# Updated Study Report

## Byllesby-Buck Hydroelectric Project

## (FERC No. 2514)

*November 17, 2021*

Prepared by:

Prepared for:

Appalachian Power Company

An AEP Company

BOUNDLESS ENERGY™

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## Acronyms and Abbreviations

| | |
|---|---|
| 2-D | two-dimensional |
| Appalachian or Licensee | Appalachian Power Company |
| AEP | American Electric Power |
| APE | Area of Potential Effects |
| BEHI | Bank Erosion Hazard Index |
| Byllesby | Byllesby Development |
| Buck | Buck Development |
| CPUE | catch per unit effort |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CUI | controlled unclassified information |
| DLA | Draft License Application |
| DO | dissolved oxygen |
| EDGE | Edge Engineering and Science, LLC |
| EPRI | Electric Power Research Institute |
| FERC or Commission | Federal Energy Regulatory Commission |
| ft | foot/feet |
| fps | feet per second |
| GIS | Geographic Information System |
| HBI | Hilsenhoff Biotic Index |
| HDR | HDR Engineering, Inc. |
| HSC | Habitat Suitability Criteria |
| Hydrolab | Hach Hydrolab® MS5 |
| ICM | Integrated Catchment Model |
| ILP | Integrated Licensing Process |
| ISR | Initial Study Report |
| LPDA | Land Planning Design Associates |
| m | meter |
| mg/l | milligrams per liter |

## *Acronyms and Abbreviations Continued*

| | |
|---|---|
| NOI | Notice of Intent |
| NRHP | National Register of Historic Places |
| PAD | Pre-Application Document |
| Project | Byllesby-Buck Hydroelectric Project |
| PM&E | protection, mitigation, and enhancement |
| PSP | Proposed Study Plan |
| RM | river mile |
| RSP | Revised Study Plan |
| SD | Scoping Document |
| SHPO | Virginia State Historic Preservation Office |
| SPD | Study Plan Determination |
| Stantec | Stantec Consulting Services, Inc. |
| Terracon | Terracon Consultants, Inc. |
| USR | Updated Study Report |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| VDEQ | Virginia Department of Environmental Quality |
| VDCR | Virginia Department of Conservation and Recreation |
| VDWR | Virginia Department of Wildlife Resources |
| VSCI | Virginia Stream Condition Index |
| YES | Young Energy Services |

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# 1 Introduction and Background

## 1.1 Introduction

Appalachian Power Company (Appalachian or Licensee), 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 (or Byllesby) is located about 9 miles north of the city of Galax, and the Buck Development (or Buck) is located approximately 3 river miles (RM) downstream of Byllesby and 43.5 RM upstream of Claytor Dam.

The Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission). 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 (FERC 1994). The current operating license for the Project expires on February 29, 2024. Accordingly, Appalachian is pursuing a subsequent license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. In accordance with FERC's regulations at 18 CFR §16.9(b), the licensee must file its final application for a new license with FERC no later than February 28, 2022.

In accordance with 18 CFR §5.15, Appalachian has conducted studies as provided in the Revised Study Report (RSP) as subsequently approved and modified by the FERC. This Updated Study Report (USR) describes the methods and results of the studies conducted in support of preparing an application for new license for the Project.

The Commission's regulations at 18 CFR §5.15(f) require Appalachian to hold a meeting with participants and FERC staff within 15 days of filing the USR. Accordingly, **Appalachian will hold an USR Meeting via Webex from 9 AM to approximately 4 PM on December 1, 2021.** An agenda for the USR Meeting is provided in Attachment 1. Participants are free to join the meeting in part based on interests or availability, but please note that the agenda is intended as an approximation and more or less time may be spent on individual studies, as needed.

**Appalachian respectfully requests that those planning on joining the USR Webex Meeting RSVP by emailing Maggie Salazar at maggie.salazar@hdrinc.com on or before close of business Tuesday, November 23, 2021.** Additional information, including instructions to join the virtual meeting, will be provided in response to the RSVP.

## 1.2 Background

Appalachian filed a Pre-Application Document (PAD) and associated Notice of Intent (NOI) with the Commission on January 7, 2019, to initiate the ILP. The Commission issued Scoping Document 1 (SD1) for the Project on March 8, 2019. As provided in 18 CFR §5.8(a) and §5.18(b), the Commission issued a notice of commencement of the relicensing proceeding concomitant with SD1. On April 10 and 11, 2019, the Commission held public scoping meetings and a site visit pursuant to 18 CFR §5.8(d). During these meetings, FERC staff presented information regarding the ILP and details regarding the study scoping process and how to request a relicensing study, including the Commission's study criteria. In addition, FERC staff solicited comments regarding the scope of issues and analyses for the Environmental Assessment. Resource agencies, Indian Tribes, NGOs, and other interested parties were afforded a 60-day period to request studies and provide comments on the PAD and SD1.

In accordance with ILP regulations, comments on the PAD and SD1 and study requests were due to FERC by May 7, 2019. Stakeholders filed letters with the Commission providing general comments, comments regarding the PAD and SD1, and/or study requests. FERC issued Scoping Document 2 (SD2) on June 21, 2019, and, in accordance with 18 CFR §5.11, Appalachian developed a Proposed Study Plan (PSP) for the Project that was filed with the Commission and made available to stakeholders on June 21, 2019. The PSP described Appalachian's proposed approaches for conducting studies and addressed agency and stakeholder study requests. Pursuant to 18 CFR §5.11(e), Appalachian held a PSP Meeting on July 18, 2019, for the purpose of clarifying the PSP, explaining initial information gathering needs, and addressing outstanding issues associated with the PSP.

In accordance with 18 CFR §5.11, Appalachian developed a Revised Study Plan (RSP) for the Project, which incorporated comments and study requests considered in developing the PSP, the Commission's June 21, 2019 SD2 and comments on the PSP, and it was filed with the Commission and made available to stakeholders on October 18, 2019. On November 18, 2019 FERC issued the Study Plan Determination (SPD). On December 18, 2019, Appalachian filed a request for rehearing of the SPD. The SPD was subsequently modified by FERC by an Order on Rehearing dated February 20, 2020.On July 27, 2020, Appalachian filed an updated ILP study schedule and a request for extension of time to file the Initial Study Report (ISR) to account for Project delays resulting from the COVID-19 pandemic. The request was approved by FERC on August 10, 2020, and the filing deadline for the ISR for the Project was extended from November 17, 2020 to January 18, 2021.

On December 23, 2020, FERC issued Scoping Document 3 (SD3) for the Project, to account for updates about how Commission staff intend to conduct their National Environmental Policy Act (NEPA) review in accordance with the Council on Environmental Quality's (CEQ) new NEPA regulations at 40 CFR Part 1500-1518.

Appalachian filed the ISR on January 18, 2021, conducted a virtual ISR Meeting on January 28, 2021, and filed the ISR Meeting summary with the Commission on February 12, 2021. Appalachian filed a response to comments on the ISR on April 13, 2021. Because no substantive study modifications were requested in response to the ISR, FERC did not in turn provide a Determination on Requests for Study Modifications. FERC letters of correspondence since the filing of the ISR are included in Attachment 2.

Appalachian filed the Byllesby-Buck Hydroelectric Project Draft License Application with the FERC on October 1, 2021 and stakeholders were notified of the filing on October 4, 2021. Major ILP milestones to-date are presented in Table 1-1.

**Table 1-1. Major ILP Milestones Completed**

| Date | Milestone |
|---|---|
| January 7, 2019 | Appalachian Filed NOI and PAD (18 CFR §5.5, 5.6) |
| March 8, 2019 | FERC Issued Notice of PAD/NOI and Scoping Document 1 (SD1) (18 CFR §5.8(a)) |
| April 10-11, 2019 | FERC Conducted Scoping Meetings and Site Visit (18 CFR §5.8(b) (viii)) |
| May 7, 2019 | Stakeholders Submitted Comments on the PAD, SD1, and Study Requests (18 CFR §5.9) |
| June 21, 2019 | FERC Issued Scoping Document 2 (SD2) (18 CFR §5.10) |
| June 21, 2019 | Appalachian Filed Proposed Study Plan (PSP) (18 CFR §5.11(a)) |
| July 18, 2019 | Appalachian Held Study Plan Meeting (18 CFR §5.11(e)) |
| September 9, 2019 | Stakeholders Submitted Comments on the PSP (18 CFR §5.12) |
| October 18, 2019 | Appalachian Filed RSP (18 CFR §5.13(a)) |
| November 3, 2019 | Stakeholders Submitted Comments on the RSP (18 CFR §5.13(b)) |
| November 18, 2019 | FERC Issued the SPD (18 CFR §5.13(c)) |
| July 27, 2020 | Appalachian Submitted First Quarterly Report, ILP Study Update, and Request for Extension of Time File ISR |
| August 10, 2020 | FERC Issued Order Granting Appalachian Extension of Time and Filing of ISR |
| August – November 2020 | Appalachian Conducted First Season of Field Studies (18 CFR §5.15(a)) |
| October 27, 2020 | Appalachian Submitted Second Quarterly Progress Report (18 CFR §5.15(b)) |
| December 23, 2020 | FERC Issued Scoping Document 3 (SD3) |
| January 18, 2021 | Appalachian Submitted ISR (18 CFR §5.15(c)(1)) |

| Date | Milestone |
|---|---|
| January 28, 2021 | Appalachian Hosted ISR Meeting (18 CFR §5.15(c)(2)) |
| February 12, 2021 | Appalachian Filed ISR Meeting Summary (18 CFR §5.15(c)(3)) |
| Spring – Fall 2021 | Appalachian Conducted Second Year of Studies |
| October 1, 2021 | Appalachian Filed Draft License Application (DLA) (18 CFR §5.16(a)) |

Appalachian has continued consultation with stakeholders regarding approved studies as required by the Commission's SPD. In accordance with the schedule presented in the RSP, Appalachian has also provided stakeholders with Quarterly ILP Study Progress Reports that include a description of study activities conducted during the previous quarter, activities expected to occur in the next quarter, and identified variances from the approved study plan. The final quarterly progress report was filed with FERC on November 2, 2021.

## 1.3 Study Plan Implementation

On November 18, 2019, the Commission issued the SPD for the Project. The SPD directed Appalachian to conduct eight studies as listed below:

1. Bypass Reach Flow and Aquatic Habitat Study
2. Water Quality Study
3. Aquatic Resources Study
4. Wetlands, Riparian, and Littoral Habitat Characterization Study
5. Terrestrial Resources Study
6. Shoreline Stability Assessment
7. Recreation Study
8. Cultural Resources Study

Preliminary study reports for the Bypass Reach Flow and Aquatic Habitat Study, Water Quality Study, Aquatic Resources Study, Recreation Study, and Cultural Resources Study were included in the ISR. Section 2 of this USR describes Appalachian's updated study reports and any variances from the study plan and schedule, including those previously reported by Appalachian in the ILP quarterly progress reports.

Final technical reports for all studies are included as appendices to this USR. Note that the final Cultural Resources Study report was filed with the FERC as a controlled unclassified information

(CUI)/Privileged volume of the DLA on October 1, 2021, therefore a summary of the report is included herein but report is not being filed with this USR. The Cultural Resources Study Report was transmitted on September 8, 2021 to the Virginia State Historic Preservation Office (SHPO) and consulting Tribes for their review and concurrence with the report's recommendations. No reply comments have yet been received.

## 1.4 Proposals to Modify Ongoing Studies or for New Studies

At this time, Appalachian is not proposing any modifications to the studies approved and modified in the Commission's November 18, 2019 SPD or any new studies. Minor variances to the study plans have been previously reported in the ILP quarterly progress reports (July 27, 2020; October 27, 2020; April 30, 2021; July 22, 2021; and November 2, 2021) and are detailed in the sections that follow, as well as within the individual study reports provided as appendices.

# 2 Status and Summaries of Studies

This section describes the status of the induvial studies, a summary of the study methods and results, and any variances from the study plan and schedule.

## 2.1 Bypass Reach Flow and Aquatic Habitat Study

### 2.1.1 Study Status

Appalachian initiated and completed the Bypass Reach Flow and Aquatic Habitat Study in accordance with the schedule provided in the RSP, with minor variances as previously noted in the ISR. A preliminary Bypass Reach Flow and Aquatic Habitat Study Report was filed with the ISR on January 18, 2021, and the results of this study were presented at the ISR meeting on January 28, 2021. No study modifications were made or required by FERC subsequent to comments received at or following the ISR meeting.

Field activities and analyses required for this study were completed in 2021. The technical report including the results of the Bypass Reach Flow and Aquatic Habitat Study is included in Appendix A of this USR.

### 2.1.2 Summary of Study Methods

In accordance with the RSP approved and modified in the Commission's SPD, Appalachian's consultant, HDR Engineering, Inc. [HDR], conducted a Bypass Reach Flow and Aquatic Habitat Study to:

- Delineate and quantify aquatic habitats and substrate types in the Byllesby and Buck bypass reaches.
- Identify and characterize locations of habitat management interest located within each bypass reach.
- Develop an understanding of surface water travel times and water surface elevation responses under variable base flow and spillway release flow combinations in the tailrace and bypass reach of each development to:
    - Demonstrate the efficacy of existing ramping rates required by the existing license.[1]
    - Demonstrate the efficacy of the existing powerhouse minimum flow requirement (i.e., 360 cubic feet per second [cfs] minimum flow to maintain aquatic resources, including resident fish species, downstream of each development consisting of the tailrace areas below each powerhouse and the bypass reaches below the main spillways).
    - Evaluate the impacts of providing seasonal minimum flows to the bypass reaches.

Appalachian's goal in selecting a process for evaluating flows at the Project is to develop a technical basis for systematically evaluating and balancing the needs and priorities of the various flow-related resources. Therefore, the goal of this study is to characterize changes in quantity of aquatic habitat over a range of flows and operational scenarios.

#### 2.1.2.1 Topography Mapping and Photogrammetry Data

HDR reviewed the hydrologic record for the Project study reaches, spillway and trash sluice gate operating procedures and design capacity, existing topographic and geologic maps, and available recent and historical aerial imagery. Light detection and ranging data (LiDAR) were collected to support development of comprehensive three-dimensional elevation and visual surface layers of the

[1] In accordance with existing FERC spillway gate operating requirements for the Buck development, Appalachian discharges flows through a 2-foot (ft) gate opening for at least three hours following any spills released through a gate opened 2 ft or more. Appalachian must then reduce the opening to 1 ft for at least an additional three hours, after which time the gate may be completely closed. The gradual reduction of flow allows time for fish to respond to the receding water levels, thus avoiding stranding that can occur with sudden flow discontinuation.

bypass reach. LiDAR data collection and digital terrain models are discussed further in the Byllesby and Buck Bypass Reach ICM Model Development reports, which are included in Appendix A. These data were used for desktop mesohabitat mapping of each bypass reach according to substrate size (e.g., sand, gravel, cobble, etc.), cover (e.g., no cover, overhead vegetation, etc.), and mesohabitat types (e.g., pools, riffles, runs, bedrock, shoals). The topographic information was then incorporated as a Geographic Information System (GIS) base layer to support field data collection and hydraulic modeling efforts.

#### 2.1.2.2 Hydraulic Model Development

Field data were collected to support development of a two-dimensional (2-D) hydraulic model of the tailrace and bypass reach of each development. The hydraulic model is based on the Innovyze Infoworks Integrated Catchment Model (ICM) software (version 7.0), which is capable of simulating depth and velocities in a 2-D grid pattern over a wide range of flow conditions. Flow and water depth data collected at four target flows for each development were used to calibrate and validate the hydraulic models to allow simulation of flow conditions and gate operations other than those that were explicitly sampled during data collection. Recorded gate operations (provided by Appalachian), flow, and level-logger data from each tailrace and bypass study reach were processed to provide operation sequences and flow and elevation hydrographs used for the calibration of gate and bypass reach model hydraulic parameters. Operational procedures for spilling and ramping rates that affect upstream-downstream connectivity were also assessed. Analyzing the results of varying spill events and spill configurations can provide insight to potential adverse effects on the fish and other aquatic species or recreational fishing opportunities in each bypass reach. Simulations were used to establish matrices of travel time, rise in water surface elevation, and velocities at locations of interest under the different flow regimes.

Target model calibration/validation flows were released into the Buck bypass reach in September 2020 for purposes of collecting depth, water surface elevations, velocities, and wetted area data under various bypass flow regimes. For the Buck Development, the target flow scenarios were designed to evaluate the effect of the existing ramping rate requirements (see Footnote 1).

For the Byllesby Development, the target flow scenarios are designed to evaluate the effect of passing the entire minimum downstream flow requirement of 360 cfs through the bypass reach. Four target flow releases were performed over three days and two separate trips, July 28, 2021 and September 8–9, 2021. Detailed descriptions of the Byllesby and Buck bypass reach ICM model development processes and results are provided in Attachment 1 of the Bypass Reach Flow and Aquatic Habitat Study report (Appendix A, Attachment 1).

#### 2.1.2.3 Desktop Mesohabitat Mapping

The mesohabitat mapping results and the 2-D model depth and velocity simulation results were used in combination with aquatic species habitat suitability criteria (HSC) (i.e., using depth, velocity, and substrate/cover preferences) to evaluate potential available aquatic habitat in each tailrace and bypass reach under each modeled flow scenario. Using the high-resolution photogrammetry data, polygons were drawn in GIS to encompass the study areas according to presence or type of cover (e.g., no cover, overhead vegetation, etc.) and substrate size (e.g., sand, gravel, cobble, etc.). Walleye was selected as a standalone target species for this study along with a total of eight species-guild representatives including three shallow-slow, one shallow-fast, two deep-slow, and two deep-fast guilds.

#### 2.1.2.4 Field Data Collection

Field data was collected to support development of a 2-D hydraulic model of each development's tailrace and bypass reach. Calibration flows were released into the tailrace and bypass reaches for purposes of collecting water surface elevation, depth, velocity, and wetted area data under four bypass reach and tailrace flow regimes. For Byllesby, the target flow scenarios were designed to evaluate the effect of passing the entire minimum downstream flow requirement of 360 cfs (or inflow, whichever is less) through the bypass reach. Tainter Gate #6 was used to pass flows into the bypass reach as it is near the center of the spillway structure and under existing operating procedures is the first gate operated for releases into the bypass reach. The four target flows proposed would allow a hydraulic model simulation range from leakage up to approximately 500 cfs. For Buck, Tainter Gate #1 was utilized at the Buck development to pass the target flows since this reflects current operations (i.e., Tainter Gate #1 is first to open and last to close during high flow events where flows are routed into the bypass reach). Gate openings of 2 ft and 1 ft were evaluated (as per existing ramping rate operating protocols) as well as a gate opening of 0.5 ft to represent flows that would occur between a 1-ft gate opening and leakage conditions. Water level data loggers (pressure transducers that measure water stage changes) were strategically deployed in the tailrace, bypass, and downstream study reaches prior to releasing the calibration target flows. The instrumentation remained in place for several weeks afterwards to collect additional data during several rainfall runoff events, which captured depth and surface flow travel time information under a variety of flow regimes (i.e., powerhouse operations and spillway gate openings).

A level logger was also placed at the downstream end of the Buck study area to capture changes in water surface elevations created by Project operations. This downstream boundary was requested

by the VDWR (formerly the VDGIF) to help better understand the potential effect Project operations may have on mussel habitat in this area.

A Wolman pebble count (Wolman 1954) was performed along three transects in the bypass reach study areas to characterize the existing grain size distribution of substrate. At Byllesby, the transects were located in (1) the bypass reach, (2) the cross-over channel between the tailrace and main channel, and (3) the upper end of the side channel to evaluate differences in substrate between the three transect locations. At Buck, the transects were located in the (1) upper, (2) middle, and (3) lower portions of the bypass reach to evaluate differences in substrate between the three locations.

#### 2.1.2.5 Habitat Evaluation

For each flow scenario evaluated, incremental changes in depth and wetted area were determined. The water level logger data in combination with the 2-D model results were used to determine rate of rise and fall of water elevation (i.e., water depth) in the tailrace and bypass reaches and evaluate flow patterns and hydraulic connectivity under each flow regime evaluated. In addition, substrate and mesohabitat mapping along with the 2-D model depth and velocity simulation results were used in combination with aquatic species habitat suitability criteria (HSC) (i.e., using depth, velocity, and habitat preferences) to evaluate potential available habitat under each modeled flow scenario in the study areas. HSC provide the biological criteria input to the ICM 2-D model, which combines the physical habitat data and the habitat suitability criteria into a site-wide habitat suitability index (i.e., weighted usable area over a range of simulation flows.

Guild representatives were selected from a variety of regionally representative sources, represent a wide range of habitat characteristics, and were selected to represent a wide range of species. In some cases, general non-species-specific criteria were used. In other cases specific species were used to represent a guild category; these include Redbreast Sunfish (*Lepomis auritus*), Silver Redhorse (*Moxostoma anisurum*), and Shorthead Redhorse (*Moxostoma macrolepidotum*). Aquatic habitat model results were used to evaluate potential aquatic habitat availability over a range of simulated flows for Walleye and the eight guild categories. HSC data tables and habitat maps for the Byllesby and Buck bypass reaches are presented in Appendix A (Attachments 2 and 3).

### 2.1.3 Summary of Study Results for the Buck Development

#### 2.1.3.1 Aquatic Habitat and Substrate Types

The mesohabitat desktop mapping and field-verification showed that different shapes/sizes and orientation of bedrock exist at the Byllesby and Buck bypass reaches. At Byllesby, flat bedrock with or without divots provides little or no instream cover; conversely at Buck, the bedrock is angular and

vertically slanted, resulting in microhabitats as instream cover available for aquatic organisms. The Byllesby bypass reach primarily consists of deep and shallow pool and shoal habitat types dominated by larger substrate sizes (i.e., bedrock and large boulders). The tailrace is a relatively deep and swift man-made channel lined with bedrock and large boulders. The cross-over channel between the tailrace and main channel is primarily comprised of run-type habitat with gravel, cobble, and sand substrate. The main channel downstream from the bypass reach consists of relatively wide riffles and runs with undulating bedrock/boulder substrate which provides instream cover. The side channel is also comprised of run/riffle habitat but is much narrower than the main channel with gravel/cobble substrates. In all, the bypass reach study area contains a wide variety of aquatic habitat and substrate types.

The Buck bypass reach consists of a complex assemblage of aquatic habitat and substrate types, dominated by angular bedrock. The key difference between the Buck upper reach versus the middle to lower reaches is that the orientation of the bedrock slabs is parallel to the flow, which facilitates scour and sediment transport, while the middle to lower reaches are dominated by bedrock slabs oriented perpendicular to streamflow, which facilitates sediment deposition (on the downstream side of the slab). As a result, the Buck upper reach is approximately 50 percent bedrock while the middle to lower reaches, while still dominated by bedrock, contain more smaller-sized particles. The middle to lower transects display zones of sediment deposition and lower-velocity shelters, which create a variety of aquatic habitat for a wider range of aquatic species and lifestages.

#### 2.1.3.2 Surface Water Travel Times and Water Surface Elevation Responses

At Byllesby, level logger data during the bypass flow field data collection period (July 26 – September 13, 2021) was used to determine surface water travel times in the bypass reach as well as water surface elevation responses throughout the bypass reach study area under the target flow releases. Depths increased in the bypass reach approximately 0.8 ft from Leakage Flow to Low Flow range (11 cfs to 88 cfs), approximately 0.2 ft from Low Flow to Mid Flow (88 cfs to 158 cfs), and approximately 0.5 ft from Mid Flow to High Flow (158 cfs to 194 cfs). The overall depth increase was approximately 1.5 ft from Leakage Flow to High Flow (11 cfs to 194 cfs). Depth increases in the main channel immediately downstream from the bypass reach were much lower than the bypass reach increasing a maximum of only 0.25 ft between Leakage Flow and High Flow. Bypass flow releases did not influence water surface elevations in the tailrace, cross-over channel, or side channel areas. These areas are influenced by powerhouse flow releases and not bypass flow releases. Finally, because the Byllesby bypass reach is relatively short (i.e., 475 ft long), travel times of flow releases from Tainter Gate #6 to the downstream end of the bypass reach are also relatively short. For

example, the Mid Flow and High Flow releases reached the downstream end of the bypass reach in 6 minutes and 2 minutes, respectively.

At Buck, flow releases from the right (looking downstream) side of the Buck spillway structure (via Tainter Gate #1) generally travel across the bypass reach toward the apex of the channel bend along the left descending bank. From there, the main flow path is along the left descending bank to the end of the bypass reach. As a result, water surface elevations spanning a large area of the upper bypass reach along the toe of the spillway from the center of the channel to the left abutment were not affected by the target flow releases. This is due to a large island of higher topography in this area. Because the island area separates the right and left channels in the upper portion of the bypass reach, flow releases from Tainter Gates 1–6 and Obermeyer Gates 7–10 would likely travel a similar path. Bypass reach flow travel time (from the spillway to the downstream end of the reach) was approximately 2 hours and 30 minutes at Low Flow (210.7 cfs), 1 hour and 40 minutes at Mid Flow (354 cfs) and 1 hour at High Flow (714 cfs). From the Leakage Flow to Low Flow range (17.1 cfs to 210.7 cfs), depths increased approximately 1.0 - 1.5 ft along the main flow path (i.e., right descending channel in the upper portion of the bypass reach and along the left descending bank in the lower portion of the reach). As the target flows increased to the Mid (354 cfs) to High (714 cfs) flow range, corresponding depths along the main flow path increased an additional 1.0 ft; or a total of approximately 2.5 ft deeper than at leakage flow. See Byllesby and Buck ICM Model Development reports in Attachment 1 of Appendix A for complete details.

