AB	0.25A	0.06
Greenside Darter	0	0	0	0	0.01	0.02	0.01	0	0.03	0.19
Johnny Darter	0.07	0	0	0	0	0	0	0	0.02	0.19
Logperch*	0.08AB	0A	0.04A	0.09AB	0.18AB	0.26AB	0.02A	0.36B	0.14AB	0.10
Appalachia Darter	0.07	0	0	0	0	0	0	0	0	0.42
Sharpnose Darter	0	0	0	0	0	0.01	0	0	0	0.42
Sculpin*	0A	0A	0A	0A	0A	0A	0A	0A	0.03B	0.07

* Species with significantly different catches among locations (P≤0.10)

** Significance value for chi-square approximation of Kruskal-Wallis test statistic

Table 8. Mean catch per unit effort (CPUE) for combined gill and hoop netting (number of fish) near the Byllesby/Buck Hydroelectric Project, New River, May - October 1990. For species with significantly different catches among loactions (identified by asterisks), CPUE values followed by the same letter are not significantly different (P>0.10).

Gill/Hoop Netting CPUE (No./Net/Day)

Species	Byllesby Upper Pool	Byllesby Middle Pool	Byllesby Lower Pool	Buck Upper Pool	Buck Middle Pool	Buck Lower Pool	P-Value**
Muskellunge*	0.04AB	0.08B	0.02AB	0A	0A	0A	0.10
Common Carp	0.25	0.23	0.44	0.05	0.15	0.13	0.25
White Sucker	0.10	0	0.04	0	0	0	0.19
Northern Hog Sucker	0	0.02	0	0	0.04	0.04	0.67
Silver Redhorse	0	0.02	0	0	0	0	0.42
Channel Catfish*	1.06B	1.00B	0.83B	0.06A	0.02A	0.08A	<0.01
Flathead Catfish*	0.48C	0.21AB	0.17AB	0.60C	0.27B	0A	<0.01
Rock Bass*	0.58A	0.35A	0.23A	1.40B	1.58B	1.33B	0.06
Redbreast Sunfish	0.04	0.02	0	0	0.08	0	0.34
Bluegill	0.06	0.02	0.02	0	0	0	0.34
Smallmouth Bass	0.13	0.06	0.10	0.13	0.15	0.21	0.90
Spotted Bass	0.10	0.06	0.15	0	0	0.17	0.13
Largemouth Bass	0	0	0	0	0	0.08	0.42
Black Crappie	0.04	0	0	0	0	0.04	0.53
Yellow Perch	0.02	0	0	0	0	0	0.42

* Species with significantly different catches among locations (P≤0.10)

** Significance value for chi-square approximation of Kruskal-Wallis test statistic

Table 13. Spawning charcteristics of fish species of the Byllesby/Buck Hydroelectric Project reservoirs.*

Species	Spawning Period	Spawning Habitat	Spawning Depth(ft)	Egg Deposition	Egg Type
Muskellunge	March-May	Bottom Detritus	1-2.5	Broadcast	Non-adhesive demersal
Common Carp	May-August	Vegetation	0.25-6	Broadcast	Adhesive demersal
Golden Shiner	May-August	Vegetation	0.25-6?	Broadcast	Adhesive demersal
Spottail Shiner	May-August	Sandy Shoals	0.25-1.5	Broadcast	Adhesive demersal
Spotfin Shiner	May-August	Crevices	0.25-6?	Broadcast	Adhesive demersal
Mimic Shiner	May-July	Vegetation	15-20	Broadcast	Demersal
Blutnose Minnow	May-July	Sand/Gravel	0.25-8	Nest	Adhesive demersal
Creek Chub	April-June	Gravel	0.25-6?	Nest	Demersal
Channel Catfish	May-July	Crevices	1-8	Nest	Adhesive demersal
Flathead Catfish	June-July	Crevices	1-8	Nest	Adhesive demersal
Rock Bass	May-June	Sand/Gravel	0.25-3.5	Nest	Adhesive demersal
Redbreast Sunfish	May-June	Sand/Gravel	1-5?	Nest	Adhesive demersal
Green Sunfish	May-August	Sand/Gravel	0.25-1.5	Nest	Adhesive demersal
Pumpkinseed	May-August	Sand/Gravel	1-2.5	Nest	Adhesive demersal
Bluegill	May-August	Sand/Gravel	1-5	Nest	Adhesive demersal
Smallmouth Bass	April-July	Sand/Gravel	1-5	Nest	Adhesive demersal
Spotted Bass	April-June	Mud/Gravel	1-8	Nest	Adhesive demersal?

Table 13. (continued)

Species Type	Spawning Period	Spawning Habitat	Spawning Depth(ft)	Egg Deposition	Egg
Largemouth Bass	April-July	Sand/Gravel	1-5	Nest	Adhesive demersal
Black Crappie	May-June	Sand/Gravel	1-8	Nest	Adhesive demersal
Yellow Perch	April-May	Bottom Detritus	2-10	Broadcast	Adhesive demersal
Logperch	April-June	Sand/Gravel	0.25-6	Broadcast	Adhesive demersal
Walleye	April-June	Rock/Gravel	1-2.5	Broadcast	Adhesive demersal

* Information consolidated from Becker (1983), Carlander (1969, 1977), and WAPORA, Inc. (1978, 1987)

APPENDIX G

INVASIVE PLANT SPECIES

Virginia Invasive Plant Species List


Tree-of-heaven


Phragmites


Wavyleaf Grass

The Virginia Invasive Plant Species List comprises species that are established — or may become established — in Virginia, cause economic and ecological harm, and present ongoing management issues.

The list is for educational purposes only and has no regulatory authority.

To be included on the list, there must be demonstrable evidence that a species poses a threat to Virginia's forests, native grasslands, wetlands or waterways.

The Virginia Department of Conservation and Recreation's Invasive Species Assessment Protocol, approved by the Virginia Invasive Species Working Group, May 2015, was used to conduct a risk assessment for each listed species. Species were ranked as exhibiting **high**, **medium** or **low** levels of invasiveness based on their threat to natural communities and native species.

www.dcr.virginia.gov/natural_heritage/invspinfo.shtml

			REGION		
Scientific Name	**Common Name**	**Virginia Invasiveness Rank**	**Mountain**	**Piedmont**	**Coastal**
Ailanthus altissima	**Tree-of-heaven**	High	•	•	•
Alliaria petiolata	**Garlic Mustard**	High	•	•	•
Alternanthera philoxeroides	**Alligator-weed**	High			•
Ampelopsis brevipedunculata	**Porcelain-berry**	High		•	•
Carex kobomugi	**Japanese Sand Sedge**	High			•
Celastrus orbiculatus	**Oriental Bittersweet**	High	•	•	•
Centaurea stoebe ssp. micranthos	**Spotted Knapweed**	High	•	•	•
Cirsium arvense	**Canada Thistle**	High	•	•	•
Dioscorea polystachya	**Cinnamon Vine**	High	•	•	•
Elaeagnus umbellata	**Autumn Olive**	High	•	•	•
Euonymus alatus	**Winged Euonymus**	High	•	•	
Ficaria verna	**Lesser Celandine**	High		•	•
Hydrilla verticillata	**Hydrilla**	High	•	•	•
Iris pseudacorus	**Yellow Flag**	High	•	•	•
Lespedeza cuneata	**Chinese Lespedeza**	High	•	•	•
Ligustrum sinense	**Chinese Privet**	High	•	•	•
Lonicera japonica	**Japanese Honeysuckle**	High	•	•	•
Lonicera maackii	**Amur Honeysuckle**	High	•	•	•
Lonicera morrowii	**Morrow's Honeysuckle**	High	•	•	
Lythrum salicaria	**Purple Loosestrife**	High	•	•	•
Microstegium vimineum	**Japanese Stiltgrass**	High	•	•	•
Murdannia keisak	**Marsh Dewflower**	High	•	•	•
Myriophyllum aquaticum	**Parrot Feather**	High	•	•	•
Myriophyllum spicatum	**Eurasian Water-milfoil**	High	•	•	•
Persicaria perfoliata	**Mile-a-minute**	High	•	•	•
Phragmites australis ssp. australis	**Common Reed**	High	•	•	•
Pueraria montana var. lobata	**Kudzu**	High	•	•	•
Reynoutria japonica	**Japanese Knotweed**	High	•	•	•
Rosa multiflora	**Multiflora Rose**	High	•	•	•
Rubus phoenicolasius	**Wineberry**	High	•	•	•
Sorghum halepense	**Johnson Grass**	High	•	•	•
Urtica dioica	**European Stinging Nettle**	High	•	•	•
Acer platanoides	**Norway Maple**	Medium	•	•	•
Agrostis capillaris	**Colonial Bent-grass**	Medium	•	•	•
Akebia quinata	**Five-leaf Akebia**	Medium		•	•
Albizia julibrissin	**Mimosa**	Medium	•	•	•
Arthraxon hispidus var. hispidus	**Joint Head Grass**	Medium	•	•	•
Berberis thunbergii	**Japanese Barberry**	Medium	•	•	•
Cirsium vulgare	**Bull Thistle**	Medium	•	•	•
Dipsacus fullonum	**Wild Teasel**	Medium	•	•	•
Egeria densa	**Brazilian Waterweed**	Medium	•	•	•
Euonymus fortunei	**Winter Creeper**	Medium	•	•	•
Glechoma hederacea	**Gill-over-the-ground**	Medium	•	•	•
Hedera helix	**English Ivy**	Medium		•	•