#### 2.1.3.3 Identify and Characterize Locations of Habitat Management Interest

Habitat model results for the Byllesby bypass reach indicate suitable habitat for species and lifestages that prefer deep and/or slow-moving water (e.g., Redbreast Sunfish adult and Walleye adult, juvenile, and fry). The bypass reach is relatively wide and includes deep and shallow pools and shoal habitat types. Therefore, increasing flow in the bypass reach only has a marginal effect on depths and velocities. As a result, the amount of available habitat in the bypass reach is very similar over the modeled flow range (between 11–194 cfs). The tailrace, cross-over channel between the tailrace and main channel, the main channel downstream from the bypass reach, and side channel areas all provide a wide range of available habitat and substrate types. Habitat model results indicate these areas provide suitable habitat for each of the guilds and Walleye lifestages under the four modeled flow scenarios. From an aquatic habitat perspective, maintaining run-of-river operations through the Byllesby powerhouse is more beneficial than increasing flows in the bypass reach because the tailrace, cross-over channel, main channel, and side channel are all fed by generation flows whereas only the main channel would be fed by increased bypass flows.

At the Buck Development, the upper portion of the channel along the left descending bank is considered an area of concern from a potential fish stranding perspective. Two level loggers were placed along this channel to evaluate potential impacts to water surface elevations resulting from spillway gate operations. Several large rainfall runoff events occurred during the level logger deployment and it was determined that bypass reach flows need to reach at least 6,500 cfs to affect water surface elevations along this upper side-channel area. As a result, the existing ramping rate requirements have little to no effect on the upper portion of the left descending channel.

#### 2.1.3.4 Efficacy of Existing Ramping Rate Requirements

During the target flow field measurements, level loggers captured the impact that the existing ramping rate requirements (described in Section 2.1.2, Footnote 1) have on bypass reach water surface elevations. The decrease in water surface elevation from a 2-ft gate opening to a 1-ft gate opening was approximately 0.5 ft in the main flow path. From a 1-ft gate opening to a closed position, the water surface decreased an additional 1.5–2.0 ft in the main flow path. The seemingly disproportionate change in depth from a 2-ft to 1-ft gate opening, and a 1-ft to closed position is likely the result of the dominant bypass reach substrate type which is angled bedrock. These bedrock slabs block and trap flows in the bypass channel and their effect on water surface elevations is more pronounced at lower flows.

#### 2.1.3.5 Efficacy of Existing Powerhouse Minimum Flow Requirement

The current FERC authorized minimum downstream flow requirement for the Project is 360 cfs or inflow, whichever is less. A review of the hydrologic record at the U.S. Geological Survey (USGS) 03165500 New River at Ivanhoe, Virginia flow gaging station from 1996 – 2020 determined that the minimum downstream flow requirement is rarely triggered but did occur during this 25-year period of record in August 2002 (over a 6-day period) and August 2008 (over an 8-day period), corresponding to the two most severe droughts on record.

When the minimum downstream flow requirement is triggered, Project inflows at the Byllesby development are passed downstream to the bypass reach either via the trash sluice gate and/or one of the Tainter or Obermeyer gates. At the Buck development, the minimum flow can be passed through the trash sluice gate into the tailrace and/or through a Tainter or Obermeyer gate into the bypass reach. Because the minimum downstream flow requirement is rarely triggered and typically occurs only during August for about a week at a time, the effect on aquatic habitat is likely negligible at both the Byllesby and Buck developments. At Byllesby, the bypass reach is relatively small (compared to the Buck bypass reach) and from an aquatic habitat perspective, it likely makes no

substantial difference which gate is used to release the minimum downstream flow requirement. Based on the habitat modeling results, there is also likely no substantial difference in aquatic habitat whether the minimum downstream flow requirement is released into the bypass reach or through the powerhouse.

#### 2.1.3.6 Evaluate the Impacts of Seasonal Minimum Flows

Seasonal minimum flows were evaluated using the habitat modeling results provided in Attachment 3 of the Bypass Reach Flow and Aquatic Habitat Study (Appendix A) for the various habitat guilds and standalone Walleye species/lifestages. Spawning lifestages were of particular interest since there is a seasonal component to this lifestage.

At Byllesby, the habitat results do not show any significant differences in the amount or location of suitable habitat between the four modeled flow scenarios. As a result, seasonal minimum flows in the bypass reach would likely have little to no effect on species and lifestages that may use the bypass reach seasonally. For example, Walleye spawning habitat is minimal in the bypass reach under all four of the modeled flow scenarios. However, Walleye spawning habitat is available in the cross-over channel between the tailrace and main channel and main channel itself. Both of these areas receive flow from run-of-river powerhouse operations which do vary seasonally

At Buck, Redbreast Sunfish spawning lifestage was used as one of the representative species for the Shallow-Slow Guild (i.e., finer substrate sizes and no cover). The amount of potential spawning habitat available is similar under all four modeled flow scenarios. The difference between modeled scenarios is the location of the potential habitat shifts from the main flow path under Leakage Flow conditions (i.e., 17.1 cfs) to the stream margins, backwater areas, and behind velocity shelters created by rock outcrops as flows in the bypass reach increase.

Potential Walleye spawning habitat was also modeled for the four target flow scenarios at Buck. While the High target flow (714 cfs) produced a minimal amount of potential habitat along the left descending channel in the lower portion of the bypass reach, the largest area of potential habitat is located just downstream of the tailrace/bypass reach confluence. Powerhouse flows of at least 1,925 cfs created the largest amount of potential available habitat in the area immediately below the confluence.

As a result, seasonal minimum flows in the Buck bypass reach are not likely to provide a significant amount of additional available habitat for the target species/lifestages of interest.

### 2.1.4 Variances from FERC-Approved Study Plan

This study has been conducted in accordance with the FERC-approved RSP.

## 2.2 Water Quality Study

### 2.2.1 Study Status

Appalachian initiated and completed the Water Quality Study in accordance with the schedule provided in the RSP, with minor variances as previously noted in the ISR. A preliminary Water Quality Study Report was filed with the ISR on January 18, 2021, and the results of this study were presented at the ISR meeting on January 28, 2021. No study modifications were made or required by FERC subsequent to comments received at or following the ISR meeting.

Field activities and analyses required for this study were completed in 2021. The technical report including the results of the final Water Quality Study is included in Appendix B of this USR.

### 2.2.2 Summary of Study Methods and Results

In accordance with the RSP approved and modified in the Commission's SPD, HDR conducted a Water Quality Study to:

- Gather baseline water quality data sufficient to determine consistency of existing Project operations with applicable Virginia state water quality standards and designated uses (Virginia Administrative Code Chapter 260).
- Provide data (temperature and dissolved oxygen [DO] concentration) to determine the presence and extent, if any, of thermal or DO stratification in the Byllesby and Buck impoundments.
- Provide data to support a Virginia Water Protection Permit application (Clean Water Act Section 401 Certification).
- Provide information to support the evaluation of whether additional or modified PM&E measures may be appropriate for the protection of water quality at the Project's developments.

The water quality monitoring sites included the following:

- **Byllesby Development**
  - One location in the upstream extent of the Byllesby reservoir
  - Three locations in the Byllesby forebay (near surface, mid-depth, and near bottom)
  - One location in the tailrace

- One location in the Byllesby bypass reach

- **Buck Development**
  - Two locations in the forebay (near surface and near bottom)
  - One location in the tailrace
  - Two locations in the bypass reach (upstream and downstream)

#### 2.2.2.1 Methods

Initial deployment of water quality instrumentation at the Project was scheduled for the week of August 17, 2020, however, due to high flow conditions and continuous flow release at the dam through the damaged flashboard section throughout the latter part of 2020, the only water quality instrumentation deployed at Byllesby was at the tailrace location. Appalachian deployed the remaining water quality instruments (i.e., DO and water temperature sondes) at Byllesby on June 15 – 16, 2021. The water quality monitor that was deployed in the tailrace in August 2020 was removed at the end of the 2020 study period and then reinstalled at the same location for the 2021 data collection effort. The equipment recorded data at 15-minute intervals. Data were downloaded from instrumentation at Byllesby approximately every 2 to 3 weeks[2] until September 28, 2021, at which time the data collection instruments were removed.

During the initial deployment and subsequent download events, discrete multi-parameter water quality measurements of temperature, DO concentration, pH, and specific conductivity were collected at each monitoring location using a Hach Hydrolab® MS5 (Hydrolab). For the upstream, tailrace, and bypass reach monitoring locations, discrete water quality data were collected at one location within the water column at a depth similar to the sondes. Profile data at the Byllesby forebay monitoring location were collected at 2.0-ft intervals near the surface and 1.0-ft intervals near the bottom of the reservoir[3] using the Hydrolab to document temperature and DO stratification at the time of the data sonde downloads.

Water quality instruments (i.e., DO and water temperature sondes) were installed at Buck the week of August 17, 2020. During the initial deployment and subsequent download events, discrete multi-parameter water quality measurements of temperature, DO concentration, pH, and specific conductivity were collected at each monitoring location using a Hach Hydrolab® MS5 (Hydrolab).

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[2] The mid-August 2021 water quality download event was postponed due to a planned reservoir drawdown event to repair a section of broken flashboards. Immediately after the reservoir returned to normal pool elevation, Tropical Storm Fred resulted in a large rainfall runoff event that further delayed the equipment download event to late August.

[3] During the initial water quality equipment deployment on June 15, 2021 and first download event on June 28, 2021, a faulty data cable prevented vertical profile measurements below a depth of 14 ft.

For the tailrace and bypass reach monitoring locations, Hydrolab water quality data were collected at one location within the water column at a depth similar to the sondes. Profile data were collected at 1-ft intervals[4] using the Hydrolab for the Buck forebay monitoring location to document temperature and DO stratification at the time of the data sonde downloads. Discrete water quality data collections occurred concurrent with initial deployment and subsequent downloads of the continuous data loggers. Data were downloaded from instrumentation at Buck during the field efforts from September 8 - 10, 2020, and at Byllesby (tailrace only) and Buck from October 7 – 8, 2020, after which time data collection instruments were removed per the schedule in the RSP.

Turbidity grab samples were collected at the Byllesby and Buck forebay surface monitoring locations on July 14, August 25, and September 29, 2021 and analyzed at Pace Analytical Services in Ormond Beach, Florida. Appalachian also performed a more intensive turbidity study to evaluate the potential impact that Project operations, in particular drag rake operations, may have on turbidity concentrations in the Project tailraces. The study was conducted in two phases under relatively low flow conditions during late-September and mid-October 2021. The first phase consisted of a one-week deployment of five Hydrolab data sondes equipped with turbidity sensors installed at five locations at the Project. The data sondes were deployed from September 28 through October 5, 2021 and set to record turbidity concentrations at 5-minute intervals. Appalachian operated the generating units and drag rakes at each Project under a normal operating regime. Due to the relatively low Project inflows which carried little debris, the drag rakes were set to operate just once per day during the morning hours (i.e., from 7–10 am) during the field collection effort. Results from this one-week deployment are provided in Attachment 8 of Appendix B. Only the Byllesby upstream data sonde and Buck tailrace data sonde operated continuously during the one-week deployment; the other three data sondes ceased operating with hours of their deployment. Due to the turbidity sensor failures and low frequency of drag rake operations during the one-week study period, a second phase was added to the original study to collect turbidity data at the Buck forebay and tailrace monitoring locations[5] over a one-day period on October 14, 2021. During this second phase, generation at the Buck Development was held relatively steady and the drag rakes were operated approximately every 30 minutes throughout the sampling period. This resulted in 15 discrete drag rake operating events.

[4] During the August 17, 2020 water quality sampling event, profile data were collected at 2-ft intervals; a 1-ft interval was used during subsequent water quality sampling events.

[5] During the second phase of the turbidity study, Byllesby was in a planned maintenance outage to repair the intake structure trash racks. As a result, the Byllesby drag rakes were not operating and Project inflows were routed through the spillway structure instead of the powerhouse.

Chlorophyll a grab samples were collected at the Byllesby and Buck forebay surface monitoring locations on July 14, September 9, and September 29, 2021 and analyzed at the certified laboratory Pace Analytical Services.

#### 2.2.2.2 Results

All continuous and discrete water temperature data collected at the Project are provided in the Water Quality Study Report in Appendix B of this USR. During the 2020 water quality study period (from August 17 to October 8, 2020), there were no station outages or flashboard failures at the Byllesby or Buck developments that would have impacted the water quality results. During the 2021 water quality study period (from June 15 to September 28, 2021), a broken section of flashboards at the Byllesby spillway resulted in a spill of approximately 88 cfs into the bypass reach from the beginning of the study period until August 13, 2021 when the repair work was completed. During this period, the Byllesby reservoir was drawn down approximately 8 ft from August 6 – 13, 2021 to support the repair work. There were no other station outages in 2021 at the Byllesby development that would have impacted the water quality results. Project inflows and precipitation data for the water quality study periods are provided in Appendix B.

Continuous and discrete water quality data collected during the August 29, 2019 site visit (at Byllesby and Buck), 2020 study period (at Buck [and one location at Byllesby]), and 2021 study period (at Byllesby) indicated little to no thermal or DO stratification at the forebay monitoring locations. Water temperatures typically varied less than 0.5ºC from reservoir surface to bottom at Buck and less than 2.0ºC at Byllesby. DO concentrations typically varied less than 1.0 mg/l from reservoir surface to bottom at both developments. While the data sondes were not deployed until August 17, 2020 at Buck, water temperature and DO concentrations were typical of warmer summer conditions. All data, analyses, and results are included in Appendix B (Water Quality) of this USR.

Water quality data collected from 2019–2021 at the Byllesby and Buck forebay areas, tailrace, and bypass reach are consistent with applicable Virginia state water quality standards for temperature, DO, and pH for Class IV (New River) surface waters with the exception of infrequent instantaneous surface water temperatures at the Byllesby upstream, forebay surface, and bypass reach monitoring locations. And, while Byllesby forebay surface water temperatures tailrace water temperatures occasionally exceeded 29ºC, the maximum was 29.5ºC, and the Byllesby tailrace water temperatures remained below 29ºC. While there is no state standard for specific conductivity, concentrations less than 500 µS/cm are generally considered to be suitable for aquatic species in southern Appalachian streams (USEPA 2020).

Figure 8-2 (Attachment 8, Appendix B) provides continuous turbidity concentration data at the Buck forebay and tailrace monitoring locations on October 14, 2021. Turbidity values in the tailrace were slightly higher than in the forebay, but low overall (ranging from approximately 5–12 NTU). Drag rake operations are also provided on this figure and there is no discernable effect on turbidity concentrations in the tailrace immediately following drag rake operations. A discrete measurement of turbidity concentrations at the Byllesby upstream monitoring location yielded a range of 4–6 NTU which represents turbidity concentrations of Project inflows during this second phase sampling event. Turbidity study results indicate that during periods of low Project inflows, turbidity entering the Byllesby reservoir is correspondingly low, typically < 3.0 NTU. Turbidity concentrations in the Buck tailrace during the one-week study were also low and ranged from approximately 3.0–6.0 NTU.

All chlorophyl a sample results were “non-detect”, indicating the chlorophyll a concentrations were less than 5.0 mg/m$^3$.

Based on the results of this water quality study, and in consideration of results of other nearby historic studies and data collection efforts, in the new license term Appalachian proposes to continue to operate the Project in the existing run-of-river mode for the protection of water quality and other resources and does not believe there is a need for additional PM&E measures to protect water quality at the Project.

### 2.2.3 Variances from FERC-Approved Study Plan

The RSP included installation of two water quality data sondes at the Byllesby forebay monitoring location, one near the surface of the forebay and the other near the bottom. During installation, the depth of the forebay monitoring location was approximately 27 ft. Since one of the study objectives was to determine the extent (if any) of thermal and DO stratification in the Byllesby reservoir, Appalachian installed a third water quality data sonde at mid-depth to supplement data collected at the near surface and near bottom monitoring locations.

## 2.3 Aquatic Resources Study

### 2.3.1 Study Status

Appalachian initiated and completed the Aquatic Resources Study in accordance with the schedule provided in the RSP, with minor variances as previously noted in the ISR. A preliminary Aquatic Resources Study Report was filed with the ISR on January 18, 2021, and the results of this study were presented at the ISR meeting on January 28, 2021. No study modifications were made or

required by FERC subsequent to comments received at or following the ISR meeting. Field activities and analyses required for this study were completed in 2021.

The types and availability of aquatic habitat within the Project boundary is presented in the technical report for the Bypass Reach Flow and Aquatic Habitat Study, which is included in Appendix A.

The Aquatic Resources Study consists of four separate studies prepared by HDR and Appalachian's sub-consultants (Edge Engineering and Science, LLC [EDGE] and Stantec Consulting Services, Inc. [Stantec]):

1. 2020 - 2021 Fish Community Survey
2. Fish Impingement and Entrainment Study
3. 2020 - 2021 Macroinvertebrate and Crayfish Community Survey
4. Freshwater Mussel Survey

These studies are included as Attachments 1 through 4 of the Aquatic Resources Study Report provided in Appendix C of this USR.

A summary for each of the four studies is provided below.

#### 2.3.1.1 2020 - 2021 Fish Community Survey

EDGE completed the Fish Community Survey in accordance with the RSP and the Commission's SPD, with minor variances as previously noted in the ISR and summarized in Section 2.3.3 below. Due to restrictions on non-essential travel and safety considerations in response to the COVID-19 pandemic, the spring 2020 field sampling activities could not be completed as scheduled and were rescheduled for and completed during spring 2021. Periodic weather delays and resulting unsafe stream conditions impacted the fall 2020 fish sampling efforts. Boat electrofishing and gill net sampling was completed during fall 2020, but due to ongoing weather delays the fall 2020 backpack electrofishing samples were not collected. The spring 2021 sampling efforts were completed as planned and included back electrofishing samples. The technical report including the results of the fall 2020 and spring 2021 sampling activities for the Fish Community Study is included in Attachment 1 of Appendix C.

#### 2.3.1.2 Fish Impingement and Entrainment Study

HDR has completed the Fish Impingement and Entrainment Study in accordance with the RSP and the Commission's SPD. A desktop-based assessment of entrainment and impingement potential at each of the Project developments was completed using entrainment study results collected at comparable facilities, as presented in the Electric Power Research Institute (EPRI) entrainment

database (1997), and the preliminary results were presented in the ISR. No modifications to the study approach were requested in response to the ISR, and the remainder of the study was completed in 2021. The remaining portion of the study consisted of the turbine blade strike evaluation, which was performed using the most recent version of the USFWS Turbine Blade Strike Analysis Model (USFWS 2020), mean and standard deviation of fish lengths based on fish data collected during the 2020-2021 Fish Community Study (Attachment 1 of Appendix C), and site-specific inputs for required model parameters. The model input parameters, as well as results of the modeling effort, are provided in Attachment 2 of Appendix C, and summarized below in Section 2.3.2.2.

#### 2.3.1.3 2020 – 2021 Macroinvertebrate and Crayfish Community Survey

EDGE has completed the study activities for the Benthic Aquatic Resources Study in accordance with the RSP and the Commission's SPD. Due to delays related to weather and the COVID-19 pandemic, the spring 2020 sampling effort was rescheduled for and completed during the spring 2021 index period (March 1 – May 31) and included sampling activities completed at the same sites sampled during the fall index period (September 1 – November 30). The technical report includes study results based on fall 2020 and spring 2021 sampling activities, as summarized in the 2020-2021 Benthic Aquatic Resources Study (Attachment 3 of Appendix C).

#### 2.3.1.4 Freshwater Mussel Community Study

Stantec has completed all components of the Freshwater Mussel Survey in accordance with the RSP and the Commission's SPD; the study report is provided as Attachment 4 of Appendix C. The study results were reported in the ISR and no additional data collection or analyses were requested or performed in 2021.

### 2.3.2 Summary of Study Methods and Results

In accordance with the RSP approved and modified in the Commission's SPD, HDR conducted an Aquatic Resources Study to:

- Collect a comprehensive baseline of the existing fish, mussel, crayfish, and benthic macroinvertebrate communities in the Project vicinity.
- Compare current aquatic resources data to historical data to determine any significant changes to species composition, abundance, or distribution.
- Confirm flow velocities at the intake structure to facilitate a desktop assessment of entrainment and impingement potential at Byllesby and Buck dams.

- Perform a desktop assessment of entrainment and impingement potential at the Byllesby and Buck developments including an assessment of mortality and survival of fish passage through turbines or other routes using the USFWS Turbine Blade Strike Analysis Model (USFWS 2020).

#### 2.3.2.1 2020 - 2021 Fish Community Survey

##### *2.3.2.1.1 Study Methods*

Fish community sampling was performed using gillnet, and boat and backpack electrofishing methods to target representative fish habitats within the Project area. The study sampling methods included a combination of equipment, techniques, seasonality, and number and location of sample sites to provide a contemporary representation of the Project area, and to facilitate comparisons with data from previous sampling efforts (Appalachian 1991). Sampling methods were derived from the National Rivers and Streams Assessment Field Operations Manual (USEPA 2019), which guides standardized electrofishing methods in lotic waterbodies of variable sizes. Gillnet methods were established in coordination with the VDWR.

Fish sampling techniques were employed to most-effectively target specific sites based on the habitat types present in the study area. Boat electrofishing was used to target near-shore pool habitats (i.e., non-wadeable), backpack electrofishing targeted wadeable riffle and run habitats, and gillnetting was used to target mid-channel pool habitats. Seven boat electrofishing sites were located in the Byllesby Pool and 10 were located in the Buck Pool. Six gillnetting sites were located in the Byllesby Pool to target Walleye (*Sander vitreus*), as recommended by VDWR.

Boat electrofishing surveys were conducted between October 22 and 24-25, 2020, and April 25-26 and May 27, 2021. Backpack electrofishing surveys were conducted between April 20-23, 2021. Gillnet surveys were conducted between November 9-11 and 18-20, 2020, and April 20-24, 2021. Specific sampling dates were based on factors including (but not limited to) weather conditions, water temperatures, river flows and reservoir elevations, and safety of field staff and the public. All surveys followed methods outlined in the RSP and occurred during relatively low-flow and clear stream conditions. Sampling was performed by EDGE's state permitted fish biologist under Virginia Scientific Collecting Permit No. 070705 (provided in Attachment 1 of Appendix C). At each sampling location, habitat characteristics (e.g., substrate, estimated water velocity, depth, and instream cover) and water quality parameters (e.g., pH, water temperature, DO, and conductivity) were measured and recorded. Representative photos of each site and fish collected during sampling efforts, along with raw fish collection data, are provided in Attachment 1 of Appendix C.

*2.3.2.1.2 Study Results*

There were differences in habitat type and substrates observed by EDGE between sites; however, differences in sampling dates, time of day, and low number of intra- and inter-site samples do not facilitate statistical comparison of physiochemical properties between sites. Results of physiochemical data collected at sample sites met the state water quality standards established for the New River, indicating that water quality within the Project area is capable of supporting fish communities. (For further details on Project water quality, see Appendix B of the USR).

A total of 404 fish representing 26 species were collected upstream of Byllesby Dam from seven boat electrofishing sites (sampled fall 2020 and spring 2021), three backpack electrofishing sites (sampled spring 2021), and six gillnet sites (sampled fall 2020 and spring 2021). Five species were collected exclusively upstream of Byllesby Dam. A total of 509 fish representing 33 species were collected between Byllesby Dam and Buck Dam from 10 boat electrofishing sites (sampled fall 2020 and spring 2021) and six backpack electrofishing sites (sampled spring 2021). Seven species were collected exclusively between Byllesby Dam and Buck Dam. A total of 206 fish representing 17 species were collected below Buck Dam from four backpack electrofishing sites (sampled spring 2021). Two of the 17 fish species were collected exclusively below Buck Dam.

Twenty species were collected in the Byllesby Pool from seven sites and 24 species were collected in the Buck Pool from 10 sites during boat electrofishing; however, species diversity was negligibly higher in the Byllesby Pool than in the Buck Pool and catch per unit effort (CPUE) was nearly identical. The additional species may be attributable to a greater number of sites being surveyed or slight differences in habitat availability. Overall, the Byllesby Pool and Buck Pool were similar in fish community composition. Boat electrofishing yielded two game fish species in the Byllesby Pool that were not present in the Buck Pool (i.e., Muskellunge [*Esox masquinongy*] and Rainbow Trout [*Oncorhynchus mykiss*]). In contrast, boat electrofishing in the Buck Pool yielded nine species of darters, minnows, shiners, suckers, and sunfish that were not collected from samples in the Byllesby Pool (Appendix C).

Eleven species were collected upstream of the Byllesby Dam from three sites, 18 species were collected between the Byllesby Dam and Buck Dam from six sites, and 17 species were collected downstream of the Buck Dam from four sites during backpack electrofishing. These differences in species richness may result from differences in effort between the Project areas; however, differences in total species diversity based on the combined sampling methods were negligible between each Project area.