continued

Invasiveness rank is higher for species that:

- Alter ecosystem processes, such as succession, hydrology or fire regime.
- Are capable of invading undisturbed natural communities.
- Cause substantial impacts on rare or vulnerable species or natural communities or high-quality examples of more common communities.
- Are found widely distributed and generally abundant where present.
- Disperse readily to new areas.
- Are difficult to control.

Early detection species

The list includes a subcategory of invasive plants that are considered early detection species. These are species not yet established or, if established, are not yet widespread in Virginia but known to be highly invasive in habitats similar to those found here. If discovered in Virginia, these species need to be quickly mapped, photographed and reported to DCR. The management goal for early detection species is eradication, as preventing the establishment and spread of newly arrived species will save valuable natural and economic resources.

INFORMATION

For more information, or to report early detection species, contact Stewardship Biologist Kevin Heffernan with the Virginia Department of Conservation and Recreation at 804-786-9112 or kevin.heffernan@dcr.virginia.gov

Photo credits:
Tree-of-heaven, Chuck Bargeron, University of Georgia, Bugwood.org. Phragmites, Jil M. Swearingen, USDI National Park Service, Bugwood.org. Wavyleaf grass, Kerrie L. Kyde, Maryland Department of Natural Resources, Bugwood.org.

Citation:
Heffernan, K., E. Engle, C. Richardson. 2014. Virginia Invasive Plant Species List. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Natural Heritage Technical Document 14-11. Richmond.

Virginia Department of Conservation & Recreation

			REGION		
Scientific Name	**Common Name**	**Virginia Invasiveness Rank**	**Mountain**	**Piedmont**	**Coastal**
Holcus lanatus	**Common Velvet Grass**	Medium	•	•	•
Humulus japonicus	**Japanese Hops**	Medium	•	•	•
Ligustrum obtusifolium var. obtusifolium	**Border Privet**	Medium	•	•	•
Lonicera tatarica	**Tartarian Honeysuckle**	Medium	•	•	
Lysimachia nummularia	**Moneywort**	Medium	•	•	•
Miscanthus sinensis	**Chinese Silvergrass**	Medium	•	•	•
Najas minor	**Brittle Naiad**	Medium	•	•	•
Paulownia tomentosa	**Royal Paulowina**	Medium	•	•	•
Persicaria longiseta	**Long-bristled Smartweed**	Medium	•	•	•
Phyllostachys aurea	**Golden Bamboo**	Medium	•	•	•
Poa compressa	**Flat-stemmed Bluegrass**	Medium	•	•	•
Poa trivialis	**Rough Bluegrass**	Medium	•	•	•
Pyrus calleryana	**Callery Pear**	Medium	•	•	•
Rhodotypos scandens	**Jetbead**	Medium	•	•	•
Rumex acetosella	**Sheep sorrel**	Medium	•	•	•
Spiraea japonica	**Japanese Spiraea**	Medium	•	•	
Stellaria media	**Common Chickweed**	Medium	•	•	•
Veronica hederifolia	**Ivy-leaved Speedwell**	Medium	•	•	•
Viburnum dilatatum	**Linden arrow-wood**	Medium		•	
Wisteria sinensis	**Chinese Wisteria**	Medium	•	•	•
Commelina communis	**Asiatic Dayflower**	Low	•	•	•
Elaeagnus pungens	**Thorny Olive**	Low	•	•	•
Lespedeza bicolor	**Shrubby Bushclover**	Low	•	•	•
Lonicera fragrantissima	**Winter Honeysuckle**	Low	•	•	•
Melia azedarach	**Chinaberry**	Low		•	•
Morus alba	**White Mulberry**	Low	•	•	•
Perilla frutescens	**Beefsteak Plant**	Low	•	•	•
Phleum pratense	**Timothy**	Low	•	•	•
Populus alba	**Silver Poplar**	Low	•	•	•
Rumex crispus ssp. crispus	**Curly Dock**	Low	•	•	•
Securigera varia	**Crown-vetch**	Low	•	•	•
Trapa natans	**European Water Chestnut**	Low			•
Ulmus pumila	**Siberian Elm**	Low	•	•	
Vinca major	**Greater Periwinkle**	Low	•	•	•
Vinca minor	**Periwinkle**	Low	•	•	•
Wisteria floribunda	**Japanese Wisteria**	Low		•	•
EARLY DETECTION SPECIES - not yet widely established in Virginia					
Aldrovanda vesiculosa	**Waterwheel**	High			•
Eichhornia crassipes	**Water Hyacinth**	High			•
Imperata cylindrica	**Cogon Grass**	High			•
Ludwigia grandiflora ssp. hexapetala	**Large Flower Primrose Willow**	High	•	•	•
Oplismenus hirtellus ssp. undulatifolius	**Wavyleaf Grass**	High	•	•	
Vitex rotundifolia	**Beach Vitex**	High			•
Heracleum mantegazzianum	**Giant Hogweed**	Medium	•	•	
Ipomoea aquatica	**Water Spinach**	Medium	•	•	•
Salvinia molesta	**Giant Salvinia**	Medium	•	•	•
Solanum viarum	**Tropical Soda Apple**	Medium		•	•

APPENDIX H

VEGETATION INFORMATION

Table 1. Habitat patches identified for the AEP Byllesby/Buck Hydroelectric Project in Grayson and Carroll counties, Virginia.

Patch ID	Date (2017)	Habitat Type	Acreage	Comment	Habitat Potential	Vegetation Description
001	18 April	Open Water	59.71	Heavy rock concentration within spillway, frequency of dam/spillway usage will contribute or negate viability of habitat.	Moderate	Tufts of grass and small shrubs dot the spillway, in addition to small sycamores.
002	18 April	Deciduous Forest	23.63	River dissects habitat	Low	Sycamore (*Platanus occidentalis*) dominated lowland forest
003	18 April	Developed Medium Intensity	5.86	Developed area including dam, access road, and buildings.	None	N/A
004	19 April	Open Water	202.46	Deep open water	None	N/A
005	18 April	Mixed Forest	3.40	Mixed oak forest	None	White pine (*Pinus strobus*), red oak (*Quercus rubra*), white oak (*Quercus alba*), chestnut oak (*Quercus montana*) mixed forest on a rocky steep slope
006	18 April	Deciduous Forest	17.67	Lowland forest	None	Lowland forest dominated by sycamore, silverbell (*Halesia carolina*), tulip poplar (*Liriodendron tulipifera*). Moderate herbaceous layer, very little shrubbery.
007	18 April	Deciduous Forest	1.62	Oak forest	None	Hardwood forest dominated by oak. Rocky slope.
008	18 April	Mixed Forest	4.17	Oak and pine	None	Oak, pine forest. Sparse ground vegetation.
009	18 April	Emergent Herbaceous Wetlands	12.69	Sparse emergent wetland dotted with black willows (*Salix nigra*), predominantly wing stem (*Verbesina alternifolia*) and cattails (*Typha* sp.).	None	Emergent wetland, no canopy, a handful of black willow trees. Primarily consists of wingstem, cattails, and poison hemlock (*Conium maculatum*).
010	18 April	Mixed Forest	17.84	Steep bank, dominated by pine, white oak, red oak, chestnut oak, scarlet oak (*Quercus velutina*).	None	Mixed forest pine/hardwood with minimal ground cover.
011	18 April	Deciduous Forest	1.78	Lowland forest	None	Lowland forest, with sycamore dominating canopy
012	18 April	Deciduous Forest	18.53	Oak forest	None	Oak forest consisting mostly of dryer oak species including white, red, scarlet, and chestnut. Sparse ground cover, and steep banks.
013	18 April	Mixed Forest	8.45	Mixed forest, sycamore, silver bell, red oak	None	Mixed forest, containing sycamore, silverbell, white pine, sparse to moderate ground cover.