The general abundance of fish in riffle/run habitats increased in the downstream direction, with CPUE doubling from upstream sites to middle sites and doubling again from middle sites to

downstream sites. For example, the two sites in the Bypass Reach of the Byllesby Dam yielded less than 10-percent of the individuals compared to the two sites in the Bypass Reach of Buck Dam. No fish species were exclusively collected using backpack electrofishing methods upstream of Byllesby Dam; however, Kanawha Darter (*Etheostoma kanawhae*) and Saffron Shiner (*Notropis rubricroceus*) were only collected between Byllesby Dam and Buck Dam and Kanawha Sculpin (*Cottus kanawhae*) and White Shiner (*Luxilus albeolus*) were only collected downstream of the Buck Dam (Attachment 1 of Appendix C).

Gillnetting methods were also implemented in the Byllesby Pool by request from VDWR to collect additional data on the resident Walleye population. Walleye was the only species of fish exclusively captured using gillnets, as all other species were collected with more than one gear type. A total of nine Walleye were captured at three of six gillnet sites; these three sites had lower-gradient streambeds with sand and silt substrates, while the sites without Walleye collections had higher gradients with larger-sized bed material near the shore. Further, the Walleye were captured in the upper, middle, and lower sections of the Byllesby Pool, indicating that Walleye use the entire length of the pool. Six Walleye were collected in fall 2020 and three in spring 2021. Six of the nine Walleye were collected at the downstream most site in the Byllesby Pool, indicating that they may occupy the deeper sections more often.

The historical study (Appalachian 1991) fish sampling efforts employed boat electrofishing, gillnetting, and hoop netting techniques. Although they did not use backpack electrofishing techniques, these differences in methodology do not appear to have impacted the results of the historical study drastically and conclusions can still be drawn between the two. The study collected a total of 2,679 individuals representing 34 species, compared to the current study which collected 1,119 individuals representing 40 species. Therefore, despite the lower effort in the present study, there was an increase in overall richness of fish species within the Project area. Both studies documented a low incidence of parasites and physical abnormalities. Four species were captured in the previous study that were not captured in the current study including Johnny Darter (*Etheostoma nigrum*), Silver Redhorse (*Moxostoma anisurum*), Bluehead Chub (*Nocomis leptocephalus*), and Silver Shiner (*Notropis photogenis*), which may simply be a result of fewer sampling types and sampling events, sampling seasonality, or absence of nighttime electrofishing; however, 11 species were captured in the current study that were not captured in the previous study (Attachment 1 of Appendix C). The overall diversity of the fish community was greater in the current study (H'=2.91) than in the previous study (H'=2.53). No state or federally listed threatened or endangered species were collected in this study or the historical study. Overall, fish species distribution, richness, and abundance throughout the Project area during the current study closely matched that of Appalachian (1991).

A comparison of species richness at boat electrofishing sites in 2020/2021 and Appalachian (1991) was used to help identify any trends in the fish community within the Project area. The comparison was limited to boat electrofishing sites due to differences between the two studies in the number and location of gillnet and backpack samples. Species richness observed in the current study during boat electrofishing in pool habitats were 20 species and 24 species in the Byllesby Pool and Buck Pool, respectively. Species richness observed in the previous study during boat electrofishing in pool habitats were 9 species and 11 species in the Byllesby Pool and Buck Pool, respectively. Overall, fish community composition was quite similar between the two studies, but richness in the Project area seems to have increased indicating that the Project area continues to support an abundant and diverse fishery.

Water quality parameters and trends throughout the Project area did not change markedly from Appalachian (1991). Information regarding effects of Project operations on the fish community (e.g., fish length frequency, effects on spawning habitat, etc.) can be referenced in Appalachian (1991) and in Attachment 1 of Appendix C.

#### 2.3.2.2 Impingement and Entrainment Study

##### *2.3.2.2.1 Study Methods*

A desktop-based assessment of the risk to fish in the New River of impingement, entrainment, and turbine blade strike and overall passage survival at the Project developments was performed. Information on the physical and operational characteristics of the Project developments, including trash rack bar spacing, intake velocities and flows, and intake proximity to feeding and rearing habitats was used to make general assessments of impingement and entrainment potential at the Project. A list of target species to evaluate in the study was developed based on data from the 2021 – 2021 Fish Community Survey (Attachment 1 of Appendix C) and historical (Appalachian1991) fish community studies (i.e., composition, abundance, listed or protected status, recreational significance), as well as known occurrence records from the VDWR for the New River at the time of the historical fish community study. The list includes consideration of fish community composition and abundance of the New River and any other species of interest to or under protection of state and/or federal agencies, or with angler significance. Selected species were evaluated for potential of entrainment and impingement based on swim speed, behavior, habitat preferences, life stages, and seasonal or temperature-dependent behavioral changes in relation to Project design and operations.

### Impingement and Intake Avoidance

Intake avoidance and impingement was considered at both the Byllesby and Buck intake structures based on the calculated approach velocities and 2.28-inch clear bar spacing of trash racks at each of the Project developments. This process involved comparing literature-based fish swim speeds with calculated intake velocities, as well as estimating minimum fish lengths that would be excluded or impinged by the trash racks for each of the target fish species. A scaling factor relating fish length to body width was used for the impingement assessment to determine minimum sizes of the target fish species that would physically be excluded by the trash racks (Smith 1985).

### Determination of Species Composition and Rates of Entrainment

With consideration of site-specific facility characteristics and fish community information, detailed entrainment data from 33 of 43 available sites included in the EPRI (1997) entrainment database were applied in this analysis. The sites from the EPRI database were selected based on their representativeness of the Project developments based on multiple characteristics (i.e., reservoir size, usable storage, plant capacity, operating mode, average velocity at trash racks, trash rack spacing) and available data (i.e., species composition of entrainment data, collection efficiency). Since many of the database facilities have trash rack spacing larger than the spacing at the Project developments, the entrainment rate estimates presented for the Project are likely conservative (i.e., overestimated).

Entrainment data were standardized to the number of fish/hour of unit capacity based on the site-specific hydraulic capacity of the sampled units and the number of hours sampling occurred during each study from the database. These data were then used to calculate fish entrainment rates (fish/hour) at maximum existing design turbine discharge at the Project developments (5,868 cfs for the Byllesby development and 3,540 cfs for the Buck development).

### Qualitative Turbine Entrainment Risk

A traits-based qualitative assessment of entrainment risk at the Project, modified from Cada and Schweizer (2012), was also performed that ranks monthly entrainment risk as low, moderate, or high based upon break points in relative entrainment risk. The goal of this additional evaluation was to include an assessment of additional factors that may influence fish behavior relative to turbine passage and mortality risk to represent overall risk of entrainment and turbine passage mortality more accurately at Project facilities. The overall risk categories are defined as:

- Low: species-life stage is generally not present in the forebay; utilizes shallow, shoreline habitats away from the intake structures; and/or not susceptible to approach intake velocities

- Moderate: species-life stage may routinely or seasonally occupy the forebay or utilize habitats near the intake structures; and some life stages/ages may be susceptible to intake velocities
- High: pelagic species that reside or spawn in or near the forebay and intake structures and are susceptible to intake velocities, species with life stages that are expected to reside in the forebay or encounter intake structures during seasonal activities, and species-life stages that broadcast spawn buoyant eggs in open waters in lake or reservoir habitats

A matrix of monthly Project entrainment risk for the target species was constructed using the empirical seasonal entrainment rates estimated from the EPRI (1997) database using maximum turbine discharge frequency (full generation), swim burst speed comparison to intake velocities, size exclusion by trash racks, species periodicity, abundance, habitat utilization, migratory behavior, and expected distributions.

**Turbine Blade Strike and Spillway Survival Assessment**

During the new license term, Appalachian proposes to modernize the Byllesby and Buck developments to include replacement of Byllesby Units 1, 2 and 4 and Buck Units 1 and 3, as many of the major electrical and mechanical and supporting systems and components of the Project developments are nearing the end of their useful service life, when compared to industry-recognized standards. The existing vertical Francis units would be replaced by fixed blade Kaplan units. Unit upgrade activities would be confined to within the powerhouse, and there would be minimal changes to operating parameters for the Project. Following completion of the upgrades, the authorized installed capacities for the Byllesby and Buck developments will be 20.85 MW and 10.39 MW, respectively, with maximum hydraulic capacities of 5,511 cfs and 3,570 cfs, respectively. Due to efficiencies of the Kaplan units and modern components, the upgrades are expected to increase average annual generation at the Project by approximately 25,927 MWh.

Given the regulatory context, project background, and considering the planned upgrades from Francis to Kaplan turbines, this study included a desktop evaluation of blade strike probabilities under existing and proposed turbine design and operating conditions. Specifically, the turbine blade strike analysis tool was used to model the downstream passage survival under two operational scenarios for each of the Project developments: 1) fish that are subject to dam passage through the powerhouse and turbines, and required bypass flow only, or 2) fish that are subject to dam passage through the powerhouse and turbines or the spillway leading into the bypass channel. The probability of a fish passing through a turbine or via spill was assumed to be in direct proportion to the volume of flow passing through each route. A spillway and bypass passage survival rate of 97 percent was assumed based on the average of 136 survival tests conducted with juvenile salmonids on the Columbia river (Amaral et al. 2013).

Flow exceedance percentile data were reviewed to determine the volume of spillage at the range of percentiles where river discharge exceeded turbine capacity. Downstream passage survival was estimated by the model for each spillage scenario. Two scenarios were evaluated for existing conditions at each Project development and rerun for proposed conditions (proposed turbine upgrades) at each Project development:

1. Typical/normal conditions (i.e., no spill beyond required bypass minimum flow)
    a. Byllesby existing condition:
        i. Routes: Turbine Units 1 through 4, each with 25 percent of flow (1,467 cfs/unit).
        ii. Fish size classes: 2, 4, 6, 8, 10, 15, 20, 25, and 30 inches.
    b. Byllesby proposed condition:
        i. Routes: Three Kaplan (Proposed Kaplan) turbine Units with 24.7 percent of flow each (1,348 cfs/unit and a single existing Francis (Existing Francis) turbine unit with 26.0 percent flow (1,467 cfs).
        ii. Fish size classes: 2, 4, 6, 8, 10, 15, 20, 25, and 30 inches.
    c. Buck existing condition:
        i. Routes: Turbine Units 1 through 3, each with 33 percent of flow (1,180 cfs/unit).
        ii. Fish size classes: 2, 4, 6, 8, 10, 15, 20, 25, and 30 inches.
    d. Buck proposed condition
        i. Routes: Two Proposed Kaplan turbine units (1,195 cfs/unit) and one Existing Francis turbine unit (1,180 cfs); each with 33 percent of flow.
        ii. Fish size classes: 2, 4, 6, 8, 10, 15, 20, 25, and 30 inches.
2. Spilling conditions - Flow exceedance percentile data were reviewed to determine the volume of spillage at the range of percentiles where river discharge exceeded turbine capacity. A downstream passage survival estimate was calculated for each spillage scenario and based on the average length of Walleye collected in the 2020 – 2021 Fish Community Survey (Attachment 1 of Appendix C) conducted in the Project area.
    a. Byllesby existing condition:
        i. Routes: Turbine Units 1 through 4, each with equal amounts of flow (1,467 cfs/unit) and spillage at 4, 3, 2, and 1 percent exceedance.
        ii. The fish length inputs (mean=13.5 inches and standard deviation=1.5 inches) were taken from the Walleye collected in the 2020 – 2021 Fish Community Survey (Attachment 1 of Appendix C) conducted in the Project area.
    b. Byllesby proposed condition:
        i. Routes: Three Kaplan (Proposed Kaplan) turbine Units with 24.7 percent of flow each (1,348 cfs/unit and a single existing Francis (Existing Francis)

turbine unit with 26.0 percent flow (1,467 cfs) and spillage at 4, 3, 2, and 1 percent exceedance.

ii. The fish length inputs (mean=13.5 inches and standard deviation=1.5inches) were taken from the Walleye collected in the 2020 – 2021 Fish Community Survey (Attachment 1 of Appendix C) conducted in the Project area.

c. Buck existing condition:

i. Route: Turbine Units 1 through 3, each at 1,180 cfs/unit and spillage at 12, 10, 8, 6, 4, 2, and1 percent exceedance.

ii. The fish length inputs (mean=13.5 inch and standard deviation=1.5 inch) were taken from the Walleye collected in the 2020 – 2021 Fish Community Survey (Attachment 1 of Appendix C) conducted in the Project area.

d. Buck proposed condition:

i. Route: Two Proposed Kaplan turbine units (1,195 cfs/unit) and one Existing Francis turbine unit (1,180 cfs) and spillage at 12, 10, 8, 6, 4, 2, and1 percent exceedance.

ii. The fish length inputs (mean=13.5 inch and standard deviation=1.5 inch) were taken from the Walleye collected in the 2020 – 2021 Fish Community Survey (Attachment 1 of Appendix C) conducted in the Project area.

#### *2.3.2.2.2 Study Results*

Results from the 2020–2021 Fish Community Survey, summarized in Section 2.3.2.1 and provided in Attachment 1 of Appendix C, were used to determine the target species for inclusion in this desktop study and included those species of management (i.e., state/federal protection), economic, and ecological importance (Table 2-1). Where appropriate, representative or surrogate species were used when evaluating other factors, such as swim burst speed and impingement potential.

**Table 2-1. Target Fish Species and Species Groups Included in the Impingement and Entrainment Study for Byllesby-Buck Hydroelectric Project**

| Common Name | Scientific Name |
|---|---|
| Black Crappie | *Pomoxis nigromaculatus* |
| Bullheads and Madtoms | *Ameiurus* spp. and *Noturus* spp. |
| Catfishes | *Ictalurus* spp. |
| Common Carp | *Cyprinus carpio* |
| Darters and Logperch | *Etheostoma* and *Percina* spp. |
| Largemouth Bass | *Micropterus salmoides* |
| *Lepomis* Sunfishes | *Lepomis* spp. |
| Muskellunge | *Esox masquinongy* |
| Rock Bass | *Ambloplites rupestris* |

| Common Name | Scientific Name |
|---|---|
| Shiners, Chubs, and Minnows | Leuciscinae |
| Smallmouth Bass | *Micropterus dolomieu* |
| Spotted Bass | *Micropterus punctulatus* |
| Suckers and Redhorse | Catostomidae and *Moxostoma* spp. |
| Walleye | *Sander vitreus* |
| White Bass | *Morone chrysops* |

### Impingement and Intake Avoidance

Using the Byllesby intake opening structure dimensions and the existing maximum turbine discharge, the calculated approach velocity in front of the intake is approximately 2.0 ft per second (fps) (i.e., existing 5,868 cfs/(143 ft x 14 ft x 1.5)). This approach velocity is similar to those presented in the historical entrainment report (Appalachian 1991). Burst swim speeds for target or representative species were compared to the estimated intake velocity to evaluate whether fish may be susceptible to intake flows at the Project. Using the Buck intake opening structure dimensions and the existing maximum turbine discharge, the calculated approach velocity in front of the intake structure is approximately 1.6 fps (i.e., 3,540 cfs/(104 ft x 14 ft x 1.5)). Under the proposed turbine upgrade conditions for Byllesby, reductions in turbine capacity from 5,868 to 5,511 cfs would reduce the intake approach velocity to 1.84 fps (i.e., 5,511 cfs / (143 ft x 14 ft x 1.5)). Under the proposed turbine upgrade conditions for Buck, a change in turbine capacity from 3,540 cfs to 3,570 cfs would result in a fractional increase in the intake approach velocity from 1.6 to 1.63 fps (i.e., 3,570 cfs / (143 ft x 14 ft x 1.5)).

Fish swim burst speeds obtained from literature indicate that all target species and life stages evaluated, with the exception of eggs, larvae, and juvenile Spottail Shiner, would be able to avoid entrainment at the Project given that estimated swim burst speeds are greater than approach velocities at the intake. Although most species were considered of entrainable size (i.e., smaller than the 2.28- inch clear-spacing width of the trash racks at both Byllesby and Buck), it is likely that juvenile and adult fish can avoid the intake.

### Species Composition and Rates of Entrainment

According to the EPRI (1997) database, fish measuring less than six inches in length were the majority (88 percent) of entrained fish, and fish less than eight inches exhibit the highest entrainment rates throughout the year. Rock Bass (*Ambloplites rupestris*), catfishes, suckers and redhorses, *Lepomis* sunfishes, and Black Crappie, Largemouth Bass, darters and logperch, and shiners, chubs,

and minnows represent the top 90 percent of target species and species groups potentially susceptible to entrainment at the Byllesby and Buck developments. Peak months of entrainment for these species and species groups varied. Smallmouth Bass, Walleye, and Muskellunge (*Esox masquinongy*), species often sought after by anglers, have some of the lowest entrainment rates of the target species and groups. Entrainment rates were highest from April to October, with peaks in April, July, and October. Months with peak entrainment rates may correspond to spawning movements (April), recruitment to catchable size (July or October), or large storm/flow events. Susceptibility to entrainment is variable depending on species and time period, however most target species and species groups have low entrainment potential for most of the year.

**Qualitative Turbine Entrainment Risk**

Several factors were considered for qualitative entrainment risk ratings for target species at each of the Project developments, including:

- Entrainment rates for each species and species group based on the EPRI (1997) database and site-specific information;
- Maximum turbine discharge frequency;
- Comparison of burst swim speed versus intake velocity for likelihood of intake avoidance;
- Size exclusion; and
- Life history characteristics, such as migratory behavior, habitat preferences, spawning behavior/requirements, and early life stage periodicity.

Since the same selection of data from the EPRI (1997) database was applied to both facilities, trends across species are similar, and therefore the considerations given below apply to both Byllesby and Buck developments.

Although few fish species in the vicinity of the Project developments would be excluded by the trash racks, almost all juvenile and adult fish species could avoid the intake entirely based on approach velocity and associated swim burst speeds. Therefore, most target species assigned elevated qualitative rankings were driven by increased entrainment rates based on the EPRI (1997) database, which has limited velocity data for comparison.

Some of the target species exhibited higher entrainment rate estimates in the spring period, which may reflect increased activity associated with spawning (e.g., dispersal for nest site selection, increased feeding); none of the species evaluated for this study exhibit fall spawning behavior. Although spring spawning is common for many species, some species migrate upstream and away from the intake structures and spillways (e.g., suckers and redhorse), create nests in protected

areas (e.g., central stoneroller, crevice-spawning shiners), and/or require habitat not found in the vicinity of the intakes; therefore, most species were assigned a low (L) ranking unless the estimated entrainment rates were elevated.

Increased entrainment rate estimates were observed for certain species during the fall months (such as Rock Bass or suckers and redhorse group) and may indicate increased activity in response to cooling summer water temperatures, triggering the need for increased foraging in preparation for the winter season, or possibly increased activity following late-summer egg hatch and swim up stage. Since most target species are not expected to spawn in the vicinity of the Project intakes or where eggs and larvae would be susceptible to intake flows, rankings for potential entrainment of early life stages were not elevated.

The majority (59 percent) of catfishes entrained from May to July, based on the EPRI (1997) database, were of the 2-4-inch size class. Since swim burst speed data suggests that catfish of this size are able to swim faster at 1.97 fps (Katopodis and Gervais 2016) than the calculated intake velocity (1.0 fps), the qualitative rating for this species group was designated as moderate (M) for these months despite the relatively high entrainment rate in the EPRI (1997) database.

Similarly, the analysis indicated that Rock Bass have increased entrainment rates during the months of April, October, and November. Most fish estimated to be entrained in April were of the 2 to 4-inch size class, therefore this month was given an elevated entrainment potential rating (low to moderate). However, the majority of Rock Bass estimated to be entrained in October and November were larger in size (4-6 inches). Based on similar body size and shape as *Lepomis* species, swim burst speeds are likely similar and sufficient to also exclude them from susceptibility to entrainment at the Project. Therefore, the entrainment potential rating for Rock Bass was determined to be low-moderate (L-M).

Black Crappie exhibited higher entrainment rates in July and August based on the EPRI (1997) database; these fish were mostly 0-2 inches (60 percent) or 2-4 inches (39 percent) total length, and therefore likely juvenile fish. Black Crappie of this size (using White Crappie as a surrogate) do not have a swim burst speed substantially greater than the intake velocity, therefore the entrainment potential rating for Black Crappie was elevated to moderate-high (M-H).

*Lepomis* sunfish had higher entrainment rates for the months of April and September. In April, most of the fish were of the 2-4 and 4-6-inch size classes (45 and 52 percent, respectively). In October, 91 percent of *Lepomis* sunfish entrained were within the 4-6-inch size class. Since almost half of the sunfish collected in April were relatively small, and with consideration of swim burst speeds for juvenile fishes, the rating for April was elevated. However, since the sunfishes estimated for October

are larger and likely able to navigate intake flows adequately to avoid entrainment, the entrainment potential rating was determined to be low-moderate.

While entrainment rates of darters and logperch were low throughout the year, rates were slightly elevated in April and May. However, based on the required habitat of most species in the *Etheostoma* and *Percina* genera, these taxa are not expected to be found in the vicinity of the intake and at risk of entrainment. Therefore, ratings for these months were determined to be low-medium or low.

Suckers and redhorse were another group with elevated entrainment rates, which peaked in October and November. The November data shows elevated entrainment rates reported from several facilities, however entrainment in October was primarily driven by fish within the 4 to 6-inch size class from one facility. This single report accounted for 98 percent of the estimated entrainment of 4 to 6-inch fish for that month. With this consideration and the high burst swim speeds exhibited by suckers and redhorse, the qualitative entrainment potential rating was determined to be moderate (M).

**Turbine Blade Strike and Spillway Survival Assessment**

Turbine blade strike probabilities for entrained fish of varying sizes were estimated for each Project development under the existing and proposed turbine unit upgrade conditions. The probability of blade strike at each development generally increases with increasing fish length, under the existing and proposed conditions. However, the planned unit upgrades are expected to reduce the maximize blade strike probabilities at Buck from 65.9 percent (existing conditions) to 42.2 percent (proposed conditions) and at Byllesby from 66.6 percent (existing conditions) to 41.0 percent (proposed conditions). Based on the 2020-2021 Fish Community Survey (Attachment 1 of Appendix C), 72.5 percent of the 1,119 fish collected from the Project area were smaller than 6 inches, while the average length of all fish collected was 4.65 inches. Fish in this size range (less than 6 inches in length), exhibit the lowest blade strike probabilities, and is estimated to be between 2.9 to 8.4 percent with proposed unit upgrades at Buck and between 2.8 and- 8.2 percent with proposed unit upgrades at Byllesby (Attachment 2 of Appendix C). While larger fish theoretically have a greater potential for blade strike, they are also more likely to be excluded by the trash racks or to have sufficient swim speeds to escape intake approach velocities. For the larger bodied fish species such as Largemouth Bass, Walleye, White Sucker, Channel Catfish, and Common Carp that attain sizes that could be excluded by the trash racks, the minimum size (fish length) of exclusion ranged from 14.5 to 18 inches.

The percentage of Walleye that would experience blade strike, spillway mortality, or pass downstream successfully was also estimated for a range of flow conditions based on actual flow

data from each of the Project developments. Due to the assumed survival rate of 97 percent for spillway passage, the overall downstream passage survival rate increased with the increasing volume of spill for the range of flow percentiles evaluated. At Byllesby, spillage first occurred at annual 4 percent exceedance and at Buck, a 12 percent exceedance flow.

The percentage of Walleye that would survive downstream passage ranged from 67.7 to 82.7 percent under existing conditions at Byllesby and 82.8 to 88.8 percent under proposed conditions For the Buck Development, the percentage of walleye that would survive downstream passage ranged from 71.1 to 88.8 percent under existing conditions and 82.7 to 91.4 percent under proposed conditions.

**Study Conclusions**

To date, the findings of the current study concur with the historical entrainment study (Appalachian 1991) completed for the prior relicensing in that effects to the fish community in the Project vicinity are expected to be minimal with continued operation of the Project. Most fish would not be excluded by the intake trashracks at Byllesby and Buck intake structures; however, velocities in front of the intakes are comparable to normal flow conditions of the New River and would therefore likely be navigable by most juvenile and adult fish in the area.

The blade strike analysis indicates that mortality is expected to increase with increasing size of fish entrained into the intake structures; however, most larger fish are able to avoid the intake structures and are therefore less likely to become entrained. For the sizes of fish most likely to be entrained at the Project developments, blade strike survival is estimated at greater than 90 percent. The planned turbine upgrades will result in a reduction in blade strike risk (up to 15 percent at Byllesby and 10 percent at Buck) to fish that are entrained at the Project intake structures. The low head Project dams and design of the Project spillways result in high spillway survival; as such, increasing spill events reduces turbine entrainment strike mortalities. Depending on the percent flow exceedance, the cumulative downstream passage survival (turbine and spillway passage) under the proposed conditions is expected to increase by as much as 15 percent at Byllesby and 10 percent at Buck. However, spill events occur infrequently at the Project developments. The cumulative downstream fish passage survival estimated to occur at Byllesby after the turbine upgrades is between 82.8 and 88.8 percent of all fish, and between 82.7 and 92.4 percent of all fish at Buck.