Patch ID	Date (2017)	Habitat Type	Acreage	Comment	Habitat Potential	Vegetation Description
014	18 April	Open Water	44.89	Craggy large rocks	Moderate	Several small islands consisting of large boulders and slab bedrock supporting small trees and shrubbery. Also high number of invasives.
015	18 April	Deciduous Forest	2.09	Oak forest	None	Small patch of oak forest, white oak, tulip tree
016	18 April	Deciduous Forest	31.69	Lowland forest	None	Lowland forest containing black walnut (*Juglans nigra*), sycamore, black locust (*Robinia pseudoacacia*), and spice bush (*Lindera benzoin*).
017	18 April	Deciduous Forest	5.95	Lowland forest	Low	Lowland sycamore dominated forest
018	19 April	Deciduous Forest	14.28	Lowland forest	Moderate	Lowland forest with sycamore dominating the canopy. A large amount of shrubs.
019	19 April	Mixed Forest	8.54	Mixed forest containing oak and tulip and white pine.	None	Mixed forest with white pine, tulip, and sycamore.
020	19 April	Evergreen Forest	1.17	White pine	None	White pine forest
021	19 April	Mixed Forest	6.84	Oak, tulip, and pine trees	None	Mixed pine forest, with oak and tulip trees.
022	19 April	Deciduous Forest	4.27	Oak forest	None	Oak forest, including chestnut, tulip, black walnut, and some silver bells.
023	19 April	Mixed Forest	21.11	Mixed pine forest	None	Mixed pine forest containing white, virginia pine (*Pinus virginiana*), and scarlet, red, white oak and tulips trees.
024	19 April	Developed High Intensity	22.42	River bank of town of fries.	None	Highly developed, bluegrass (*Poa* ssp.) and sycamore sporadically along bank.
025	19 April	Mixed Forest	21.70	Mixed forest pine, oak forest	None	Pine and oak forest with some tulip tree
026	19 April	Shrub/Scrub	0.09	Small shrubby islands	Moderate	Small island dominated by multiflora rose (*Rosa multiflora*)
027	19 April	Shrub/Scrub	0.12	Shrubby island	Low	Island dominated by multi flora rose
028	19 April	Mixed Forest	0.64	Mixed pine forest	None	White pine, hemlock (*Tsuga canadensis*), tulip with rhododendron (*Rhododendron* ssp.) dominating understory.
029	19 April	Deciduous Forest	16.75	Lowland forest, very low chance of Virginia spiraea.	Low	Sycamore and silver maple (*Acer saccharinum*) forest dissected by a small stream.
030	19 April	Mixed Forest	7.54	Mixed pine forest	None	Mixed pine with white pine, tulip, red, and scarlet oak.
031	19 April	Deciduous Forest	1.11	Lowland forest	None	Sycamore dominated lowland forest on the edge of developed property.