While the greatest opportunity for fish mortality at a facility is associated with potential contact with the turbine runner blades, injuries and mortalities can result from other mechanisms including extreme pressure changes, shear stress, water turbulence, cavitation, and grinding (Deng et al. 2005); however, the historical study (Appalachian1991) determined that these factors are minimal at

the Project. Since no significant changes have occurred at the facility that would change these parameters since the last relicensing, injuries and mortalities caused by factors other than turbine strikes are expected to be negligible. Susceptibility to entrainment is variable depending on species and time period, however most target species and species groups have low entrainment potential for most of the year. Entrainment of early life stage fishes (eggs and larvae) is likely minimal given the life history characteristics of species in the vicinity of the Project.

In summary, the findings of this study concur with the historical entrainment study completed for the prior relicensing in that effects to the fish community in the Project vicinity are expected to be minimal. Most fish would not be excluded by the intake trash racks at Byllesby and Buck intake structures; however, velocities in front of the intakes are comparable to normal flow conditions of the New River and would therefore likely be navigable by most juvenile and adult fish in the area. Entrainment of early life stage fishes (eggs and larvae) is likely minimal given the life history characteristics of species in the vicinity of the Project intake structures. Susceptibility to entrainment is variable depending on species and time period, however most target species and species groups have low entrainment potential for most of the year.

#### 2.3.2.3 2020 - 2021 Macroinvertebrate and Crayfish Community Survey

##### *2.3.2.3.1 Study Methods*

EDGE conducted a Benthic Aquatic Resources Study to document a comprehensive representation of the Project area and to correlate with previous sampling efforts (Appalachian 1991) for comparison. Macroinvertebrate and crayfish sampling efforts targeted representative habitat at 16 sites throughout the Project area using sampling methods derived from the National Rivers and Streams Assessment Field Operations Manual and Virginia Department of Environmental Quality (VDEQ) Biological Monitoring Program Quality Assurance Project Plan and included quantitative and qualitative sampling methods that target different habitats (USEPA 2019; VDEQ 2008). Quantitative sampling methods targeted riffle/run habitats and qualitative sampling methods targeted available microhabitats in pools habitats. Sampling was performed by an EDGE state and federally permitted astacologist under Virginia Scientific Collecting Permit No. 068630. All macroinvertebrate sites were sampled between October 6 and 8, 2020 during the fall sample index period defined by VDEQ (September 1 – November 30) (VDEQ 2008). The spring sampling effort was completed during the spring 2021 index period (March 1 – May 31).

**Quantitative Sampling Methods**

Benthic macroinvertebrate and crayfish sampling efforts were completed at eight riffle/run sites along 100-meter (m) transects. Macroinvertebrate sampling was conducted holding the D-frame net on the

bottom of the stream perpendicular to flow and kicking substrate to agitate and dislodge organisms, thus allowing dislodged organisms to flow into the net. A single quantitative sample consisted of a composite of six kick sets, each disturbing approximately 0.33 meters (m)² above the dip net for a duration of 30-90 seconds and totaled an area comprising 2.0 m². For quality assurance measures, replicate sampling was conducted at one quantitative site within close proximity (not in the same locations as the first set of samples) of the initial sampling area.

To assess the crayfish community, additional kick samples and seining efforts were performed following benthic macroinvertebrate sampling to ensure all crayfish habitat had been covered.

**Qualitative Sampling Methods**

Benthic macroinvertebrate and crayfish were also sampled at five qualitative sites (i.e., multi-habitat) along 100-meter transects following guidelines defined by USEPA (2019) and VDEQ (2008). Sampling was conducted by performing 20 jabs with a D-frame net into suitable, stable habitats (snags, vegetation, banks, and substrate) 20 times. A single jab consists of forcefully thrusting the net into a microhabitat for a linear distance of 1.0 meter, followed by 2-3 sweeps of the same area to collect dislodged organisms for 20-90 seconds per jab, sweep, or kick. Different types of habitat were sampled in rough proportion to their frequency within the reach. Sampling effort was proportionally allocated (20 jabs/sweeps/kicks) to shore-zone and bottom-zone, 20-90 seconds per jab, sweep, or kick.

*2.3.2.3.2 Study Results*

Benthic macroinvertebrate and crayfish community metrics can be used as indicators of water quality, as these organisms often exhibit sensitivity to changing water quality conditions, and because they serve as a food resource for fish and other fauna in the riverine community. A healthy stream generally includes habitat diversity and limited pollution, often indicated by a high VSCI and HBI score (standard biological metrics).

Macroinvertebrate samples were collected from 16 sites between October 6 and 8, 2020, during the fall sample index period (September 1 – November 30) and between April 20 and 23, 2021, during the spring sample index period (March 1 – May 31), as defined by VDEQ (2008). Sampling was performed by EDGE's state and federally permitted astacologist under Virginia Scientific Collecting Permit No. 068630. The physiochemical data from each of the sample sites met the state water quality standards established for the New River (VAC Chapter 260), indicating that water quality conditions within the Project area are capable of supporting macroinvertebrate communities. Additional water quality data are provided in the Water Quality Study Report provided in the Project USR.

A total of 49 macroinvertebrate taxa were collected upstream of Byllesby Dam from two quantitative sites and four qualitative sites, along with the Spiny Stream Crayfish, which was collected from a qualitative site near the dam. The average VSCI score for sites sampled upstream of Byllesby Dam in fall 2020 was 41.9 (impaired), and only a single site resulted in a "similar to reference" score above 60, with a score of 62.7. However, four sites above Byllesby Dam had HBI values indicating "Good" to "Excellent" water quality. In spring 2021, one site upstream of Byllesby Dam had a VSCI score greater than 60, with a score of 75.1. The average VSCI score for all sites above Byllesby Dam and for both sampling seasons was 38.0. Similar to the fall sample, four sites in this Project area had HBI values indicating "Good" to "Excellent" water quality based on the tolerance of the macroinvertebrate community.

A total of 53 macroinvertebrate taxa were collected between the Byllesby Dam and Buck Dam from four quantitative sites and four qualitative sites. The average VSCI score for sites sampled between the Byllesby Dam and Buck Dam in fall 2020 was 52.5 (impaired); however, four sites (three quantitative and one qualitative) resulted in a "similar to reference" score above 60. Four sites in this section of the Project area had HBI values indicating "Good" to "Excellent" water quality. In spring 2021, only three sites resulted in a VSCI score greater than 60, and the average VSCI score for sites between Byllesby and Buck dams was 46.5. In contrast to the fall sample, seven of eight sites in the area between Byllesby and Buck dams had HBI values indicating "Good" to "Excellent" water quality based on the tolerance of the macroinvertebrate community.

A total of 30 macroinvertebrate taxa were collected from two quantitative sites located downstream of the Buck Dam. The average VSCI score for sites sampled downstream of the Buck Dam in fall 2020 was 58.8 (impaired). One of two sites scored above 60 with a total of 63.0, which was classified as "similar to reference", and had an HBI value indicating "Very Good" water quality. However, the HBI value at the downstream site was classified as "Fair". In spring 2021, one of two sites resulted in a "similar to reference" score of 62.2. The average VSCI score for the sites downstream of Buck Dam was 59.0, which is just below the threshold for "similar to reference". In contrast, both sites below Buck Dam in the fall 2020 sample, had HBI values indicating "Very Good" and "Good" water quality based on the tolerance of the macroinvertebrate community.

VSCI scores recorded at each site were greater on average in the fall than in the spring. The average VSCI scores upstream of Byllesby Dam, between Byllesby and Buck Dam, and downstream of Buck Dam all indicated "impaired" conditions during the fall and spring samples. Downstream of Buck Dam had an overall average VSCI score (58.9) just below the threshold of "similar to reference" conditions (60). During both seasonal collections, the lowest VSCI scores were recorded upstream of Byllesby Dam and the highest were recorded downstream of Buck Dam, which indicates

less impairment as you move downstream through the project area. Seven sites throughout the Project area resulted in VSCI scores greater than 60 during at least one season of survey.

One of two species of crayfish was collected upstream of Byllesby Dam, but both species were collected between Byllesby and Buck dam, and downstream of Buck Dam. There were zero crayfish captured at the two quantitative sites upstream of Byllesby Dam and both species of crayfish were captured at both quantitative sites below Buck Dam. These sites had similar substrate and habitat composition and relatively similar physiochemical parameters. Conhoway Crayfish were observed under large boulders both near the bank and further towards the middle of the channel, while the Spiny Stream Crayfish were concentrated within cobble substrates and near shore cover. Overall, the presence of two relatively abundant native crayfish species and zero invasive crayfish species in the Project vicinity may indicate a healthy community.

The mustached clubtail and the pygmy snaketail were identified as species with potential to occur in the Project vicinity by the Virginia Department of Conservation and Recreation (VDCR) in a letter dated September 23, 2017. The presence of these “species of greatest conservation need” would indicate relatively high water quality. The pygmy snaketail was collected from the New River near the Fries Project (Carey et al. 2017), which is located approximately 13 river kilometers upstream of the Project. Prior to the present study, no macroinvertebrate data were available for the Project and the presence of the mustached clubtail and pygmy snaketail were unknown for the Project reach of the New River. Although dragonfly larvae were collected during the fall and spring sampling efforts from 2020-2021, no mustached clubtail or pygmy snaketail dragonfly larvae were collected.

Crayfish surveys were also completed as part of the Fries Project, where spiny stream crayfish were the only species collected (Carey et al. 2017); however, prior to the current study, no site-specific information on crayfish populations in the Project reach of the New River were available. Approximately 33 species of crayfish, including non-indigenous and/or invasive species such as the northern virile crayfish, have been documented in waterbodies throughout Virginia (VDGIF 2018; VISAC 2018). The northern virile crayfish was collected at the Claytor Project (DTA 2008) located 70 river kilometers downstream of the Project. Representative site and crayfish photos are provided in the study report in Attachment 3 of Appendix C.

#### 2.3.2.4 Freshwater Mussel Survey

##### *2.3.2.4.1 Study Methods*

Methods used to survey mussels consisted of visually identifying potential mussel habitats within the approximately 3,000-m long reach between Byllesby Dam and the Buck Reservoir Islands as well as

the tailrace of Buck Dam. These areas were chosen to fill information gaps based on available data from historic studies completed for the majority of the surrounding habitats (Pinder et al. 2002; Alderman 2008; Stantec 2018a, 2018b). This study did not examine the Buck or Byllesby impoundment pools due to the availability of data from recent studies completed during drawdown activities (Stantec 2018a, 2018b).

To assess the Buck Dam tailrace, exposed riverbanks were observed to identify any spent valves or evidence of suitable mussel habitat. The high velocities and unknown depths in the narrow channel were not conducive for safe in-water surveys such as wading, SCUBA, or snorkeling. Ten areas identified as potential mussel habitats in the reach between Byllesby Dam and Buck Reservoir Islands were assessed using wandering timed searches (two shallow shoals, three deep shoals, three pools, and two side channels). Surveyors used SCUBA, surface supplied air diving, and snorkeling to conduct 200-minute wandering searches of the substrates in each area. Searching tactics included moving cobble and woody debris, hand sweeping away silt, sand, and/or small detritus, and disturbing/probing the upper five centimeters (two inches) of substrate where possible. Total search time was 33.3 hours.

*2.3.2.4.2 Study Results*

Nine *Cyclonaias tuberculata* were identified during the survey of the ten habitat units. Live mussels were only found in two of the ten surveyed areas and overall mussel densities were lower than the sites downstream of Buck Dam. Quality habitat within the survey area was limited as bedrock and overlying silt deposits were the most predominant substrate types. A reconnaissance level habitat assessment of the Buck Dam tailrace was also conducted. No evidence of spent valves or viable mussel habitat were observed within the Buck Dam tailrace, where high velocities resulting from a narrow, confined channel most likely preclude mussel occupancy.

Existing relevant and reasonably available studies of mussels within the Project area were reviewed and compared to results of summer 2020 field surveys. In total, data from six other mussel surveys conducted within the Project area between 1997 and 2018 were compiled to form a more comprehensive understanding of the mussel community in the vicinity of Project operations. Six species were observed within the Project area: *Cyclonaias tuberculata*, *Eurynia dilatata, Tritogonia verrucosa, Lampsilis fasciola, Lasmigona subviridis,* and *Lampsilis ovata.* Survey sites downstream of Buck Dam (downstream of the confluence of the tailrace and bypass channel) supported the highest density mussel habitats. *Cyclonaias tuberculata* and *Tritogonia verrucosa* were the most abundant species and mussel size data suggests that recent recruitment has occurred for these species. Results of 2020 field surveys are consistent with findings of historical surveys. High quality

mussel habitat within the Project area is limited and does not support a diverse or abundant mussel community.

### 2.3.3 Variances from FERC-Approved Study Plan

The Aquatic Resources Study was conducted in accordance with the methods described in the RSP with the following exceptions:

- Restrictions on non-essential travel and safety considerations for field staff prohibited spring 2020 field efforts, therefore, spring aquatic species (i.e., fish, macroinvertebrates and crayfish) sampling occurred in 2021.
- Periodic weather delays and resulting unsafe stream conditions impacted the fall 2020 fish sampling efforts. Boat electrofishing and gill net sampling was completed during the fall 2020 sampling efforts, but the ongoing weather delays resulted in the fall 2020 backpack electrofishing methods being rescheduled for spring 2021.
- At the time of sampling, the habitat and stream conditions of the proposed fish sample site were not conducive to the pre-defined methods identified during the desktop-based site selection process. To provide the most representative data for the sites identified in the RSP, sampling methods for those locations were adjusted in the field. As such, two sites were sampled with boat electrofishing instead of backpack electrofishing and one site used backpack methods instead of boat electrofishing methods.
- Per the Project RSP and Commission's SPD, intake velocities were to be measured using an ADCP along the upstream face of the angled trash racks to determine the approximate approach velocity immediately upstream of the intake structure. During the 2020 field season, a combination of high flow events and inoperable units prevented field data collection efforts As a result, approach velocity for Byllesby and Buck dams was calculated using the intake structure and trash rack dimensions along with the design maximum flow capacity of the generating units at each development. Using this approach, the calculated velocities in front of the intakes is approximately 2.0 fps (Byllesby) and 1.6 fps (Buck), which is similar to the intake velocities for the two development Project presented in the historical entrainment report (Appalachian 1991). Further, a desktop evaluation using New River hydrologic and flow data from the nearest upstream gage (USGS 03165500 New River at Ivanhoe, Virginia) suggests that the streamflow in the vicinity of the Project is comparable to that estimated in front of the intakes at Byllesby and Buck dams. Given this information, and since the design and the general operation of the facility have not changed since the prior license application, the calculated approach velocity is representative of actual conditions at

the intake structures at Byllesby and Buck dam and is used to support evaluations of impingement and entrainment at the Project.

## 2.4 Wetlands, Riparian, and Littoral Habitat Characterization Study

### 2.4.1 Study Status

Appalachian initiated and completed activities for the Wetlands, Riparian, and Littoral Habitat Characterization Study in accordance with the RSP as subsequently modified by FERC. Due to delays in the schedule documented previously, the Wetlands, Riparian, and Littoral Habitat Characterization Study Report was not filed with the ISR.

Field activities and analyses required for this study were completed in 2021. The technical report including the results of the Wetlands, Riparian, and Littoral Habitat Characterization Study is included in Appendix D of this USR.

### 2.4.2 Summary of Study Methods and Results

#### 2.4.2.1 Methods

A desktop characterization of existing and potential wetlands and waterbodies, and existing riparian and littoral vegetation was performed initially. Information sources included the USFWS NWI, VDEQ Wetland Condition Assessment Tool, USGS topographic maps and the National Hydrography Dataset, elevation data, high-resolution orthoimagery, and Natural Resources Conservation Service soil surveys. Data collected during the desktop survey were used to create preliminary habitat characterization maps, which were then used to facilitate the field verification efforts. For the purposes of this study, the riparian zone was defined as terrestrial areas 100 feet from the shoreline or to the study area boundary, whichever was closer. The littoral zone was defined as the shallow shoreline area of the New River from the stream bank down to the maximum depth of light penetration in the water column and also includes instream emergent and/or submerged aquatic vegetation beds.

Potential streams and wetland areas not confirmed previously (i.e., through prior licensing studies or other sources) were field-verified by HDR wetland scientists from July 20 – 22, 2021. A visual assessment and field evaluation of wetland hydrology, hydrophytic vegetation, and hydric soils was performed to identify wetlands. Wetland cover types were classified according to dominance by trees (palustrine forested), shrub species (palustrine scrub-shrub), herbaceous species (palustrine emergent), and rocky bottom (palustrine rocky bottom). Ordinary high water mark indicators

including bed and banks, change in sediment texture, deposition, shelving, and change in vegetation were identified in the field to assess the presence of non-wetland waterbodies and streams.

Transect-based surveys were performed to characterize the availability of littoral zone aquatic habitats within the study area. Seven transect lines were evaluated in each of the Project reservoirs and four additional transect lines were evaluated in the tailrace and bypass portions downstream of the Byllesby and Buck dams. In the reservoirs, transects were oriented parallel to the shoreline in boat accessible areas, with transects distributed to represent both shorelines. In the tailrace and bypass reaches of the river, transects were oriented perpendicular to the shoreline to include littoral zones along the stream margins and potential instream shallows where emergent or submerged vegetation may occur.

Each transect line was 100 meters (m) in length and 1.0-$m^2$ areas (i.e., quadrants) spaced equally along the transect line at 10-meter intervals were surveyed. For two of the eleven transects (littoral zones 10 and 11), only four quadrants were sampled along the transect. The survey at each of the intervals consisted of a visual presence/absence assessment for emergent or visible submerged aquatic vegetation. A vegetation sampling throw rake was also deployed at each sample area on transect lines (when feasible) to capture any non-visible submerged aquatic vegetation. The location and scientific name of each vegetation sample were recorded during the survey.

Data from the desktop review were also used to perform the riparian habitat field verification. To facilitate the field verification of the preliminary vegetative cover maps, the riparian habitat within each vegetative community type was characterized by recording the dominant species of vegetation at three strata (tree, sapling/shrub, and herb). HDR biologists used relevant reference materials including regional field guides and plant identification mobile apps to identify plants to genus and species level. Riparian areas located in within the study area resembled Piedmont/Mountain Floodplain Forest and Swamps as described in the VDCR Natural Communities of Virginia Ecological Groups and Community Types -Third Approximation (Version 3.3) (VDCR 2021).

Field teams performed a survey for the federally threatened state-listed Virginia spiraea (*Spiraea virginiana*) during field activities during the recommended survey window of the species (May-July). Results from the Virginia spiraea habitat assessment performed in 2017 (ESI 2017) were used to perform field-based habitat assessments and visual assessments in areas with potential habitat.

#### 2.4.2.2 Results

##### *2.4.2.2.1 Wetlands*

A total of 95.43 acres of wetlands were field verified during field efforts from July 20 through July 22, 2021. There were 50.72 acres of palustrine emergent wetlands, 11.6 acres of palustrine scrub shrub,

15.37 acres of palustrine forested, and 17.74 of rock bottom wetlands. Palustrine emergent wetlands comprise the majority of the wetlands within the study area and occur primarily as fringe wetlands and floodplain wetlands along the shorelines of the New River and Crooked Creek, as well as on islands within the New River. Palustrine forested wetlands within the Study Area occur primarily on the higher floodplains and point bars of the New River. Palustrine scrub-shrub wetlands within the study area occur primarily in the floodplain of the New River at an elevation higher than most of the emergent wetlands but lower than the forested wetlands where frequent inundation could occur. Palustrine rock bottom wetlands are seasonally flooded to intermittently exposed trees, shrubs, and herbaceous vegetation on boulder and cobble deposition bars, or less frequently bedrock exposures, on the shores and islands of high-gradient streams. In the study area, these occur primarily within the Byllesby and Buck bypass reaches. The VDEQ Wetland Condition Assessment Tool results indicated that there were no stressed areas of wetlands in the study area.

Riverine habitats in the study area include the New River and associated tributaries. The New River is a lower perennial riverine feature on the upstream and downstream limits of the study area. There are several perennial tributaries that flow into the New River including Chestnut Creek, Crooked Creek, Rocky Branch, Poor Branch, Big Branch, and Brush Creek along with eight unnamed tributaries. In general, these perennial riverine habitats included several areas of scour with dominant vegetation consisting of American sycamore, boxelder, cattails, and reed canary grass. The dominant substrate included cobble to boulder sized rock along with bedrock. Additionally, there are four intermittent streams that flow into the New River. These streams had similar dominant vegetation as the perennial streams with a substrate consisting of mud to cobble. A total of 15,608.42 linear feet of riverine features were field verified; there were 514.9 linear feet of perennial stream habitat and 501 linear feet of intermittent stream habitat. The locations and characteristics of streams and wetlands are detailed further in Appendix D and representative photos are included in Attachment 1 of Appendix D.

*2.4.2.2.2 Littoral Zone*

The littoral zone contained seasonally flooded to intermittently exposed herbaceous vegetation along depositional bars on the shores of the reservoirs and within the rock exposures of the bypass reaches. Substrates consisted of angular bed rock and depositional bars of sand and organic material. Pools of surface water were present throughout the surveyed littoral zones with patchy vegetation growth in areas that were above water level. The location of littoral zone transects are included in Appendix D and representative photos along the transects are provided in Attachment 2 of Appendix D.

Littoral zone vegetation included *Elodea Spp*, algae, curly pondweed (*Potamogeton crispis*), Parrot's feather (*Myriophyllum aquaticum*), broad leaf pondweed (*Potamogeton natans*), smartweed (*Polygonum* sp.), spike rush (*Eleocharis palustris*), bulrush (*Scirpoides holoschoenus)*, rice cut grass, soft rush (*juncus effusus)*, water willow (*Justicia americana)*, shallow sedge (*Carex lurida*), Japanese honeysuckle (*Lonicera japonica*), goldenrod (*Solidago sp*.), Virginia creeper (*Parthenocissus quinquefolia*) and American sycamore (*Platanus occidentalis)*. Curly pondweed is considered to be a non-native invasive species. Elodea was the most abundant submerged aquatic vegetation throughout the reach located close to the stream bank adjacent to wetlands. Although present throughout the reach, algae was dominant in the littoral zone upstream from the Byllesby Dam where water flow was slower. In the bypass reaches, Elodea and algae were the dominant aquatic plants. Representative photographs of littoral zone habitat are provided in Attachment 2 of Appendix D.

#### *2.4.2.2.3 Riparian Zone*

The riparian area consisted of approximately 177 acres and included areas along the shoreline, on islands, and within the bypass reach. The majority of the riparian area appeared to be flooded on a seasonal or annual basis. The riparian areas surveyed ranged from early to mid-successional stage, with most trees at an intermediate age and height, between 20 and 70 feet. Diversity and patchiness were generally moderate. In some areas, particularly in the riparian islands, coarse litter was abundant in the form of trees, limbs and other debris washed in during high water events. Photos of representative habitat in riparian zones are provided in Appendix D, Attachment 3.

#### *2.4.2.2.4 Virginia Spiraea Survey*

There were no observed occurrences of Virginia spiraea in areas identified in the ESI (2017) survey. However, suitable habitat was observed throughout the study area in rocky, low flow areas of streams, and on portions of bars and benches. Figure 4 in Appendix D show the location of potential Virginia spiraea habitat and provides a classification of low suitability or moderate suitability. Attachment 4 of Appendix D provides representative photographs of potential Virginia spiraea habitat.

#### *2.4.2.2.5 Invasive Plant Species*

The invasive plant species observed in the study area were Japanese knotweed, multiflora rose, oriental bittersweet, and Tree of Heaven. These species were located along the banks of the New River and several associated tributaries as well as within the floodplain. These results are reflective of the region-wide invasion of these invasive and non-native species in the eastern U.S.

### 2.4.3 Variances from FERC-Approved Study Plan

The Wetland, Riparian, and Littoral Habitat Study was conducted in conformance with the FERC-Approved Study Plan.

## 2.5 Terrestrial Resources Study

### 2.5.1 Study Status

Appalachian initiated and completed activities for the Terrestrial Resources Study in accordance with the RSP as subsequently modified by FERC. Due to delays in the schedule documented previously, the Terrestrial Resources Study Report was not filed with the ISR.

Field activities and analyses required for this study were completed in 2021. The technical report including the results of the Terrestrial Resources Study is included in Appendix E of this USR.

### 2.5.2 Summary of Study Methods and Results

#### 2.5.2.1 Methods

The Terrestrial Resources Study was performed initially as a desktop analysis followed by a field verification to confirm locations and boundaries of upland terrestrial habitat types within the study area. A high-level characterization of the upland vegetation communities within the study area boundary was completed using high-resolution orthoimagery and other online databases including the Nature Conservancy's Terrestrial Habitat Map (TNC 2018) and Virginia Natural Heritage Data Explorer (VDCR 2021).

The Virginia Invasive Plant Species List (VDCR 2014) was used to rank the level of threat to forests and other natural communities and native species. A "high ranking" indicates a species poses a significant threat to native species, natural communities, or the economy. A "medium ranking" indicates the species poses a moderate threat to native species, natural communities, or the economy, and "low ranking" indicates a species poses a low threat.