Patch ID	Date (2017)	Habitat Type	Acreage	Comment	Habitat Potential	Vegetation Description
032	19 April	Developed Medium Intensity	10.87	Residences	None	Maintained residential yards. Occasional sycamore directly along river.
033	19 April	Developed High Intensity	0.50	Bridge with makeshift boat ramp.	None	N/A
034	19 April	Emergent Herbaceous Wetlands	14.57	Wetland	None	Wetland with box elder (*Acer negundo*), black willow, reed canary grass (*Phalaris arundinacea*) and cat tails.
035	19 April	Developed High Intensity	3.19	Access road, dam, and associated buildings	None	Some reed canary on the fringes
036	19 April	Emergent Herbaceous Wetlands	1.96	Small reed canary grass	None	Reed canary marsh
037	19 April	Evergreen Forest	16.89	Dense evergreen forest with intermittent hardwoods	None	Virginia, cedar, white pine, and chestnut oak
038	19 April	Emergent Herbaceous Wetlands	1.18	Reed canary marsh	None	Reed canary marsh
039	19 April	Emergent Herbaceous Wetlands	0.96	Reed canary marsh	None	Reed canary grass marsh
040	19 April	Emergent Herbaceous Wetlands	6.73	Reed canary marsh	None	Black willow, and reed canary grass
041	19 April	Deciduous Forest	0.17	Small sliver of lowland forest	None	Small sliver of sycamore lowland forest
042	19 April	Emergent Herbaceous Wetlands	2.74	Reed canary marsh with some sycamore	None	Reed canary with some wingstem, and sycamore
043	19 April	Deciduous Forest	2.50	Oak forest	None	Oak forest containing white, chestnut, red, and scarlet
044	19 April	Mixed Forest	0.43	Mixed pine forest	None	White pine, tulip, and oak
045	19 April	Mixed Forest	1.50	Mixed pine forest	None	Mixed pine forest.
046	19 April	Mixed Forest	1.58	Mixed pine and hardwood forest	None	White and Virginia pine with white oak
047	19 April	Emergent Herbaceous Wetlands	0.45	Reed canary sand bar	None	Reed canary grass with some wingstem

Patch ID	Date (2017)	Habitat Type	Acreage	Comment	Habitat Potential	Vegetation Description
048	19 April	Emergent Herbaceous Wetlands	0.24	Reed canary sandbar	None	Reed canary grass, with some wingstem and sycamore
049	19 April	Mixed Forest	1.91	Mixed pine forest	None	Mixed white, Virginia pine forest, sugar maple (*Acer saccharum*) and tulip tree. Dense rhododendron understory.
050	19 April	Mixed Forest	1.02	Oak and hemlock forest	None	Formerly clear cut oak and hemlock forest.
051	19 April	Mixed Forest	2.22	Mixed forest oak, hemlock	None	Hemlock, tulip, and oak forest
052	19 April	Deciduous Forest	7.42	Oak forest with an rhododendron understory	None	White, red, and chestnut oak forest
053	19 April	Emergent Herbaceous Wetlands	1.89	Reed canary sand bar	None	Reed canary with some wignstem
054	19 April	Evergreen Forest	6.14	Pine forest	None	White pine and hemlock forest
055	19 April	Emergent Herbaceous Wetlands	8.03	Sandbar supporting plant life	None	Canary reed grass and cattails
056	19 April	Deciduous Forest	1.05	Lowland forest	None	Lowland forest, with silver maple, sycamore, and black willow.
057	19 April	Mixed Forest	8.22	Oak, pine forest	None	White oak and white pine forest
058	19 April	Developed Medium Intensity	2.31	Parking lot and access road	None	Developed parking lot and access road
059	19 April	Mixed Forest	1.23	Oak pine forest	None	White and Virginia pine, white oak
060	19 April	Deciduous Forest	1.12	White oak forest	None	White oak forest
061	19 April	Evergreen Forest	1.27	White pine forest	None	White pine forest
062	19 April	Emergent Herbaceous Wetlands	2.66	Reed canary wetland, with a few silver maples and a black walnut.	None	Reed canary grass wetland with some silver maple and a black walnut.
063	19 April	Shrub/Scrub	0.37	Silky dogwood (*Cornus amomum*)	Low	Silky dogwood dominated scrub shrub.
064	19 April	Deciduous Forest	0.93	Mixed oak and pine	None	Hemlock, white oak, and white pine forest
065	19 April	Pasture/Hay	47.30	Cultivated farmland	None	Cultivated pasture