The on-site terrestrial surveys were conducted from May 26 through May 28, 2021. Applicable reference materials were using during the field assessments including regional field guides and plant identification mobile apps to identify plants to genus and species level. Upland vegetation cover types were verified in the field and plant communities were characterized according to VDCR (2021a). The dominant species of upland vegetation, and any invasive species observations, were noted within each community type. The location of invasive species observed during the field verification were georeferenced and photographed using the ArcGIS Collector mobile app. Finalized

cover type maps depicting plant community classifications and locations of invasive species were generated along with a summary list of the upland vegetative plant species documented during the field verification effort.

During the field verification activities, observations of avifauna, mammals, or observations of their tracks and scat were recorded. A summary list of the wildlife species or signs of their presence were compiled along with the general vegetative community where the observation occurred.

#### 2.5.2.2 Results

The base map created during the desktop study depicting major upland vegetation cover types present within the study area was used to verify and characterize terrestrial communities that best represent ecological groups described in accordance with VDCR (2021a). Terrestrial habitats varied throughout the study area and best professional judgement was used to categorize identified habitats into ecological groups and community types described in VDCR (2021a). Four upland communities were mapped within the study area: 1) Acidic Cove Forests, 2) Montane Mixed Oak and Oak Hickory Forests, 3) Mountain/Piedmont Basic Woodlands, 4) Piedmont/Mountain Floodplain Forests and Swamps. The most prevalent natural community was Piedmont/Mountain Floodplain Forests and Swamps, encompassing approximately 228 acres. Descriptions, classifications, and photographs for ecological groups and natural communities are included in Appendix E.

Five herpetofauna, 15 bird species, and 10 mammal species were observed during the field surveys. According to the VDGIF Fish and Wildlife Information Services Search Report (VDGIF 2021), a total of 511 animal species (including terrestrial and aquatic species) are known or likely to occur within a 3-mile radius of the study area (Attachment 3). Of these 511 species, 342 are terrestrial species, 127 are aquatic species, and 42 are semi-aquatic species. Table 3 of Appendix E (Terrestrial Resources Study Report) presents wildlife species directly observed or signs of their presence during the field visit as well as the natural community type in which each species was observed.

The presence of several species on VDCR's Virginia Invasive Species Plant List (VDCR 2014) were identified throughout the study area. Many invasive species were observed at low densities scattered throughout the study area and not feasible to map each individual location, however, significant infestations were mapped and are presented in Appendix E. Significant infestations of Japanese knotweed (most abundant), oriental bittersweet, and mutliflora rose were noticed primarily in riparian areas along the reservoirs. Photographs of invasive species and the ranking of each invasive species on the Virginia Invasiveness Ranking (VDCR 2014) list are also presented in Appendix E.

Continued operation and maintenance of the Project over the new license term is not anticipated to have any short- or long-term, unavoidable, adverse impacts on terrestrial resources. Appalachian proposes to continue to operate the Project in the existing run-of-river mode for the protection of multiple resources. There are no plans for improvements or activities at the Project that would include extensive clearing of vegetation; therefore, trees that provide habitat for roosting or maternity colonies for Indiana bat and northern long-eared bat and nesting and roosting trees for bald eagles would not be impacted.

While the continuation of Project operations is not expected to adversely impact terrestrial resources; local improvements to recreational facilities could have the potential to disturb botanical and wildlife resources (please see Appendix G for the Recreation Study Report).

### 2.5.3 Variances from FERC-Approved Study Plan

The Terrestrial Resources Study was conducted in conformance with the FERC-approved study plan.

## 2.6 Shoreline Stability Assessment

### 2.6.1 Study Status

Appalachian initiated and completed activities for the Shoreline Stability Assessment in accordance with the RSP as subsequently modified by FERC. Due to delays in the schedule documented previously, the Shoreline Stability Assessment Report was not filed with the ISR.

Field activities and analyses required for this study were completed in 2021. The technical report including the results of the Shoreline Stability Assessment is included in Appendix F of this USR.

### 2.6.2 Summary of Study Methods and Results

#### 2.6.2.1 Methods

The Shoreline Stability Assessment was performed as a desktop analysis followed by field confirmation of shoreline areas within the study area, including the reservoir, bypass reach, and tailrace areas identified in the desktop analysis as requiring confirmation or additional investigation. Relevant literature and data were reviewed including ESRI Geographic Information System data, Virginia Geographic Information Network aerial photos, USGS topographic maps, and Natural Resources Conservation Service soil surveys to assess bank composition and erosion potential in the study area.

The field surveys for the Shoreline Stability Assessment were conducted on July 20-22, 2021. Streambanks were assessed in the field for susceptibility to erosion and the need and potential for remediation by two, two-person field crews either by canoe or walking along the streambanks. Best professional judgement was used to estimate root depths and density since bank materials were not disturbed or removed during the study. The Bank Erosion Hazard Index (BEHI) method (Rosgen 2001; WVDEP 2015) was used to assess physical and geomorphic properties of the streambank to validate the probable sources of bank instability using streambank variables. The metrics used to estimate BEHI include ratio of bank height to bankfull height, ratio of root depth to bank height, root density percentage, surface protection percentage, and bank angle in degrees. These metrics are associated with scores as based on Rosgen (2001) and were totaled to categorize the overall condition of the stream reach assessed. Detailed methods are included in Appendix F of this USR.

#### 2.6.2.2 Results

Of the approximately 7.25 miles of New River shoreline assessed, results of the field investigation indicated that approximately 80 percent of the shoreline within the study area exhibited no signs of erosion. Of the 15 areas identified as having some degree of shoreline erosion, average BEHI scores ranged from 11.75 (low) to 33.85 (high). There were no areas categorized as having very high or extreme erosion potential. Most of the banks with some level of visible erosion had moderate root depth, low to moderate surface protection, and moderate to high bank angle. Generally, banks adjacent to the Jefferson National Forest exhibiting significant incision were least stable. High erosion potential was observed in Erosion Areas 1 and 2 on the west bank just north of Byllesby Powerhouse. High erosion potential was also observed in Erosion Areas 4, 5, and 6 along the west bank north of Areas 1 and 2. Erosion Area 3 immediately to the north of Erosion Areas 1 and 2 had moderate erosion potential. Erosion Area 9 on the east bank across from Area 2 also exhibited high erosion potential. Streambanks to the north near Buck Powerhouse and to the southeast near Crooked Creek were categorized as having moderate erosion potential and Erosion Area 15 exhibited low erosion potential. Details, erosion area maps, and photographs of each erosion area are included in the Shoreline Stability Assessment Report in Appendix F.

Under the new license term, Appalachian proposes to continue operating the Byllesby and Buck developments as they are presently operated, including run-of-river operations and maintenance of existing vegetated and buffer areas. Soils along the Project shorelines 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 higher 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. Overall, visual inspection of the Project shoreline during this study indicated stable banks, no noticeable aggradation/degradation, and only localized streambank erosion, which is an important process in maintaining habitat for aquatic resources. Appalachian does not, therefore, propose remediation of any shoreline areas in the Project Boundary or study area at this time.

### 2.6.3 Variances from FERC-Approved Study Plan

The Shoreline Stability Assessment was conducted in conformance with the FERC-approved study plan.

## 2.7 Recreation Study

### 2.7.1 Study Status

Appalachian initiated and completed the Recreation Study in 2020 in accordance with the schedule provided in the RSP, with minor variances as previously noted in the ISR. A Recreation Study Report was filed with the ISR on January 18, 2021, and the results of this study were presented at the ISR meeting on January 28, 2021. No study modifications were made or required by FERC subsequent to comments received at or following the ISR meeting.

Additional field activities and consultation in support of this study were completed in 2021. The Recreation Study Report (including advancements since submission of the ISR) is included in Appendix G of this USR.

### 2.7.2 Summary of Study Methods and Results

#### 2.7.2.1 Recreation Facility Inventory and Condition Assessment

As discussed in the ISR, Appalachian's sub-consultant, Land Planning Design Associates (LPDA), conducted a Recreation Facility Inventory and Condition Assessment of seven Project and Non-Project recreation facilities. LPDA staff conducted the site assessments on November 13, 2019 and as described in the RSP recorded the specific criteria for each facility and completed a qualitative assessment of the condition of the facilities.

LPDA observed several common themes among the recreation facilities (project and Non-Project) including:

- Lack of Americans with Disabilities Act accessibility,

- Aging though functional furnishings, informally developed amenities, incomplete signage, and deferred maintenance.
- There is a high potential for increasing recreation value of the sites, both by improving the existing conditions and by developing related amenities.

The Recreation Facility Inventory and Condition Assessment is provided in Appendix G, Attachment 1. This task was completed in 2020 and no updates have been made since the ISR.

#### 2.7.2.2 Site Visit with Stakeholders

As discussed in the ISR, Appalachian convened a site visit with interested relicensing participants to discuss existing and future recreational opportunities at the Project on October 28, 2020. Prior to the site visit, Appalachian held a virtual meeting on October 21, 2020 with involved stakeholders to share preliminary recreation data.

Since the filing of the ISR, Appalachian conducted additional consultation with VDWR to evaluate potential Project and Non-Project recreation facility improvements to be included as part of Appalachian's licensing proposal, as follows:

- Site visit to the VDWR Loafer's Rest recreation facility with VDWR, Appalachian, and Appalachian's consultants on March 24, 2021.
- Conference call with VDWR, Appalachian, and Appalachian's consultants for the Recreation Study on June 29, 2021 to discuss priorities for potential Project and Non-Project recreation facility improvements and to introduce preliminary concepts for development of the VDWR Loafer's Rest recreation facility.

Meeting notes are provided in Appendix G, Attachment 2.

#### 2.7.2.3 Recreation Visitor Use Online Survey

As discussed in the ISR, HDR developed an online survey as described in the RSP. The online survey was administered through the Project's relicensing website and offered respondents the opportunity to provide survey responses electronically from April through November 2020.

Appalachian posted signs at the Project and Non-Project recreation facilities (except the Byllesby VDWR Boat Launch) providing a brief description of the purpose and intent of the survey and the website address. This allowed respondents to complete a survey onsite, or later upon returning home from their visit, or without visiting the Project if the link was identified through other (electronic) communications. Appalachian also contacted the USFWS, VDEQ, VDWR, Virginia Department of Conservation and Recreation, New River Conservancy, and Carroll County stakeholders at the beginning and end of the survey window to support distribution of the survey. Additionally,

Appalachian notified relicensing participants that the online survey was available through the quarterly ILP study progress report. Notice of the survey was also posted on the Project's relicensing website and on a relevant social media outlet (i.e., Claytor Lake Facebook page) maintained by Appalachian.

The online survey provided a method for existing and potential recreation visitors to the Study Area to respond and provide feedback on recreation opportunities (Project and Non-Project facilities) at the Project. From April 21, 2020 to December 1, 2020, Appalachian received 142 responses to the online survey. Eighty-four percent of the responses came from four recreation facilities: Byllesby Boat Launch (VDWR), Buck Dam Canoe Portage, New River Canoe Launch, and New River Trail Picnic Area, indicating these sites were the most frequently utilized by online survey participants. The online survey resulted in positive feedback along with requests for more access and use of Loafer's Rest for fishing. Respondents also requested the reopening of the Thompson campground. The online survey respondents also reported a local interest in maintaining and improving the recreation facilities at the Project for the local economy.

Facility-specific summaries and verbatim user comments from the online survey are included in Appendix G, Attachment 3. This task was completed in 2020 and no updates have been made since the ISR.

#### 2.7.2.4 Recreational Use Documentation

As discussed in the ISR, HDR documented and reviewed over a full year of Project and Non-Project recreation facility usage with motion-activation trail cameras. The cameras were installed to collect site visitor data and document use patterns. Eight trail cameras were installed on October 15 and 16, 2019 and were removed on November 5, 2020. HDR downloaded data from the cameras on eight different occasions, capturing thousands of photos. All cameras recorded time, temperature, date, and vehicle usage. Review of the trail camera data indicates that the Study Area is well-used during the spring to fall months, which is attributed largely to the easy access along the entire left bank via the New River Trail.

The Project facilities most frequented by users are the Byllesby VDWR Boat Launch and the Byllesby Canoe Portage parking lot. These two Project facilities provide a range of recreation opportunities including boating, canoeing, fishing, walking, biking, and hiking. The Byllesby VWDR Boat Launch has the easiest boat access to the New River within the Study Area. Fishing is also popular along the shoreline at this facility. Based on the capacity assessed through the trail camera study the parking areas at the Project are sufficient to meet the current demand during a typical and peak recreation day. The Buck Dam Canoe Portage was the only Project recreation facility that saw

very little recreation usage, likely because it is inaccessible except by canoe/kayak. The tailrace at Loafer's Rest is of interest to anglers but is often flooded by the trash gate; that camera station observed approximately two recreational users over the course of the trail camera study. Appendix G, Attachment 4 provides a representative photo for select seasonal days. This task was completed in 2020 and no updates have been made since the ISR.

### 2.7.3 Variances from FERC-Approved Study Plan

The Recreation Study was conducted in conformance with the FERC-approved study plan.

## 2.8 Cultural Resources Study

### 2.8.1 Study Status

Appalachian initiated and completed the Cultural Resources Study in accordance with the schedule provided in the RSP, with minor variances as previously noted in the ISR. A preliminary Cultural Resources Study Report was filed with the ISR on January 18, 2021, and the results of this study were presented at the ISR meeting on January 28, 2021. No study modifications were made or required by FERC subsequent to comments received at or following the ISR meeting.

The final Cultural Resources Study report was filed with the FERC as a CUI/Privileged volume of the DLA on October 1, 2021, therefore a summary of the report is included below but the report is not being filed with this USR. The Cultural Resources Study Report was transmitted on September 8, 2021 to the Virginia SHPO and consulting Tribes for their review and concurrence with the report's recommendations. No reply comments have yet been received.

### 2.8.2 Summary of Study Methods and Results

The goal of the Cultural Resources Study is to collect additional information regarding cultural resources within the Project APE to assist in identifying Project effects on archeological and historic properties and developing appropriate management measures.

Concurrent with the January 7, 2019 PAD and NOI required by the ILP, Appalachian requested designation as the Commission non-federal representative for carrying out informal consultation pursuant to Section 106. The Commission granted Appalachian's request by notice dated March 8, 2019. Pursuant to 36 CFR §800.4(a)(1), in a letter dated September 1, 2020, Appalachian consulted with the Advisory Council on Historic Preservation, the U.S. National Park Service, Bureau of Indian Affairs, SHPO, the Cherokee Nation, the Catawba Indian Nation, the Delaware Nation, the Pamunkey Indian Tribe, the Eastern Band of Cherokee Indians, and the Archaeological Society of

Virginia, requesting concurrence on determining the APE for the Project defined as all lands necessary for Project operations. Responses from these stakeholders are included in the Cultural Resources Study Report filed with the FERC on October 1, 2021.

#### 2.8.2.1 Methods

In August 2020, Appalachian's sub-consultant [Terracon Consultants, Inc. (Terracon)] reviewed the Virginia Cultural Resource Information System to identify previously recorded cultural resources within a 0.5-mile radius of the Study Area. On September 10, 2020, Terracon staff traveled to the SHPO office in Richmond, VA to gather additional information otherwise unavailable in the database. The results of Terracon's research are presented in the Cultural Resources Study Report filed with FERC on October 1, 2021.

From October 19 to 22, 2020, Terracon conducted an archaeological assessment of portions of the Project APE. Areas south of Byllesby were accessed by boat, while areas north of Byllesby were accessed by land where possible. The riverbank and islands between Byllesby and Buck were generally not observed due to accessibility and safety concerns with rapidly flowing water and shoals. Terracon attempted to re-locate archaeological sites, although neither was observed during the field work, possibly due to high water levels. Archaeological and geomorphological investigations of the Project found that most of the APE is either steeply sloped or deeply buried in historic alluvium. In addition, there was very little erosion or other Project related effects in any portions of the APE.

#### 2.8.2.2 Results

Nine different portions of the Project area considered to have the highest potential for containing archaeological resources were examined using shovel testing. In addition, Terracon tried to relocate the three previously recorded sites, 44CA3, 44CA33, and 44CA121. As a result of the survey, only site 44CA33 was identified. This temporally non-diagnostic lithic scatter is recommended as being ineligible for inclusion in the NRHP. Sites 44CA3 and 44CA121 could not be relocated, possibly because the water level was too high. In addition to the archaeological investigations, geomorphological investigations were conducted by Seramur & Associates from October 26–28, 2020, and again on April 20, 2021. Twenty hand auger borings were placed in the same nine areas where archaeological investigations took place. Based on the geomorphological analysis, only the area near site 44CA33 had the potential to contain buried archaeological deposits. Currently, this area is not being affected by Project operations, including erosion. The other eight areas did not have suitable landforms for containing undisturbed archaeological resources.

Additionally, there are three aboveground resources identified within the Project boundary—the Buck Hydroelectric Facility (017-0022); the Byllesby Dam (017-5154); and the Norfolk and Western Railway Cripple Creek Extension (077-5068). The Byllesby and Buck facilities were determined to be eligible for the NRHP (Louis and Berger 1991), as was the Norfolk and Western Railway. None of these historic resources are currently being affected by Project operations. The three above-ground historic resources are eligible for inclusion in the National Register of Historic and were revisited during the field work. All three remain eligible for listing in the NRHP.

Based on the initial background research and site investigations, and the fact that none of the properties eligible for listing in the NRHP are being impacted, it is Terracon's opinion that no historic properties are currently being affected by continued Project operations. However, Terracon recommended if new construction or significant ground disturbance occurs in areas that have the potential to contain archaeological resources (including areas with an unknown potential), additional archaeological investigations may be warranted and consultation with the SHPO would be necessary. Similarly, if there are any substantial changes to either the Byllesby or Buck facilities, consultation with the SHPO and other consulting parties would be required.

### 2.8.3 Variances from FERC-Approved Study Plan

The Cultural Resources Study was conducted in conformance with the FERC-approved study plan.

# 3 Upcoming ILP Milestones and Study Reporting

Table 3-1 presents upcoming ILP milestones.

**Table 3-1. Upcoming Major ILP Milestones**

| Date | Milestone |
|---|---|
| November 17, 2021 | Appalachian File USR (18 CFR §5.15(f)) |
| December 1, 2021 | Appalachian Host USR Meeting (18 CFR §5.15(f)) |
| December 16, 2021 | Appalachian File USR Meeting Summary (18 CFR §5.15(f)) |
| December 31, 2021 | Stakeholders File Comments on DLA (18 CFR §5.16(e)) |
| January 15, 2022 | Stakeholders File Disagreements with USR Meeting Summary (18 CFR §5.15(f) (if necessary) |
| February 14, 2022 | Appalachian File Response to USR Meeting Summary Disagreements (18 CFR §5.15(f) (if necessary) |
| February 28, 2022 | Appalachian File Final License Application (18 CFR §5.17) |

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# Attachment 1

Attachment 1 – USR Meeting Agenda

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# Attachment 1

Attachment 1 - Byllesby-Buck USR Meeting Agenda

# Updated Study Report Meeting Agenda

| | |
|---|---|
| Project: | Byllesby-Buck Hydroelectric Project |
| Subject: | Updated Study Report Meeting |
| Date: | Wednesday, December 01, 2021 |
| Location: | WebEx |

The Updated Study Report (USR) meeting is scheduled for December 1, 2021 from 9 a.m. to approximately 4 p.m. The USR meeting topics are currently scheduled for the following times:

| Topic | Schedule* |
|---|---|
| Welcome and Introduction | 9:00 AM – 9:15 AM |
| Water Quality Study | 9:15 AM – 10:15 AM |
| Wetlands, Riparian, and Littoral Habitat Study | 10:15 AM – 10:35 AM |
| Terrestrial Resources Study | 10:35 AM – 10:55 AM |
| *Morning Break* | 10:55 AM – 11:10 AM |
| Shoreline Stability Study | 11:10 AM – 11:30 AM |
| Aquatic Resources Study<br>• Fish Community<br>• Impingement and Entrainment<br>• Macroinvertebrate and Crayfish | 11:30 AM – 12:30 PM |
| Lunch Break | 12:30 PM – 1:00 PM |
| Bypass Reach Flow and Aquatic Habitat Study | 1:00 PM – 2:00 PM |
| *Afternoon Break* | 2:00 PM – 2:10 PM |
| Recreation Study | 2:10 PM – 3:10 PM |
| Cultural Resources Study | 3:10 PM – 3:30 PM |
| Discussion, Questions and Next Steps | 3:45 PM – 4:00 PM |

*Participants are free to join the meeting in part based on interests or availability, but please note that the agenda is intended as an approximation and more or less time may be spent on individual studies, as needed.

# Attachment 2

Attachment 2 – FERC Correspondence

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**Appalachian Power Company**
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

Via Electronic Filing

January 18, 2021

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

**Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514-186)**
**Filing of Initial Study Report and Schedule for Virtual ISR Meeting**

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Licensee), 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 Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission). The Project underwent relicensing in the early 1990s, and the current operating license for the Project expires on February 29, 2024. Accordingly, Appalachian is pursuing a subsequent license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Appalachian developed a Revised Study Plan (RSP) for the Project that was filed with the Commission and made available to stakeholders on October 18, 2019. On November 18, 2019 FERC issued the Study Plan Determination (SPD). On December 18, 2019, Appalachian filed a request for rehearing of the SPD. The SPD was subsequently modified by FERC by an Order on Rehearing dated February 20, 2020.

On July 27, 2020, Appalachian filed an updated ILP study schedule and a request for extension of time to file the Initial Study Report (ISR) to account for Project delays resulting from the COVID-19 pandemic. These delays pushed the start of the 2020 field season into early August 2020 and resulted in some of the spring and summer 2020 field work being rescheduled for 2021. The request was approved by FERC on August 10, 2020, and the filing deadline for the ISR for the Project was extended from November 17, 2020 to January 18, 2021.

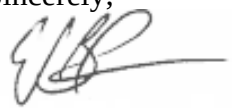
During the restricted 2020 field season, Appalachian has conducted studies in accordance with 18 CFR §5.15, as provided in the RSP and as subsequently modified by FERC's SPD. In accordance with 18 CFR §5.15, Appalachian is hereby filing the ISR with the Commission. The ISR describes the Licensee's overall progress in implementing the study plan and schedule, summarizes available data, and describes any variances from the study plan and schedule approved by the Commission.

The Commission's regulations at 18 CFR §5.15(c) require Appalachian to hold a meeting with participants and FERC staff within 15 days of filing the ISR. **Accordingly, Appalachian will hold an ISR Meeting via Webex from 10 AM to 3 PM on Thursday, January 28, 2020.** An agenda for the ISR Meeting is provided in Attachment 2. Participants are free to join the meeting in part based on interests or availability, but please note that the agenda is intended as an approximation and more or less time may be spent on individual studies, as needed.

**Appalachian respectfully requests that the stakeholders interested in participating in the Virtual ISR Meeting contact Maggie Yayac at maggie.yayac@hdrinc.com on or before close of business Tuesday, January 26, 2021 to obtain instructions to join the virtual meeting.**

If there are any questions regarding this progress report, please do not hesitate to contact me at (540) 985-2441 or via email at ebparcell@aep.com.

Sincerely,



Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

cc: Distribution List
Jonathan Magalski (AEP)

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

**Federal Agencies**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**State Agencies**

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

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

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

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

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

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

Ms. Emma Williams
Office of the Secretary of the Commonwealth
Virginia Council on Indians
PO Box 2454
Richmond, VA 23218
emma.williams@governor.virginia.gov

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

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

Ms. Sharon Ewing
Virginia Department of Conservation and Recreation
sharon.ewing@dcr.virginia.gov

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

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

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

Mr. Sam Sweeney
New River Trail State Park Manager
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Max Meadows, VA 24360
sam.sweeney@dcr.virginia.gov

Mr. Jimmy Elliott
Virginia Department of Conservation and Recreation - New River Trail
james.elliott@dcr.virginia.gov

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

Mr. Joe Grist
Water Withdrawl Program Manager
Virginia Department of Environmental Quality
PO Box 1106
Richmond, VA 23218
joseph.grist@deq.virginia.gov

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

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

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

Mr. Steve Truitt
Carroll County Administrator

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

NEPA Review
Virginia Department of Environmental Quality
eir@deq.virginia.gov

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

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

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

Timothy Roberts
Review and Compliance Division
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221
Tim.Roberts@dhr.virginia.gov.

**Local Governments**

Mr. Stephen Bear
Wythe County Administrator
340 South Sixth Street
Wytheville, VA 24382
sdbear@wytheco.org

Mr. Rex Hill
Carroll Board of Supervisor
Carroll County
rex.hill@carrollcountyva.gov
Carroll County
605-1 Pine Street

Hillsville, VA 24343
Steve.Truitt@carrollcountyva.gov

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

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

Dr. Beth Taylor
Mayor
Town of Wytheville
beth.taylor@wytheville.org

**Tribes**

Caitlin Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Road
Rock Hill, SC 29730
Caitlin.Rogers@catawba.com

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

Erin Paden
Director of Historic Preservation
Delaware Nation
31064 State Highway 281
Anadarko, OK 73005
epaden@delawarenation-nsn.gov

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

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

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

Terry Clouthier
Tribal Historic Preservation Officer
Pamunkey Indian Tribe
1054 Pocahontas Trail
King William, VA 23086
terry.clouthier@pamunkey.org.

Whitney Warrior
Natural Resources & Cultural Preservation Director
United Keetoowah Band of Cherokee Indians
PO Box 746
Tahlequah, OK 74465
wwarrior@ukb-nsn.org

**Non-Governmental Organizations**

Mr. Bill Tanger
Friends of the Rivers of Virginia
PO Box 1750
Roanoke, VA 24008
Bill.tanger@verizon.net

Ms. Angie Grooms
angie.grooms750@gmail.com

Mr. David Taylor
jklfloat@embarqmail.com

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

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

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

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

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

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

Ms. Andrea Langston
New River Land Trust
PO Box K
Blacksburg, VA 24063-1025

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

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

**Appalachian Power Company**
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

February 12, 2021

Via Electronic Filing

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

**Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514-186)**
**Filing of Initial Study Report Meeting Summary**

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Licensee), 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.

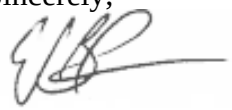
The Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission). The Project underwent relicensing in the early 1990s, and the current operating license for the Project expires on February 29, 2024. Accordingly, Appalachian is pursuing a subsequent license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Pursuant to 18 CFR § 5.15(c), Appalachian filed the Initial Study Report (ISR) with the Commission on January 18, 2021. The ISR filing also included notification of the ISR Meeting date, time, and proposed agenda. As required by the ILP schedule within 15 days of the ISR filing, Appalachian held a virtual ISR Meeting via Webex from 9:30am to 3pm on Thursday, January 28, 2021.

Pursuant to 18 CFR § 5.15(c)(3), Appalachian hereby files the ISR Meeting summary for Commission and stakeholder review. The ISR Meeting presentation is included as an attachment to the ISR Meeting summary.

If there are any questions regarding this filing, please do not hesitate to contact me at (540) 985-2441 or via email at ebparcell@aep.com.

Sincerely,



Elizabeth Parcell
Process Supervisor
American Electric Power Service Corporation

cc: Distribution List
Jonathan Magalski (AEP)

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

**Federal Agencies**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**State Agencies**

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

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

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

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

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

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

Ms. Emma Williams
Office of the Secretary of the Commonwealth
Virginia Council on Indians
PO Box 2454
Richmond, VA 23218
emma.williams@governor.virginia.gov

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

Ms. Jennifer Wampler
Environmental Programs Planner
Virginia Department of Conservation and Recreation
600 East Main Street, 24th floor
Richmond, VA 23219
jennifer.wampler@dcr.virginia.gov

Ms. Ewing
Virginia Department of Conservation and Recreation
sharon.ewing@dcr.virginia.gov

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

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

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

Mr. Sam Sweeney
New River Trail State Park Manager
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Max Meadows, VA 24360
sam.sweeney@dcr.virginia.gov

Mr. Jimmy Elliott
Virginia Department of Conservation and Recreation - New River Trail
james.elliott@dcr.virginia.gov

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

Mr. Joe Grist
Water Withdrawl Program Manager
Virginia Department of Environmental Quality
PO Box 1106
Richmond, VA 23218
joseph.grist@deq.virginia.gov

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

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

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

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

NEPA Review
Virginia Department of Environmental Quality
eir@deq.virginia.gov

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

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

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

Mr. Jeff Williams
Regional Fisheries Manager
Virginia Department of Wildlife Resources
1796 Highway Sixteen
Marion, VA 24354
jeff.williams@dwr.virginia.gov

Timothy Roberts
Review and Compliance Division
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221
Tim.Roberts@dhr.virginia.gov.

**Local Governments**

Mr. Stephen Bear
Wythe County Administrator
340 South Sixth Street
Wytheville, VA 24382
sdbear@wytheco.org

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

Mr. Rex Hill
Carroll Board of Supervisor
Carroll County
rex.hill@carrollcountyva.gov

Mr. Mike Watson
Carroll County Administrator
Carroll County
605-1 Pine Street
Hillsville, VA 24343
michael.watson@carrollcountyva.gov

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

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

Dr. Beth Taylor
Mayor
Town of Wytheville
beth.taylor@wytheville.org

**Tribes**

Caitlin Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Road
Rock Hill, SC 29730
Caitlin.Rogers@catawba.com

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

Erin Paden
Director of Historic Preservation
Delaware Nation
31064 State Highway 281
Anadarko, OK 73005
epaden@delawarenation-nsn.gov

Mr. Andrew Downs
Administration
Delaware Tribe of Indians
5100 Tuxedo Blvd
Bartlesville, OK 74006

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

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

Terry Clouthier
Tribal Historic Preservation Officer
Pamunkey Indian Tribe
1054 Pocahontas Trail
King William, VA 23086
terry.clouthier@pamunkey.org.

Whitney Warrior
Natural Resources & Cultural Preservation Director
United Keetoowah Band of Cherokee Indians
PO Box 746
Tahlequah, OK 74465
wwarrior@ukb-nsn.org

**Non-Governmental**

Mr. Bill Tanger
Friends of the Rivers of Virginia
PO Box 1750
Roanoke, VA 24008
Bill.tanger@verizon.net

Ms. Angie Grooms
angie.grooms750@gmail.com

Mr. David Taylor
jklfloat@embarqmail.com

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

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

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

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

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

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

Ms. Andrea Langston
New River Land Trust
PO Box K
Blacksburg, VA 24063-1025

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

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

Mr. Zachary R. Slate
New River Regional Water Authority
newriverwater@gmail.com

Mr. Richard Roth
Friends of the Rivers of Virginia
rroth@radford.edu

# Meeting Summary

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|---|---|
| Project: | Byllesby-Buck Hydroelectric Project (P-2514) |
| Subject: | Initial Study Report Meeting |
| Date: | Thursday, January 28, 2021 |
| Location: | WebEx Virtual Meeting |
| Attendees: | Jonathan Magalski (AEP)<br>Elizabeth Parcell (AEP)<br>David Bailey (AEP)<br>Fred Colburn (AEP)<br>Sarah Kulpa (HDR)<br>Maggie Yayac (HDR)<br>Misty Huddleston (HDR)<br>Ty Ziegler (HDR)<br>Erin Settevendemio (HDR)<br>Kerry McCarney-Castle (HDR)<br>Joe Dvorak (HDR)<br>Jon Studio (EDGE)<br>John Spaeth (EDGE)<br>Dan Symonds (Stantec)<br>Allyson Conner (FERC)<br>Jeremy Feinberg (FERC)<br>Jody Callihan (FERC)<br>Laurie Bauer (FERC)<br>Woohee Choi (FERC)<br>Jeff Williams (VDWR)<br>John Copeland (VDWR)<br>Toby McClanahan (VDWR)<br>Brian Watson (VDWR)<br>Janet Norman (USFWS)<br>Jessica Pica (USFWS)<br>Joe Grist (VDEQ)<br>Sam Sweeney (VDCR)<br>Jennifer Wampler (VDCR)<br>Angie Grooms (Landowner)<br>David and Beth Taylor (Landowner/Mayor of Wytheville)<br>Rick Roth (Friends of the Rivers of Virginia)<br>Zach Slate (New River Water Authority, Austinville) |

# Overview

This document provides the meeting summary for Appalachian Power Company's (Appalachian) Byllesby-Buck Hydroelectric Project Initial Study Report (ISR) Meeting. The meeting was held via WebEx to review with stakeholders the progress and results reported in the ISR, which was filed with the Federal Energy Regulatory Commission (FERC) on January 18, 2021. The ISR can be accessed from either FERC's website or from AEP's website: www.aephydro.com/HydroPlant/ByllesbyBuck. A copy of the meeting presentation is included with this meeting summary as Attachment A.

# Welcome and Introductions (Slides 1-7)

Jon Magalski introduced the Byllesby-Buck Project and the ISR meeting goals and objectives, and encouraged participation and feedback. He provided an overview of the agenda and the completed and upcoming ILP schedule milestones. The studies presented in the ISR meeting correspond to those for which Appalachian made substantive progress toward completion in the first ILP study season (2020) and for which preliminary study reports were filed with the ISR:

- Aquatic Resources Study
- Bypass Reach Flow and Aquatic Habitat Study
- Water Quality Study
- Recreation Study
- Cultural Resources Study

## Questions/Comments

Janet Norman asked for a reminder about the schedule for the 2021 wetland and shoreline study. Wetland study field work is planned late July - August 2021 (previously determined to be appropriate study season for botanical species of interest) and the shoreline study field work is planned April - July 2021. Maggie Yayac noted the schedule in the ISR provides the timeline for each task of the individual studies.

Joe Grist asked when Appalachian will apply for a Virginia Water Permit (VWP) Surface Water Withdrawal Permit/401 Certification with the Virginia Department of Environmental Quality (VDEQ). J. Magalski noted that Appalachian and their consultants would be giving this further consideration and plan to follow-up with VDEQ in 2021 to confirm the schedule and pre-application meeting requirements. Sarah Kulpa noted that the VWP application would benefit from completion of the relicensing studies and is not required by the FERC licensing process to be filed until after the Final License Application, but added that Appalachian understands VDEQ's interests in an earlier filing. J. Grist noted that the sooner Appalachian plans ahead, the better it will be for VDEQ and Appalachian since the process can take a while.

# Aquatic Resources Study (Slides 8-48)

Misty Huddleston (Aquatic Resources Study Lead) introduced herself and her study team including Erin Settevendemio and HDR's sub-consultants, Jon Studio and John Spaeth with EDGE Engineering & Science (EDGE) and Dan Symonds with Stantec Inc. (Stantec).

## Study Results

**Fish Community Survey**

M. Huddleston reviewed the goal, objectives, and status of the fish community survey. J. Studio reviewed the survey methods (i.e., boat electrofishing and gillnets) and results. J. Studio noted that in general there were frequent precipitation events in the watershed in 2020 resulting in relative high base flows on the New River throughout the 2020 field season. He also explained the challenges encountered with river access in the Study Area. The Byllesby Virginia Department of Wildlife Resources (VDWR) boat launch was used as an access point to survey upstream of Byllesby Dam; however, in the riverine reach below Byllesby Dam and upstream of the Buck reservoir, EDGE could not put a boat in due to the bedrock and boulders in the riverbed.

Fall 2020 sampling efforts included boat electrofishing and gill net sets, with gill net deployment delayed to later in the index period specifically to target Walleye, and the sampling schedule and methods were done in consultation with VDWR. EDGE stated that the 2021 field effort will include backpack electrofishing samples in wadeable, riffle habitats. EDGE made clear that the backpack electrofishing

methodology would be appropriate for sampling the Candy Darter in spring 2021 if they are present within the Study Area.

J. Studio provided a high-level overview of the survey results but noted that analyses are ongoing and are pending awaiting additional data to be collected during the 2021 field season. J. Studio noted the consistency in species diversity between the Byllesby and Buck pools, with 15 fish species collected in samples from each pool.

**Desktop Impingement/Entrainment Study**

E. Settevendemio introduced the methodology and results for the desktop impingement and entrainment study. The Byllesby intake approach velocity was determined, using desktop calculation methods, to be 2.0 feet per second (fps) and the Buck intake approach velocity is 1.6 fps.

A list of target species was identified based on species recently collected within the study area, collected in prior relicensing studies within the study area, or from VDWR records of historical presence. Swim burst speeds for target species (or their surrogates) indicate that most juvenile and adult species can avoid the velocities at the intakes. Entrainment rates were estimated using historical entrainment study data compiled by the Electric Power Research Institute (EPRI). Entrainment rates were highest in April, July and October, and species that are over 8 inches in length as juveniles or adults were infrequently entrained (less than 5%). M. Huddleston clarified that the difference observed in entrainment rates between the Byllesby and Buck intakes is based on the flow capacity of the individual intakes (i.e., the four-unit Byllesby powerhouse has a higher hydraulic capacity than the three-unit Buck powerhouse).

**Macroinvertebrate and Crayfish Survey**

M. Huddleston provided an overview of the goal, objectives, and status of the macroinvertebrate and crayfish study. J. Studio covered the methods and results of the first field survey, which was completed between October 6 and October 8, 2020, and noted that the quantitative sites have good quality habitat at 7 of 8 of the sites, while the qualitative sites exhibited lower quality or poor habitat at all sites. Field teams identified two native species of crayfish. Crayfish were collected at six of the sixteen sites. No invasive species were collected. No crayfish were collected from upstream of the Byllesby dam; however, J. Studio emphasized that there are potentially many reasons for this and noted that crayfish may be collected from above Byllesby Dam during the planned spring 2021 sampling.

**Freshwater Mussel Survey**

Dan Symonds reviewed the methods and results of the mussel survey. The survey effort was concentrated in potential habitat identified downstream of Byllesby Dam and upstream of Buck Dam and additional sites downstream of Buck Dam. Dan described how reservoir areas upstream of Byllesby and Buck Dams, and the river reach downstream of Buck Dam have been subject to recent or ongoing surveys that inform our understanding of mussel populations in other parts of the study area – including the notable shift in mussel communities (increase in species richness and abundance) downstream of Buck Dam. Nine live mussels (Purple Wartyback) were found in two of the ten survey areas. Species richness was greater downstream of Buck versus in the reservoir.

## Questions/Comments

**Fish Community Survey**

Angie Grooms asked about the location of backpack shocking location below Buck Dam (J. Studio pointed it out on the map in the PowerPoint).

Janet Norman asked whether the turbidity of the water or the effects of high flows had any impact on the efficacy of the electrofishing? J. Studio noted that sampling was during what was considered “baseflow” for 2020, and turbidity was not an issue. J. Studio further clarified that Secchi disk readings (light penetrating through water) were also recorded at sampling sites prior to initiating electrofishing and results did not indicate concerns for turbidity. EDGE conducted boat electrofishing and gillnets in pool areas, which do not change much under slightly higher flows. Riffle habitats may change with higher flows, therefore J. Studio noted there is a hydrograph provided in the ISR that demonstrates after precipitation events, water levels recede quite rapidly—thus field surveys were completed after the peak in the hydrograph occurred and water levels had receded to near [2020] baseflow levels.

John Copeland asked if there is a map of where the backpack electrofishing will be located for the 2021 field season? J. Studio noted there is a map in the Revised Study Plan (RSP) and clarified where the sampling will be on the map shown in the PowerPoint (backpack shocking upstream of BFB1). There were two locations noted as boat electrofishing sites, but J. Studio clarified that they will be sampled using backpack electrofishing methods due to onsite observations and terrain restrictions (i.e. boulder habitat). There will also be four backpack electrofishing sites located downstream of Buck Dam.

Jody Callihan asked if EDGE could include the raw catch data in the Preliminary Fish Community Study Report. He explained it would be helpful to have the raw fish length data to support FERC staff’s impingement/entrainment analysis for the Environmental Analysis. J. Callihan noted that total length data would be sufficient. J. Studio agreed. The preferred format for the data is to present by “site”, “gear type”, and “species”. (Action item: HDR/Edge to include data in this format in the Updated Study Report [USR].)

J. Copeland asked about the four redhorse (*Moxostoma* spp.) fish that were caught in the gill nets and offered to share a paper that was published about New River species introductions (i.e., related to V-lip Redhorse and Silver Redhorse). (J. Copeland shared the paper with Jon Studio and HDR immediately after the meeting ended.)

J. Norman noted that in the table on page 6 (of the Preliminary Fish Community Study Report), Appalachian identifies hydrograph vs. sampling period (which is helpful to U.S. Fish and Wildlife Service [USFWS]). It shows the fall period is much higher than median daily flow over the 98-year period. J. Norman asked if there were any flow related challenges and if turbidity was measured. S. Kulpa noted that turbidity will not be measured as part of the Fish Community Study. J. Studio confirmed that EDGE did not take turbidity measurements but took Secchi depth measurements and could provide if necessary. J. Studio clarified the Secchi depths indicated that turbidity was not a concern for proceeding with sampling activities.

J. Callihan asked about the velocity measurements and how they were taken. J. Studio noted velocity measurements were taken via handheld flow measurement instruments during the fish community survey.

A. Grooms asked about the spring backpack electroshocking and wondered whether Appalachian would consider adding turbidity as a parameter since it is such an interest to the locals. J. Studio noted that it would require grab samples as EDGE surveyed different locations, but it is possible. S. Kulpa said it would be taken into consideration. A. Grooms asked whether surveys used or would use any of the continuous in-situ parameters? S. Kulpa confirmed the approved study plan for the Projects does not include continuous turbidity monitors or conduct of a broad turbidity study.

**Impingement and Entrainment**

J. Callihan asked about calculation of approach velocity (i.e., multiplying by 1.5) and if HDR could explain the calculation methodology. Ty Ziegler explained that the approach velocity calculation is based on the maximum design turbine capacity divided by the area of the intake structure opening. However, because

the headgate opening is at the bottom of the intake structure, most of the flow entering the powerhouse will be pulled from the bottom 2/3 (approximate) of the water column. For example, at the Buck development, the maximum design turbine capacity is 3,540 cubic feet per second (cfs). The width of the intake opening is 104 feet (ft) and the height of the headgate opening is 14 ft. Therefore, the calculated approach velocity = 3,540 cfs / (104 ft x 14 ft x 1.5) = 1.6 fps. The 1.5 factor assumes that flow entering the headgate will be pulled from the bottom portion of the water column equal to approximately 150 percent of the headgate height. For Buck, this equates to 14 ft x 1.5 = 21 ft which is approximately 60 percent of the total depth (approximately 35 ft) in front of the intake structure. This calculation methodology results in a conservative approach velocity because if the full depth in front of the intake structure was assumed to enter the headgate, the resulting calculated approach velocity would be approximately 1.0 fps (i.e., 3,540 cfs / [104 ft x 35 ft]).

For the Byllesby development, the design of the intake structure and location of the headgate is similar to Buck, so the same calculation methodology was used. The maximum design turbine capacity is 5,868 cfs, the width of the intake structure is 143 ft, and the height of the headgate opening is 14 ft. This results in a calculated approach velocity = 5,868 cfs / (143 ft x 14 ft x 1.5) = 2.0 fps. Again, a conservative value as the depth of water column in front of the intake structure is approximately 39 ft; using this depth would result in a calculated approach velocity = 1.0 fps (i.e., 3,540 cfs / [104 ft x 35 ft]).

T. Ziegler pointed J. Callihan to the intake structure drawings for both developments which provide the dimensions used to calculate approach velocities.

J. Callihan asked whether taking acoustic doppler current profiler (ADCP) measurements in the field to calculate approach velocity is still planned. S. Kulpa noted that originally field measurements were proposed, but after additional time in the field and understanding the trash rack design and orientation further, HDR is proposing to forgo the field work and depend on the calculated approach velocities described above. Measuring approach velocities in the field is not as straightforward as originally anticipated. T. Ziegler noted that the trash racks are angled at 15 degrees, so the bottom of the rack extends approximately 10 ft upstream of the top of the rack, which complicates ADCP measurements because the ADCP also measures velocity at an angle of approximately 25 degrees from vertical. As a result, approach velocities would have to be measured over an area across the face of each intake structure and extending approximately 25 ft upstream. Therefore, HDR recommends using the conservative approach velocity calculation methodology described above in lieu of measured approach velocities given the complexities associated with field measurements at the Byllesby and Buck developments. There was no concern noted from stakeholders on the call about forgoing field measurements to determine approach velocities.

Jessica Pica asked about the intake structure drawings and where they are available. S. Kulpa noted that we did not include them in the ISR, but can provide them in the USR and in the interim directly to USFWS if needed (Action Item: HDR to include detailed historical intake drawings in as an appendix or attachment to the final Fish Community Study Report that will be filed with the USR, after confirming the drawing or excerpted sections do not require treatment as CEII by FERC).

J. Grist asked if the literature or reference information used to determine swim speeds for assessing intake avoidance was available in the report. M. Huddleston noted that the resource used to determine swim speeds is cited in the report. S. Kulpa asked the group to please contact Appalachian or HDR if anybody has trouble finding a reference cited in the preliminary study reports.

J. Copeland questioned the species included in the study, specifically White Bass, which have become extremely rare and wondered why it was considered. E. Settevendemio explained that species were included based on both historical range data (VDWR), species of management interest, species of

recreational or commercial value, and species recently collected from the New River. E. Settevendemio clarified that the list was meant to be conservative and inclusive of more species (rather than less). M. Huddleston explained that this data is preliminary and after the field sampling at the end of the second study season (2021) HDR will update the species list to include any new species and information identified (including potential removal of White Bass), which will also be used to perform the Turbine Blade Strike Analysis.

J. Norman asked about the entrainment results figure in the report (and presentation) regarding the White Bass percentage and asked if it was not a representative species, then why include in the graph, and recommended that the graphic would be more effective if representative of species that are actually occurring in the study area. Relative abundance of fish by species collected in the 2020 and 2021 surveys will be provided in the USR. E. Settevendemio added that in the USR there will be a qualitative assessment of impingement and entrainment susceptibility of target species and clarified that the assessment is based on best professional judgement and interpretation of the impingement and entrainment assessment results. Results may change with additional fish community data, and there will be added discussion in the USR comparing the results of the fish community study versus what is provided in the EPRI entrainment database with regard to relative abundances.

M. Huddleston also added that susceptibility to impingement and entrainment is not necessarily correlated with relative abundance in of a species within the study area. Based on HDRs experience with impingement and entrainment assessments (including thermal generation cooling water intakes, as well as hydroelectric powerhouse intakes), susceptibility to entrainment and impingement at intakes is species-specific and influenced more by the type of spawning behavior (broadcast of demersal adhesive eggs, nest builders, or broadcast of buoyant eggs), life stage, body size, and seasonality (related to spawning and recruitment) when an organism encounters the intake structure. The dominant species encountered in entrainment and impingement studies rarely corresponds to the species that are most abundant in the waterbody. This point will be clarified in the USR.

**Macroinvertebrate and Crayfish Study**

No questions or comments. J. Studio clarified that all sampling and laboratory processing is being conducted in conformance with VDEQ guidelines.

**Freshwater Mussel Survey**

J. Norman asked about the sampling site where the green floater was found. D. Symonds noted that it was found during the 2018 drawdown (survey of exposed bank areas) and not the recent relicensing mussel survey. J. Copeland noted that the location is mentioned on page 19 of the Freshwater Mussel Survey Study Report. Appalachian is able to provide the report of the 2018 survey upon request.

A. Grooms asked whether there was any indication that mussel populations are changing below Buck Dam. D. Symonds noted that Stantec is evaluating mussel populations in that vicinity as part of the Claytor Project (AEP-owned dam downstream from Buck). D. Symonds noted that trends do not suggest the population is changing. A. Grooms noted that as a landowner (approximately 2 miles downstream of Buck Dam), visually she sees less shells on the shoreline than she did five years ago. D. Symonds agreed he has also heard this anecdotally from fisherman in the area. Brian Watson noted that pistolgrip is still in higher numbers in this area, although habitat is focused in the river and since it's a larger area, it's easy to be 'off' by just a small amount when sampling. Brian noted this observation is derived from VDWR's experiences collecting pistolgrip from this area for propagation.

J. Magalski noted that as part of the ongoing mussel monitoring plan for the Claytor Project AEP and VDWR are looking into deploying a mussel silo downstream of Buck and below Claytor Dam. J. Magalski noted mussel abundance and diversity is generally low throughout the watershed.

## Variances from FERC-approved Study Plan

- Forgo approach velocity field measurements and rely on calculated approach velocities for the impingement/entrainment study.
- Replace boat electrofishing with backpacking shocking where necessary to ensure adequate covered of the available habitat at the predefined sampling location.

## Second Field Season (2021)

- Spring Fishery Survey (Boat, Backpack, and Gillnetting): April – May 2021
- Turbine Blade Strike Analysis: July 2021

# Bypass Reach Flow and Aquatic Habitat Study (Slides 50-77)

## Study Results

T. Ziegler (Study Lead) introduced the study, methodology, and results for the bypass reach flow and aquatic habitat study. He explained that the Buck development study is further along than the Byllesby development (due to gate and unit operational issues that resulted in high flows in the Byllesby bypass reach during the 2020 field season).

The desktop mesohabitat and substrate mapping, determination of model calibration target flows, and assembly of habitat suitability index (HSI) criteria have been completed for both developments. T. Ziegler summarized the results of this effort at a high level and explained that additional details are provided in the Preliminary Bypass Reach Flow and Aquatic Habitat Study Report.

Field data (i.e., depths, water surface elevations, point velocities, flow measurements, and pebble counts) were collected in the Buck bypass reach during September 2020 under four model calibration target flows (i.e., leakage [17.1 cfs], low [210 cfs], middle [354 cfs], and high [714 cfs]). This data is provided in the Buck Bypass Reach ICM Model Development report (Attachment 1 of the Preliminary Bypass Reach Flow and Aquatic Habitat Study Report) and was used to calibrate the 2-D hydraulic model. Modeled water surface elevations closely matched the measured water surface elevations at the four target flows ($R^2$=0.99). T. Ziegler also summarized the bypass reach level logger data and explained how it was used to determine flow travel times and changes in water surface elevation under various flow regimes (note the level loggers recorded depths during a two month period which included the four model calibration target flows and higher flows during rainfall runoff events).