Patch ID	Date (2017)	Habitat Type	Acreage	Comment	Habitat Potential	Vegetation Description
066	20 April	Deciduous Forest	19.35	Yellow buckeye (*Aesculus flava*), black walnut, silver maple, sycamore lowland forest	None	Sycamore, yellow buckeye, silver maple and black walnut forest.
067	20 April	Shrub/Scrub	2.19	A few sycamores and smaller willows among rose species	Low	Scrub shrub island with a few sycamores and smaller willows
068	20 April	Deciduous Forest	2.78	Upland forest	None	Scarlet, red oak dominated upland forest with tulip tree
069	20 April	Shrub/Scrub	6.31	Bedrock boulders cluster with some scrub shrub	Moderate	Scrub shrub with some sycamore
070	20 April	Deciduous Forest	2.02	Lowland forest	None	Sycamore dominated low lying forest
071	20 April	Evergreen Forest	0.60	Pine forest	None	White and Virginia pine forest
072	20 April	Deciduous Forest	0.97	Sycamore dominated lowland forest	None	Sycamore dominated forest with rose and rhododendron understory.
073	20 April	Mixed Forest	8.03	White and Virginia pine forest	None	Red oak and white pine forest
074	20 April	Shrub/Scrub	11.67	Cluster of large rocks	Moderate	Scrub shrub and barren rocks
075	20 April	Mixed Forest	3.07	Mixed pine, hemlock forest	None	Hemlock, white pine, and tulip, black walnut.
076	20 April	Shrub/Scrub	8.49	Scrub shrub island	Moderate	Scrubby cluster of boulder and bed rock few sycamores
077	20 April	Deciduous Forest	4.40	Lowland forest	None	Lowland forest dominated by sycamore and tulip tree as the slope increases
078	20 April	Mixed Forest	5.55	Mixed oak, pine	None	Scarlet oak, white pine forest
079	20 April	Deciduous Forest	5.55	Sycamore dominated lowland forest	None	Sycamore dominated forest
080	20 April	Deciduous Forest	1.35	Sycamore dominated lowland forest	None	Sycamore dominated lowland forest, with minor land maintenance clearing out understory.
081	20 April	Mixed Forest	19.27	Oak pine forest	None	Oak pine forest. Hemlock, red and scarlet oaks.
082	20 April	Emergent Herbaceous Wetlands	6.26	Reed canary and cat tails marsh	Low	Reed canary marsh, with some cattails and wingstem.
083	20 April	Deciduous Forest	8.52	Lowland forest	Moderate	Lowland sycamore forest on an island. Includes silver maple, Japanese honeysuckle (*Lonicera japonica*), spicebush, silky dogwood.
084	20 April	Deciduous Forest	10.35	Lowland forest	None	Sycamore , silver maple, box elder
085	20 April	Deciduous Forest	24.42	Lowland	None	Sycamore dominated lowland forest, also silver maple and box elder.

Patch ID	Date (2017)	Habitat Type	Acreage	Comment	Habitat Potential	Vegetation Description
086	20 April	Mixed Forest	8.32	Mixed pine oak forest	None	White pine, Virginia pine forest with tulip and red maple (*Acer rubrum*).
087	20 April	Open Water	2.02	Open tributary, low potential along banks and rock clusters	Low	Silky dogwood, box elder
088	20 April	Evergreen Forest	5.35	White pine forest	None	White pine forest
089	20 April	Mixed Forest	10.82	Oak pine forest	None	White pine, scarlet oak. Red oak
090	20 April	Open Water	182.71		None	N/A
091	20 April	Developed Medium Intensity	1.96	Railroad bridge	None	Multiflora rose waste
092	20 April	Deciduous Forest	1.21	Lowland forest	None	Sycamore dominated lowland forest
093	20 April	Mixed Forest	1.25	Lowland forest	None	White pine, tulip tree, spice bush, multiflora rose
094	20 April	Open Water	5.30	Rock clusters capable of habitat overgrown	Low	Canary reed grass
095	20 April	Shrub/Scrub	0.04	Rock cluster	Low	Rock cluster supporting small shrubs
096	20 April	Deciduous Forest	1.49	Oak forest with rhododendron	None	Oak forest, scarlet, chestnut with strong rhododendron.
097	20 April	Deciduous Forest	3.24	Sparse forsest	None	Sycamore along the coast
098	20 April	Evergreen Forest	3.56	Oak pine forest	None	White pine, hemlock,
099	20 April	Open Water	376.45	Hemlock	None	N/A
100	20 April	Mixed Forest	0.28	Oak, pine	None	Scarlet oak, white pine, rhododendron, and hemlock
101	20 April	Deciduous Forest	0.50		None	Lowland sycamore forest
102	20 April	Deciduous Forest	1.13	Mixed pine, hemlock forest	None	Hemlock, white pine, and tulip, black walnut

APPENDIX I

CULTURAL RESOURCES STUDY REPORTS (PRIVILEGED)