For the Buck bypass reach study, an initial set of habitat suitability model runs have been completed at the four model calibration target flows. Results are provided in Attachment 3 of the Preliminary Bypass Reach Flow and Aquatic Habitat Study Report. T. Ziegler reviewed results for one of the guild categories (i.e., Deep-Fast) as an example and explained how the results can be used to evaluate potential available habitat under different bypass reach flow regimes.

## Questions/Comments

J. Norman asked how cover is determined. T. Ziegler explained that cover is comprised of both instream cover (e.g., large rock outcrops, aquatic vegetation, undercut banks) and overhead cover (e.g., overhanging tree limbs, shrubs). J. Norman asked if velocity is a factor in determining whether or not vegetation is considered to be cover. T. Ziegler explained that the model determines the presence of available habitat based on a combination of depth, velocity, substrate, and cover; and this can vary by species and life stage. J. Norman asked if the habitat mapping assumes there is fish habitat, even if there is no water. T. Ziegler clarified that substrate and cover mapping is independent of depth. The model will determine if habitat is available based on a combination depth, velocity, substrate and cover. If a particular area has suitable substrate and cover, but zero depth and velocity, the model results would indicate that no habitat is available in that area at that flow.

J. Norman asked if all four model calibration target flows were released from Tainter Gate #1. T. Ziegler confirmed that no gates were open during the leakage target flow field measurements, but Tainter Gate #1 was used for the other three target flow releases.

J. Callihan asked if T. Ziegler knew the maximum flow that could be passed through Tainter Gate #1. Joe Dvorak noted it depends on pond level, but the capacity of each tainter gate is approximately 3,000 cfs at pond elevation 2003.4 (i.e., top of operating pool).

J. Callihan asked J. Copeland about the state management goal for the Buck bypass reach. J. Copeland noted that discussions to date have focused on historical stranding issues and the need to maintain connectivity to minimize fish stranding, especially for Walleye.

J. Norman asked about flow characteristics under higher flow conditions, specifically referring to Figure 6.6. T. Ziegler explained that the substrate and cover mapping provided in Figure 6.6 (of the Preliminary Bypass Reach Flow and Aquatic Habitat Study Report) does not change based on modeled flow conditions. However, as simulated flows increase, depths and velocities will also increase (generally speaking), so the amount of available habitat will change. Changes in available habitat are specific to each species/life stage modeled at each modeled flow.

J. Norman asked about the guild HSI curves and T. Ziegler clarified that absent a specific recommendation from resource agencies as to individual species of interest (in this case only Walleye was specifically requested), guild curves are typically used as they cover the vast majority of species present in the study area (i.e., species/life stages that prefer Deep-Fast, Deep-Slow, Shallow-Fast, and Shallow-Slow habitats).

J. Copeland asked about the species (example: Silver Redhorse) and whether these are specific to the New River or representative of other species. T. Ziegler confirmed that species/life stages used to represent a certain guild are considered to be surrogates with preferences matching the specific guild criteria. In this example, Silver Redhorse adult is representative of the Deep-Fast guild with a slight preference for finer substrate sizes and cover. The HSI curves are not specific to the New River but were developed from and/or used in other studies in the mid-Atlantic region (including the New and Roanoke Rivers). T. Ziegler noted that development of HSI curves is a significant undertaking, typically performed by universities or USFWS. J. Copeland confirmed VDWR's understanding of the origins of the HSI curves and noted that they are okay with the guild approach and walleye-specific (but not New River walleye-specific) curves used in this study.

J. Norman noted that USFWS asked early on about the possibility of releasing flows from gates other than Tainter Gate #1 (which was used during the target flow field measurements). J. Callihan noted that the operational gates (i.e., Tainter gates and Obermeyer gates) are on the right side of the dam (looking downstream) and the area of interest from a fish stranding perspective is downstream of the left side of the dam. T. Ziegler showed a photograph of the dam depicting the location of the Tainter and Obermeyer gates and explained that, due to a break in the topography approximately mid-channel of the upper bypass reach, flow releases from any of the gates would likely not affect the area of interest unless the flows were greater than 6,500 cfs. J. Callihan clarified that 6,500 cfs was the total flow (including powerhouse flows in the tailrace) and if you assumed the powerhouse was operating at maximum design capacity (i.e., 3,540 cfs), this would equate to approximately 3,000 cfs in the bypass reach. T. Ziegler agreed with this assessment. J. Callihan asked at what flow (in the bypass reach) does the high area located in the center of the channel immediately downstream of the dam (i.e., center channel of the upper bypass reach) start to become inundated with water and how frequent do those types of flows occurs/and when? J. Magalski noted that Appalachian can work with AEP operations to obtain Buck powerhouse operations data. T. Ziegler noted we already have flow data from the Ivanhoe USGS gage (downstream of the bypass reach and tailrace confluence) and could use Buck generation data and/or flow releases to the tailrace to estimate flows in the bypass reach (by subtracting tailrace flows from the Ivanhoe USGS gage flows). Action Items: (1) Include definition or clarification of bypass versus total New River flows in characterization of dam release operating scenarios in the USR, (2) Correct cfs label on figures (for inclusion in USR) – 354 cfs not 654 cfs.

J. Norman asked if the 17 cfs leakage flow is what is keeping the side channel (i.e., river left immediately downstream of the dam) watered. T. Ziegler noted that 17 cfs was the total leakage flow measured in September 2020; approximately 5 cfs of the total leakage flow is routed to the side channel area.

A. Grooms noted she has observed flashboard failures at the Buck dam during high rainfall runoff flow events which result in large amounts of sediment released into the bypass reach.

Woohee Choi asked about the mesh size used in the 2-D hydraulic model. J. Dvorak explained that HDR is using Innovyze Infoworks Integrated Catchment Model (ICM) software which uses terrain sensitive meshing to develop an unstructured grid. Terrain sensitive meshing allows for a maximum height variation between cells to be selected; for the Buck model, this was set at 0.25 ft. The average element area (i.e., mesh size) in the model is approximately 0.2 square meters. W. Choi recommended showing the mesh on the model results figures, but J. Dvorak explained that the mesh size is so small it would show up as a solid mass and you would not see anything else on the figures. J. Dvorak also pointed out that more information on the ICM model (i.e., configuration, assumptions, etc.) is provided in the Buck Bypass Reach ICM Model Development report (Attachment 1 of the Preliminary Bypass Reach Flow and Aquatic Habitat Study Report).

J. Callihan asked about the information provided on Slide 64 showing the 2-D hydraulic model calibration results. J. Dvorak confirmed that the data shown is a comparison of modeled to measured water surface elevations for the four model calibration target flows.

J. Norman asked about the level logger travel time information presented on Slides 68 and 69; in particular, the location of the level logger shown as a red line. T. Ziegler replied that the level logger depicted by the red line was located immediately downstream from Tainter Gate #1 and was placed there to record gate operations during the model calibration target flow fieldwork.

J. Callihan asked if the minimum flow requirement (360 cfs) is specific to the bypass reach, or just downstream from the Buck development. S. Kulpa clarified the minimum flow requirement is downstream from the Buck development and is a combination of tailrace and bypass reach flows. In response to J. Callihan's question as to whether it's possible to pass the minimum flow requirement though the powerhouse, Appalachian confirmed the powerhouse is capable of providing the minimum flow requirement through unit generation.

J. Norman asked if habitat model runs are correlated with seasonality (e.g., specific to spawning periods). T. Ziegler explained that the habitat model runs to date are specific to the four model calibration target flow scenarios. A next step in the modeling process is to incorporate hydrology over time (i.e., seasons) to determine if there are particular flows of interest from a habitat modeling perspective. HDR could also use the model to evaluate different flow release points along the Buck Dam and spillway structure. S. Kulpa reminded the group that while we can model hypothetical flows and release points, we also need to keep in mind the real-world challenges of water management at these projects, including run-of-river operations, aging structures and a variety of release mechanisms, and flashy river conditions, such that there are practical limits to how precisely flows and wetted areas can be managed by Project operation.

J. Norman noted the management goal for the Buck bypass reach was to not isolate or strand species that get into the side channel area at higher flows. She asked if the model had the capability of excluding a habitat 'cell' if the adjacent cell had zero habitat. T. Ziegler replied that the model is not excluding isolated habitat cells. Rather, it is up to the end user to determine if isolated habitat cells are considered to provide meaningful habitat. J. Callihan commented the focus should be on flow connectivity as opposed to habitat.

J. Norman asked if HDR could determine the amount of flow in the bypass reach over time, and in particular, on a day-to-day basis to help evaluate flow connectivity. M. Huddleston noted this would vary from year-to-year. J. Copeland noted that Walleye spawning is triggered by a combination of flow and water temperature which typically occurs in March with the highest activity during in the 2nd week of March. Action Item: T. Ziegler noted HDR has the information necessary to provide a chart (or figure) showing estimated flows in the Buck bypass reach during March (on a daily basis) over the hydrology period of record (i.e., 1996 – 2020). This would help the group evaluate the potential for Project inflows that are high enough and long enough to promote Walleye spawning.

J. Copeland asked if the model considers diurnal conditions (i.e. changes in sunlight and temperature over the course of a 24-hr day). T. Ziegler noted that the model simulations are based on changing flow conditions and do not consider diurnal effects.

**2021 Byllesby Study Activities**

- Mesohabitat Mapping and Substrate Characterization Field Data Verification (June – August 2021)
- Conduct Flow and Water Level Assessment and Hydraulic Model Development (June – October 2021)

# Water Quality Study (Slides 79-96)

T. Ziegler (Study lead) introduced the water quality study, methods and results.

## Study Results

T. Ziegler explained that at the Byllesby development, instrumentation was only installed at the tailrace monitoring location due to a Tainter gate open during the study period and a damaged flashboard section which made installation at other monitoring locations unsafe. Instrumentation at all of the Buck development monitoring locations identified in the RSP and Study Plan Determination was installed. Instrumentation captured continuous temperature and dissolved oxygen (DO) data (15-min intervals) and HDR also collected discrete data (i.e., water temperature, DO, pH, and specific conductivity) during installation, monthly data downloads, and removal of the equipment. Vertical profiles were also collected at the Buck forebay monitoring location during discrete data collection events. The monitoring locations at Byllesby that were not captured during the 2020 study period will be captured during July – September 2021.

Water temperature, DO, and pH measurement results meet Virginia Class IV (New River) water quality standards. While there isn't a state standard for specific conductivity, measurement results are suitable for aquatic species and typical for this reach of the New River. T. Ziegler explained there was little to no thermal or DO stratification at the Byllesby or Buck forebay.

## Questions/Comments

**General**

J. Callihan asked how deep the two DO instruments were in the Buck bypass reach. T. Ziegler answered 3 to 5 feet deep, depending on flow conditions. J. Callihan noted that it would be beneficial to have information on Project operations during the study period to determine if the data collected is typical of normal operations. Action Item: Appalachian/HDR to determine Project operations during the Water Quality Study to determine if operations were typical and include additional notations in the USR.

**Turbidity**

A. Grooms stated that turbidity is a parameter of interest to the residents living downstream of the Buck development, including the consideration of flow coming into and out of the Project, trash rake operation and looking at flashboard failure (scoured out sediment). She is interested in fine sediment downstream of the confluence of the tailrace and bypass and asked that evaluating turbidity be considered. T. Ziegler stated that one of the tasks in 2021 is to collect turbidity data specific to trash rake operations to determine if this affects turbidity levels in the Project's forebay and tailrace areas. This study will be performed during a low flow period to better isolate the effect of trash rake operations. S. Kulpa noted that based on sediment modeling conducted for Appalachian for the Claytor relicensing, our understanding of sediment transport in the New River is that the river carries a significant sediment load during high flows, and this sediment load passes through the Projects and riverine reaches downstream of Buck, with much of the sediment carried by high river flows settling in Claytor Lake. HDR observed turbid river conditions throughout the study area (including inflows to the Byllesby reservoir) during or following high flows in 2020, which supports this understanding. The limited turbidity study to be conducted in 2021 focuses on the issue where there is a potential nexus to Project operations. A. Grooms noted that data on sedimentation coming into the Project from upstream would be helpful to understand potential impacts on water quality downstream. She noted that information for the local governments on turbidity (even if unrelated to Project effects) would help identify mitigation needs like sediment erosion control measures or tighter buffers in the watershed to help the water quality downstream.

J. Callihan asked if flashboard ruptures/breaks might be less frequent with the newly installed Obermeyer gates. J. Magalski responded that is the intent.

## 2021 Field Season

- Continuous and Monthly Water Quality Monitoring at Byllesby (July – September 2021)
- Conduct monthly chlorophyll a grab samples at 1-meter depth in the forebay of each development during July, August, and September 2021
- Conduct ~1-week turbidity study in the forebay and tailrace of each development during a low flow period (July – September 2021).

# Recreation Study (Slides 97-131)

Maggie Yayac (Study lead) introduced the Recreation Study goals and results and provided an overview of the Project and non-Project Recreation Facilities.

## Study Results

M. Yayac explained HDR found consistent recreation usage at most of the Project and non-Project facilities with usage peaking on weekends, holidays, and warmer months. The New River Trail provides a unique opportunity to access most of the recreation facilities in otherwise remote locations. The trail camera and online survey results indicated that fishing and canoe/kayaking were the primary recreation activities. The Buck Dam Canoe Portage was the only Project recreation facility that saw very little recreation usage, likely because it is inaccessible except by boat.

## Questions/Comments

J. Copeland asked if Byllesby Dam – Fishing Access (adjacent to the New River Trail) was considered a Project Facility. M. Yayac responded that it was included in the Recreation Inventory Assessment after the RSP since it was determined to be a Project facility.

A. Grooms noted that VDWR Loafer's Rest access is used a lot by the people who live in that area for a kayak and canoe launch. Residents' and visitors' abilities to shuttle for kayaking and canoeing was impeded by COVID-19 restrictions and precautions in 2020. M. Yayac responded that Loafer's Rest access area was not part of the Recreation Study, but stakeholder interest in the Buck tailrace for fishing access was evaluated. J. Copeland noted the VDWR's original intent of Loafer's Rest access was to provide a way for people to get closer (and safer) access to tailrace fishing.

J. Copeland stated that there is interest from anglers to fish from the New River Canoe Launch. There is a no fishing sign upstream of that area and VDWR is seeking to make sure fishing isn't restricted in that area. M. Yayac and S. Kulpa confirmed that the no fishing sign restricted access to the powerhouse, but not the sandy beach before the access road. Elizabeth Parcell acknowledged that signage will be replaced and potentially increased in conjunction with the relicensing effort.

Sam Sweeney stated there is no signage across the New River below the spillways, such that a canoer or kayaker would not have visible signage. S. Sweeney recommends adding signage letting the user know they are not allowed in areas close to the dams.

M. Yayac asked if the group wanted to add anything to the discussion from the recreation site visit or virtual call (October 2020). Allyson Conner asked if Fowler's Ferry was owned by Appalachian. S. Kulpa explained the land is owned by Appalachian, but it is not entirely within the Project Boundary. E. Parcell noted Appalachian would be interested in leasing this land to VDWR, as she understands there is a grant

that may make this feasible for VDWR. J. Copeland noted that the grant is operational. Toby McClanahan did not know about the grant at that time, but stated he could find out more.

Jennifer Wampler stated that people are interested in improvements on the Thompson Campground based on her studies. M. Yayac explained the Virginia Department of Conservation and Recreation (VDCR) has not been successful in leasing the land from the U.S. Forest Service. M. Yayac noted that interest in this area was noted throughout many of the Recreation Study communications, especially responses to the online survey. S. Kulpa asked if anybody uses the area right now. S. Sweeney stated people use it anyway (especially during COVID restrictions), as camping is allowed on U.S. Forest Service land. A. Grooms wondered if that land needs to be transferred to the state and asked how to drive interest in this process at the regional level. S. Sweeney stated that they have participated in meetings and stated that U.S. Forest Service might consider a lease. A. Grooms stated it would help the local economy and the city of Wytheville. The group agreed that transfer of federal land to the state (i.e., in lieu of a long-term lease) is unlikely as a it does take an act of congress to move land from federal to state. Sam noted that a long-term lease (e.g., 99 years) is needed for the VDCR to justify investments needed to re-open the campground.

David Taylor noted that regarding the VDWR Loafer's Rest access, he would love to see better access for people to use and put in their boats. He wondered whether there is a put-in between Buck Dam and Austinville Bridge owned by the state? S. Sweeney noted that VDWR has a portage on river left only. D. Taylor explained that river rescue does not have a place to get in along that stretch and has on occasion asked to use his property.. D. Taylor noted there is a long walk from the parking area to the river, making it very difficult to use. S. Sweeney agreed it would be advantageous to put a larger road/put in at Loafer's Rest. This area is currently considered "fishing access" by VDWR and does not include a formal hand-launch area, though the area is commonly used for that purpose. J. Wampler agreed.

John Copeland commented he does not think the No Trespassing signs in the Buck Dam tailrace were posted by VDWR and will follow-up with Appalachian.

A. Grooms noted that she believes high turbidity levels kept users off of the river throughout much of 2020.

A. Conner asked about signs near the Buck Dam Canoe Portage. S. Kulpa acknowledged more signage a certain distance from each dam should be provided for boaters to make it clear where access is prohibited. E. Parcell followed up to note the Public Safety Plan on file with FERC which says boats must stay 500 feet away from the dam.

A. Conner asked about the Buck Dam Fishing Access and M. Yayac clarified that this area is not a Project facility, but an informal access point that was of study interest to the VDWR for tailrace fishing.

A. Conner asked if there would be any additional surveys in 2021 for the Recreation Study. M Yayac and S. Kulpa stated that the Recreation Study had been completed, and that 2021 activities would focus on evaluation of the feasibility of potential enhancements to be included as part of Appalachian's licensing proposal.

A. Grooms asked if Loafer's Rest would be looked at for expansion and improvement. J. Copeland stated that overall, more background and clarification on Loafer's Rest is needed and who owns what, where the trespassing signs are and come from. Sarah K. said Appalachian would consider an addendum to the study report regarding to the Loafer's Rest area and existing agreement.

Beth Taylor (Mayor of Wytheville) used the Webex chat feature to provide her interests which included: 1) as Mayor she is interested in the possibility to increase economic development, 2) New River Water Authority where turbidity and velocity are important 3) noted that property owners below Buck have observed over past four years have seen a marked decrease in catching fish, swimming and boating due to increase turbidity. She added she also appreciates any evaluation and improvements that may come out of this study of Loafers Rest "fishing input" and invite all to take a walk or better yet a boat down there.

# Cultural Resources Study (Slides 133-138)

M. Yayac (Study lead) reviewed the cultural resources methods and results by Terracon Consultants, Inc. (sub-consultant).

## Study Results

Terracon received four responses to the Area of Potential Effects (APE) consultation with no objections. Phase I and geomorphological assessment tasks were completed in 2020. No historic properties are adversely affected by the Project. New construction or modifications of the Project structures (historical features) would require consultation with the State Historic Preservation Office (SHPO).

## Questions/Comments

A. Conner asked about definition of historic alluvium as used in this report. S. Kulpa explained it included soils deposited in the river valley by river flows.

J. Grist wanted to make sure that all Virginia recognized tribes were included in communications. A. Conner read off the list of tribes FERC included in initial tribal consultation. Joe listed a few more that should be included (seven state and federally recognized). A. Conner requested a full list of tribes to ensure the Project ILP consultation by FERC includes them all. J. Grist agreed to provide her with the list. J.Wampler provided a website for the list of tribes: https://www.ncsl.org/research/state-tribal-institute/list-of-federal-and-state-recognized-tribes.aspx#Virginia.

J. Norman asked if there are copies of all correspondence from tribes in the ISR. However, tribal responses are privileged.

# Next Steps and Discussion

J. Magalski reviewed key milestones for the ILP including meeting summary, stakeholder requests, FERC determination.

## Questions/Comments

A. Grooms asked when exactly stakeholders should expect Appalachian to file the ISR Meeting notes since follow-up dates are dependent. J. Magalski said it would probably be right on the 12th of February.

# Attachment 1

## Attachment 1 – ISR Meeting Presentation

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# Byllesby-Buck Hydroelectric Project

## Initial Study Report Meeting
## January 28, 2021

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# Initial Study Report

- Appalachian is pursuing a subsequent license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

- The Initial Study Report (ISR) filed on January 18, 2021 describes the Licensee's overall progress in implementing the study plan and schedule, the data collected, and any variances from the study plan and schedule.

- The Commission's regulations at 18 CFR § 5.15(c) requires Appalachian to hold an ISR Meeting within 15 days of filing the ISR.

- The purpose of the ISR Meeting is to discuss available study results and any proposals to modify the study plans in light of the data collected.

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# Meeting Agenda

| Topic | Schedule |
|---|---|
| Welcome and Introduction | 9:30 AM – 9:45 AM |
| Aquatic Resources Study:<br>• Fish Community Survey<br>• Fish Impingement and Entrainment Study<br>• Macroinvertebrate and Crayfish Survey<br>• Freshwater Mussel Survey | 9:45 AM – 11:00 AM |
| Morning Break | 11:00 AM – 11:10 AM |
| Bypass Reach Flow and Aquatic Habitat Study | 11:10 AM – 12:30 PM |
| Lunch Break | 12:30 PM – 1:00 PM |
| Water Quality Study | 1:00 PM – 1:40 PM |
| Recreation Study | 1:40 PM – 2:40 PM |
| Afternoon Break | 2:40 PM – 2:45 PM |
| Cultural Resources Study | 2:45 PM – 2:55 PM |
| Discussion, Questions and Next Steps | 2:55 PM – 3:00 PM |

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# Completed ILP Milestones

| Date | Milestone |
|---|---|
| January 7, 2019 | Appalachian Filed NOI and PAD (18 CFR §5.5, 5.6) |
| March 8, 2019 | FERC Issued Notice of PAD/NOI and Scoping Document 1 (SD1) (18 CFR §5.8(a)) |
| April 10-11, 2019 | FERC Conducted Scoping Meetings and Site Visit (18 CFR §5.8(b) (viii)) |
| May 7, 2019 | Stakeholders Submitted Comments on the PAD, SD1, and Study Requests (18 CFR §5.9) |
| June 21, 2019 | FERC Issued Scoping Document 2 (SD2) (18 CFR §5.10) |
| June 21, 2019 | Appalachian Filed Proposed Study Plan (PSP) (18 CFR §5.11(a)) |
| July 21, 2019 | Appalachian Held Study Plan Meeting (18 CFR §5.11(e)) |
| September 9, 2019 | Stakeholders Submitted Comments on the PSP (18 CFR §5.12) |
| October 19, 2019 | Appalachian Filed RSP (18 CFR §5.13(a)) |
| November 3, 2019 | Stakeholders Submitted Comments on the RSP (18 CFR §5.13(b)) |
| November 18, 2019 | FERC Issued the SPD (18 CFR §5.13(c)) |
| July 27, 2020 | Appalachian Submitted First Quarterly Report, ILP Study Update, and Request for Extension of Time File ISR |
| August 10, 2020 | FERC Issued Order Granting Appalachian Extension of Time and Filing of ISR |
| August – November 2020 | Appalachian Conducted First Season of Field Studies (18 CFR §5.15(a)) |
| October 27, 2020 | Appalachian Submitted Second Quarterly Progress Report (18 CFR §5.15(b)) |
| December 23, 2020 | FERC Issued Scoping Document 3 (SD3) |
| January 18, 2021 | Appalachian Submitted ISR (18 CFR §5.15(c)(1)) |

# Studies Approved in the SPD

FERC's November 18, 2019 Study Plan Determination (SPD) for the Byllesby-Buck Hydroelectric Project (Project) directed Appalachian to conduct eight studies:

1. Bypass Reach Flow and Aquatic Habitat Study
2. Water Quality Study
3. Aquatic Resource Study
4. Wetlands, Riparian, and Littoral Habitat Characterization Study
5. Terrestrial Resources Study
6. Shoreline Stability Assessment Study
7. Recreation Study
8. Cultural Resources Study

# Proposals to Modify Studies or for New Studies

At this time, Appalachian is not proposing any modifications to the studies approved and modified in the Commission's November 18, 2019 SPD or any new studies.

Minor variances to the study plans have been previously reported in the ILP quarterly progress reports (July 27, 2020 and October 27, 2020) and are detailed in the sections that follow, as well as within the individual study reports.

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# Upcoming ILP Milestones

| Date | Milestone |
|---|---|
| **January 28, 2021** | **Appalachian Host ISR Meeting (18 CFR §5.15(c)(2))** |
| February 12, 2021 | Appalachian File ISR Meeting Summary (18 CFR §5.15(c)(3)) |
| March 14, 2021 | Stakeholders File Disagreements with ISR Meeting Summary (18 CFR §5.15(c)(3)) (if necessary) |
| April 13, 2021 | Appalachian File Response to ISR Meeting Summary Disagreements (18 CFR §5.15(c)(5)) (if necessary) |
| May 13, 2021 | FERC Provide Determination on Disputes (18 CFR §5.15(c)(6)) (if necessary) |
| Spring – Fall 2021 | Appalachian Conducts Second Year of Studies |
| October 1, 2021 | Appalachian File Draft License Application (DLA) (18 CFR §5.16(a)) |
| November 17, 2021 | Appalachian File Updated USR (18 CFR §5.15(f)) |
| December 2, 2021 | Appalachian Host USR Meeting (18 CFR §5.15(f)) |
| December 17, 2021 | Appalachian File USR Meeting Summary (18 CFR §5.15(f)) |
| December 30, 2021 | Stakeholders File Comments on DLA (18 CFR §5.16(e)) |
| January 16, 2022 | Stakeholders File Disagreements with USR Meeting Summary (18 CFR §5.15(f)(4)) (if necessary) |
| February 15, 2022 | Appalachian File Response to USR Meeting Summary Disagreements (18 CFR §5.15(f)(5)) (if necessary) |
| February 28, 2022 | Appalachian File Final License Application (18 CFR §5.17) |

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# Aquatic Resources Study: Fish Community Survey

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# Fish Community Survey

- **Study Goal:** Obtain current information on the fish community in the New River in the vicinity of the Project to support an analysis of Project effects
- **Specific Objectives:**
  - Collect comprehensive baseline of the existing fish community in the vicinity of the Project
  - Compare current fish community data to historical data to evaluate changes to species composition, abundance, or distribution
  - Confirm intake velocities to evaluate the potential of fish impingement or entrainment

# Fish Community Survey

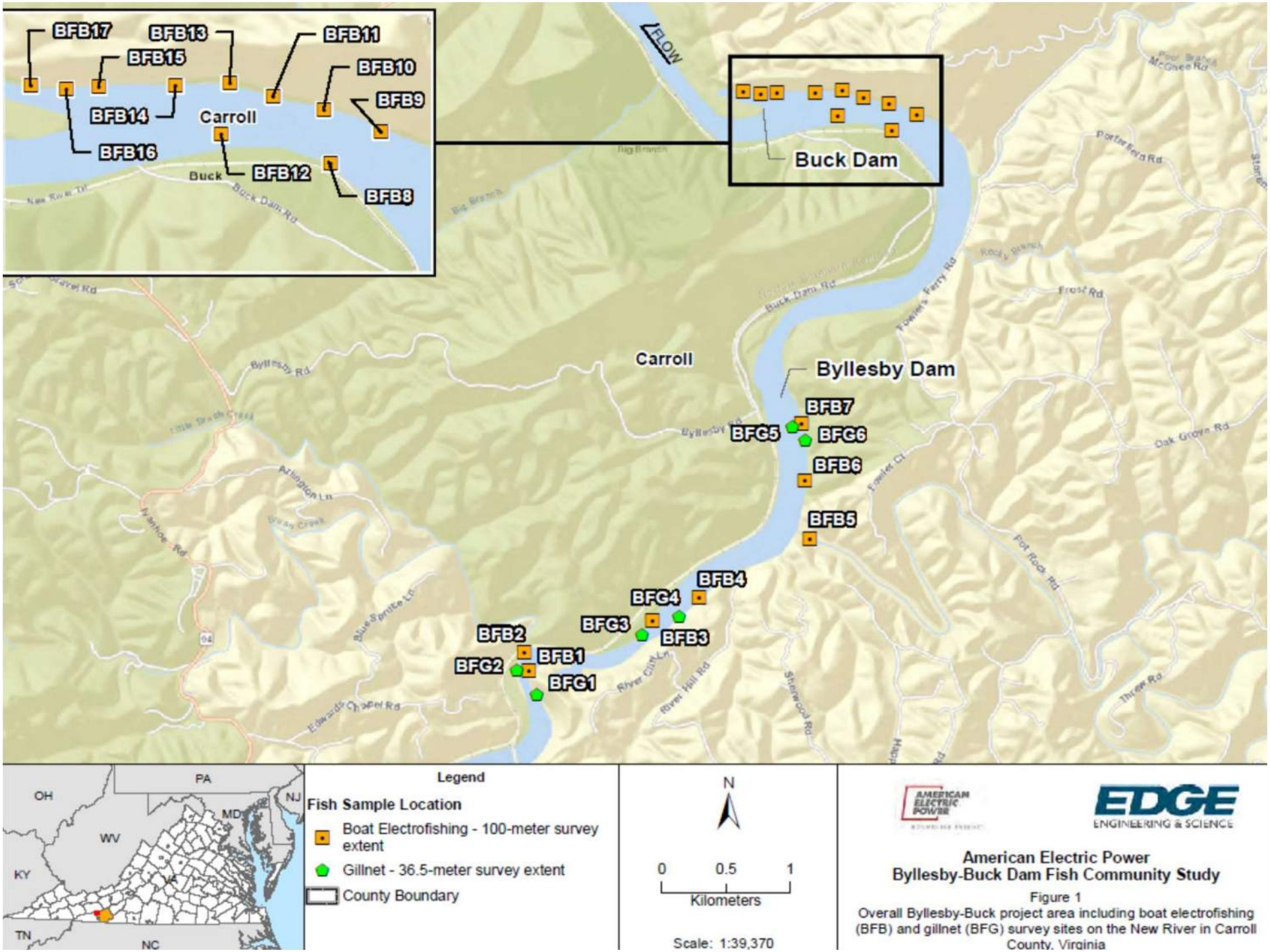
## Study Status

- Appalachian initiated the Fish Community Survey in accordance with the methods described in the RSP and SPD.
  - General fish community survey utilizing boat electrofishing and gill net sets was completed fall 2020
  - Confirmed intake velocities desktop calculations
  - Preliminary assessment of impingement and entrainment at the intake structures

# Fish Community Survey Methods

## Byllesby – Boat Electrofishing

- October 22, 24 – 25 of 2020
- Seven sites in Byllesby impoundment electrofished by boat, a minimum of 5 minutes each site
- Fish ID to species, enumerated, and examined for anomalies; up to 30 individuals per taxon measured and weighed
- Calculated catch per unit effort (CPUE) as number of fish per minute and H'; Shannon index and compared preliminary results to those from historical studies




**American Electric Power**
**Byllesby-Buck Dam Fish Community Study**

Figure 1
Overall Byllesby-Buck project area including boat electrofishing (BFB) and gillnet (BFG) survey sites on the New River in Carroll County, Virginia

# Fish Community Survey Methods

## Byllesby - Gillnets

- November 9 -11, 18 – 20 of 2020

- Six sites in Byllesby impoundment sampled with 36.5-meter[m]-long by 2.4-m-deep gillnets
  - Each gillnet consisted of eight 4.6-m-long panels with mesh sizes of 1.9, 2.5, 3.2, 3.8, 5.1, 6.4, 7.6, and 10.2 centimeters
  - Fished for 24-hours and then checked, redeployed
  - Fished additional 24-hours and then retrieved, total of 48 hours

- Fish ID to species, enumerated, and examined for anomalies; up to 30 individuals per taxon measured and weighed

- Calculated CPUE (# fish/min) and H'; Shannon index and compared preliminary results to those from historical studies

# Fish Community Survey Methods

## Buck – Boat Electrofishing

- October 22, 24 – 25 of 2020
- Ten sites in Buck impoundment electrofished by boat, a minimum of 5 minutes each site
- Fish ID to species, enumerated, and examined for anomalies; up to 30 individuals per taxon measured and weighed
- Calculated CPUE (# fish/min) and H'; Shannon index and compared preliminary results to those from historical studies

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# Fish Community Survey Results

- 207 fish representing 23 species
  - 107 fish (20 species) by boat electrofishing
  - 37 fish (7 species) from 4 of 6 gill net sites
- Boat electrofishing sites
  - Average CPUE of 1.5 (2.0 in Byllesby pool; 1.2 in Buck pool)
  - Average diversity of 1.25 (1.3 in Byllesby pool; 1.1 in Buck pool)
- Gill net sites
  - Average CPUE of 3.8 (4.6 for 4 sites with fish collected)
  - Average diversity of 0.91

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# Aquatic Resources: Fish Impingement and Entrainment Study

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# Fish Impingement and Entrainment Study

## Assessment Methods

- Compiled intake specifications, flow characteristics, and calculated approach velocity
- Identified target species/groups
- Assessed potential of impingement or entrainment
  - Intake avoidance (swim burst speed comparison)
  - Size exclusion (max length: width scaling)
  - Early life stage entrainment (spawning periodicity)

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# Fish Impingement and Entrainment Study

## Assessment Methods

- Evaluated entrainment rate based on EPRI entrainment database
  - 43 facilities
  - 5 were eliminated due to no collection efficiency data
  - 5 were eliminated based on trash rack spacing
  - **33 facilities** used for this analysis

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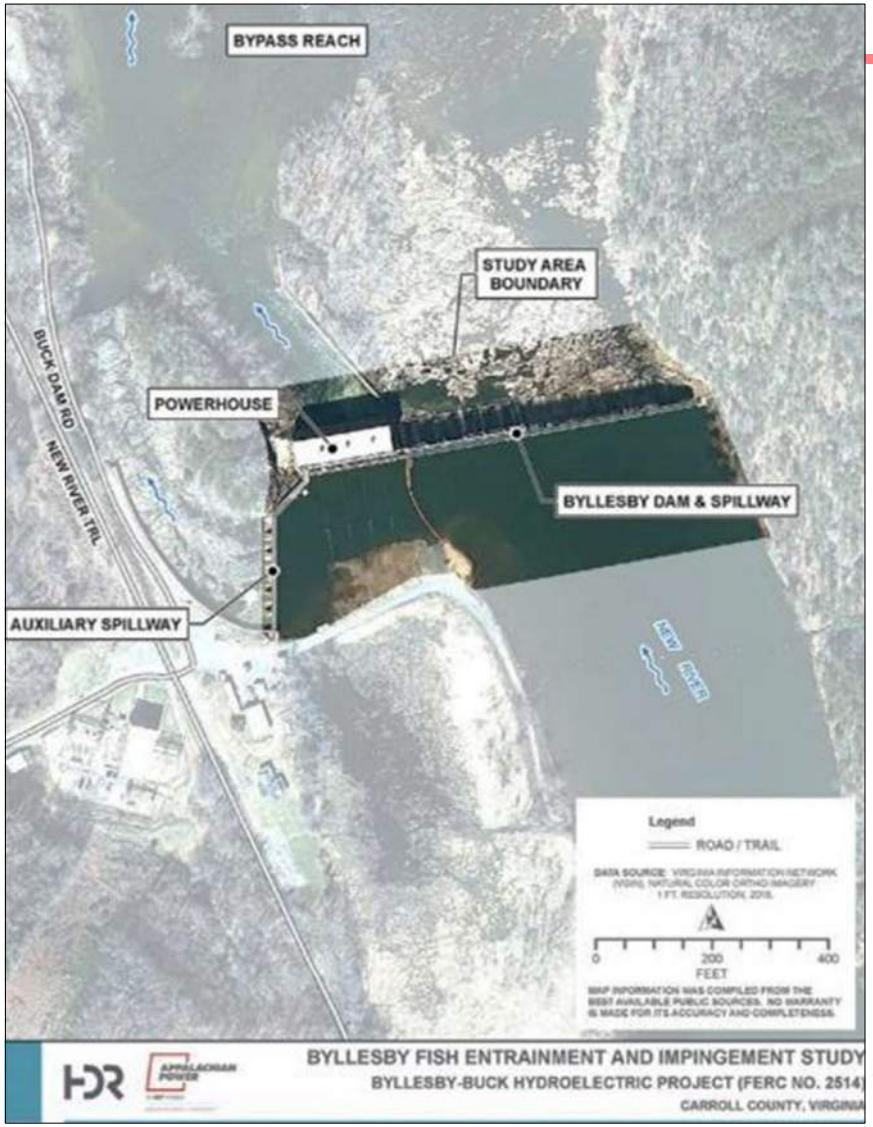
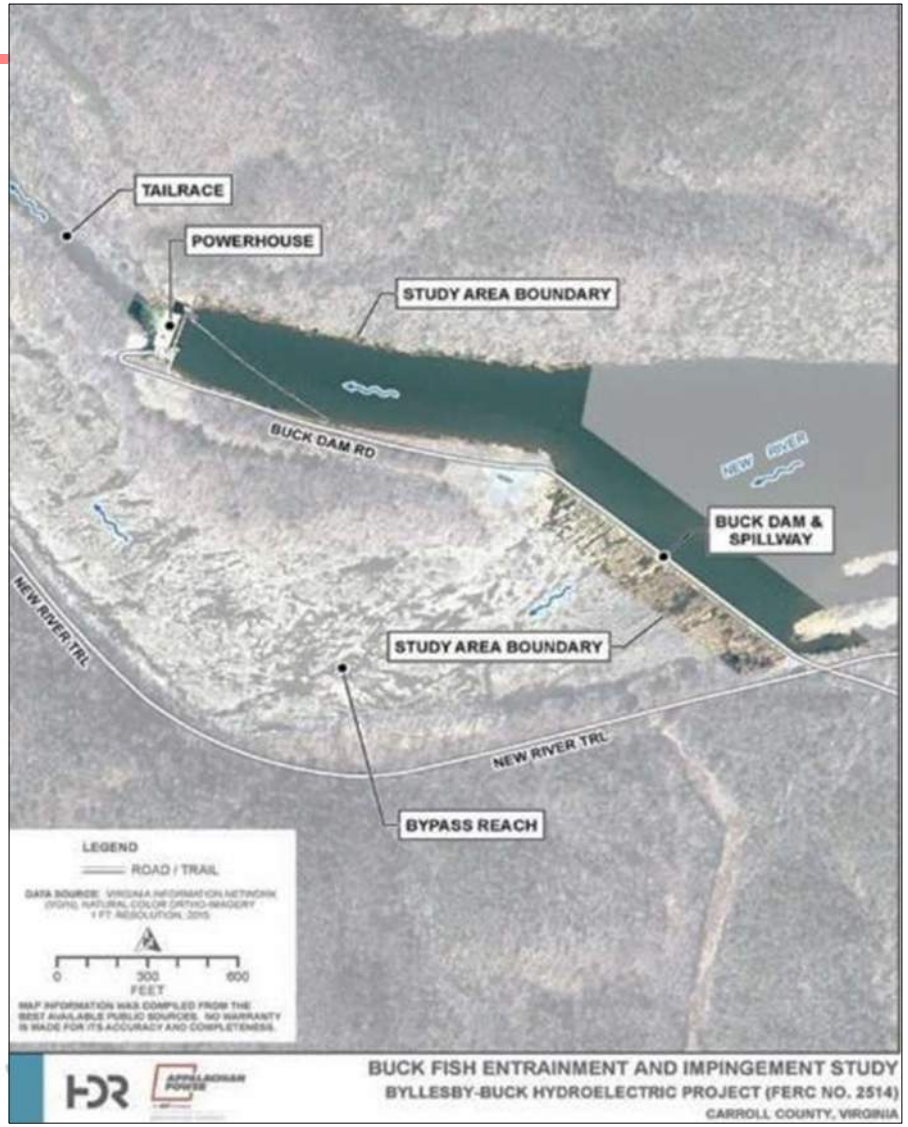
# Fish Impingement and Entrainment Study



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# Fish Impingement and Entrainment Study

- Target species/groups

| Common Name | Scientific Name |
|---|---|
| Black Crappie | *Pomoxis nigromaculatus* |
| Bullheads and Madtoms | *Ameiurus* spp. and *Noturus* spp. |
| Catfishes | *Ictalurus* spp. |
| Common Carp | *Cyprinus carpio* |
| Darters and Logperch | *Etheostoma* and *Percina* spp. |
| Largemouth Bass | *Micropterus salmoides* |
| *Lepomis* Sunfishes | *Lepomis* spp. |
| Muskellunge | *Esox masquinongy* |
| Rock Bass | *Ambloplites rupestris* |
| Shiners, Chubs, and Minnows | Leuciscinae |
| Smallmouth Bass | *Micropterus dolomieu* |
| Spotted Bass | *Micropterus punctulatus* |
| Suckers and Redhorse | Catostomidae and *Moxostoma* spp. |
| Walleye | *Sander vitreus* |
| White Bass | *Morone chrysops* |

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# Fish Impingement and Entrainment Study

## Assessment Results

- Intake avoidance
  - Byllesby approach velocity – 2.0 feet per second (fps)
  - Buck approach velocity – 1.6 fps
  - Swim burst speeds indicate that most juvenile and adult species occurring near the intake can avoid the velocities at the intake.
- Size exclusion (impingement assessment)
  - Several species including Channel Catfish*, Common Carp*, and Largemouth Bass*, Walleye, and White Sucker would be excluded. The remaining target and surrogate species would pass through the trash racks (and be entrained).
- Early life stage entrainment susceptibility
  - Spawning April-June, subsequent egg and larvae development May-August
  - Many species spawning habitats are not found near the intake structure; therefore, entrainment potential is considered low for most early life stages.

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# Fish Impingement and Entrainment Study

## Assessment Results

- 88% of entrainment consisted of fish less than six inches in length
- Average seasonal rates of entrainment were highest in April, July, and October
- Fish over 8 inches in length were infrequently entrained (less than 5% of entrainment)
- Entrainment susceptibility varied temporally and by species
- Most target species/groups had low entrainment potential throughout the year

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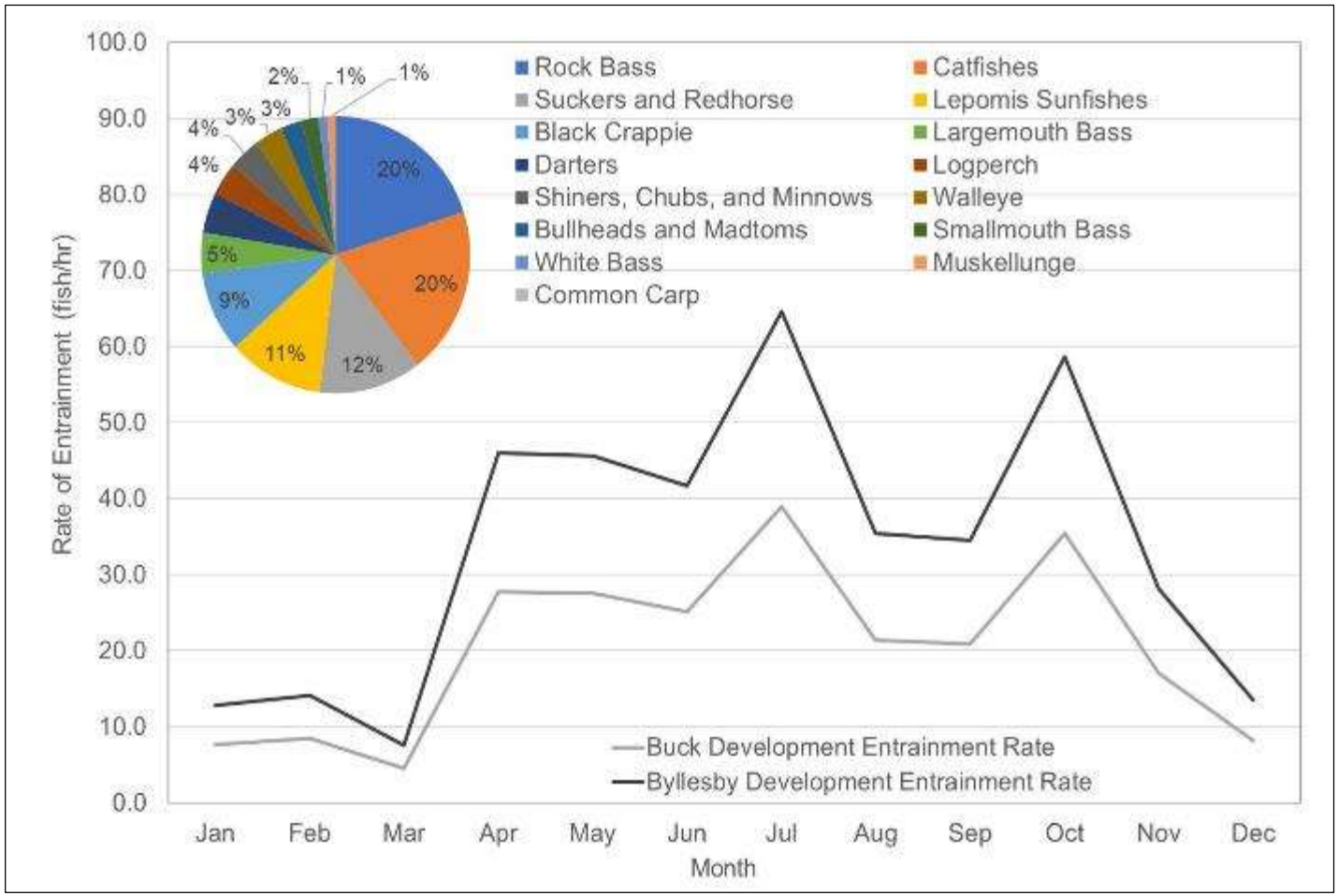
# Fish Impingement and Entrainment Study

- **Dominant species entrained**



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# Fish Impingement and Entrainment Study

- Seasonal patterns in entrainment rates are likely driven by spawning activity/movement (spring/summer), juvenile recruitment (summer/fall), or in response to cooling water temperatures (fall)

- Most species not expected to spawn in the vicinity of the intake due to a lack of required spawning habitat

# Fish Impingement and Entrainment Study

- **Walleye and Muskellunge**
  - Older life stages are considered low risk for impingement at the Project as their burst speeds are sufficient to overcome intake approach velocities.
  - Early life stages are considered low risk for entrainment at the Project based on the absence of preferred spawning habitat near the intake structures.

# Variances from FERC-approved Study Plan

**Variances from FERC-approved Study Plan:**

- Intake velocity
  - Unable to evaluate with ADCP due to high flow events and station operation
  - Determined using desktop calculation
  - Angled trashracks would require ADCP measurement some distance upstream

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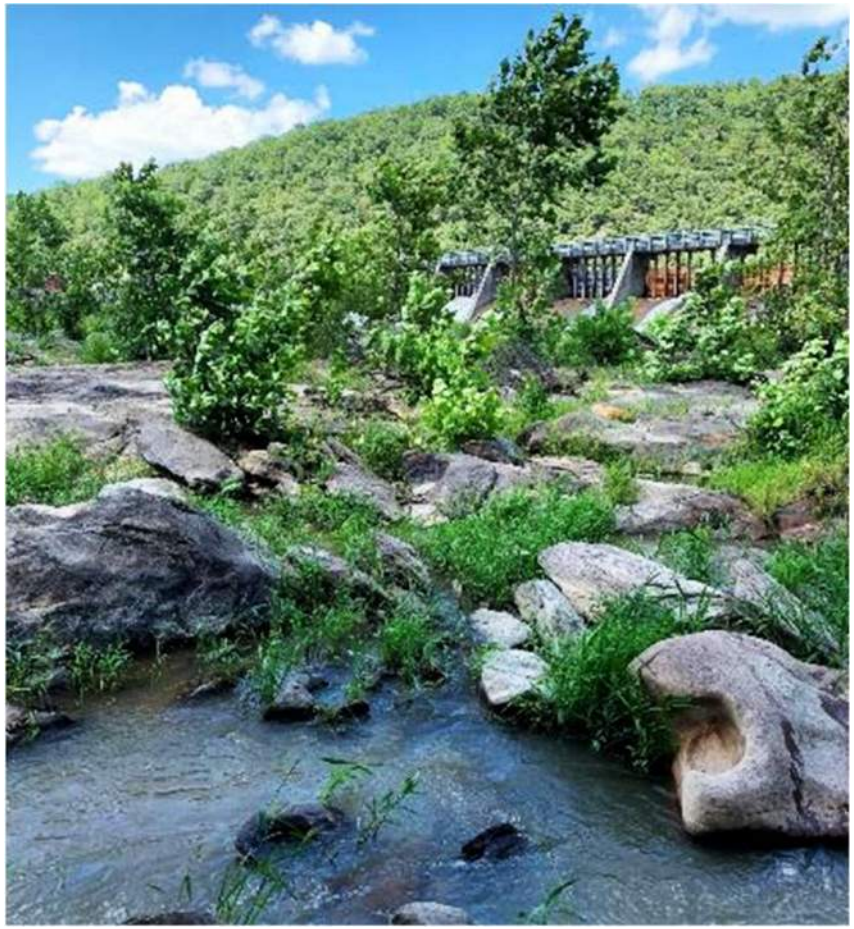
# Aquatic Resources: Macroinvertebrate and Crayfish Survey



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# Macroinvertebrate and Crayfish Survey

- **Study Goal:** Obtain current information on the benthic aquatic community in the New River in the vicinity of the Project to support an analysis of Project effects.
- **Specific Objectives:**
  - Quantify the amount of benthic habitat available for macroinvertebrates and crayfish within each bypass reach;
  - Collect a baseline of existing macroinvertebrate and crayfish communities in the vicinity of the Project using two temporally independent sampling efforts (fall 2020 index period and spring 2021 index period)

# Macroinvertebrate and Crayfish Survey

## Study Status

- Appalachian has partially completed study activities for the Benthic Aquatic Resources Study in accordance with the schedule and methods described in the RSP and SPD
  - Completed fall 2020 sampling
  - Taxonomic identification in process
  - Spring sampling scheduled for 2021

# Macroinvertebrate and Crayfish Survey

## Summary of Study Methods

- Sampling performed October 6, 7, and 8, 2020
- Visual habitat assessment
- Qualitative and quantitative sampling

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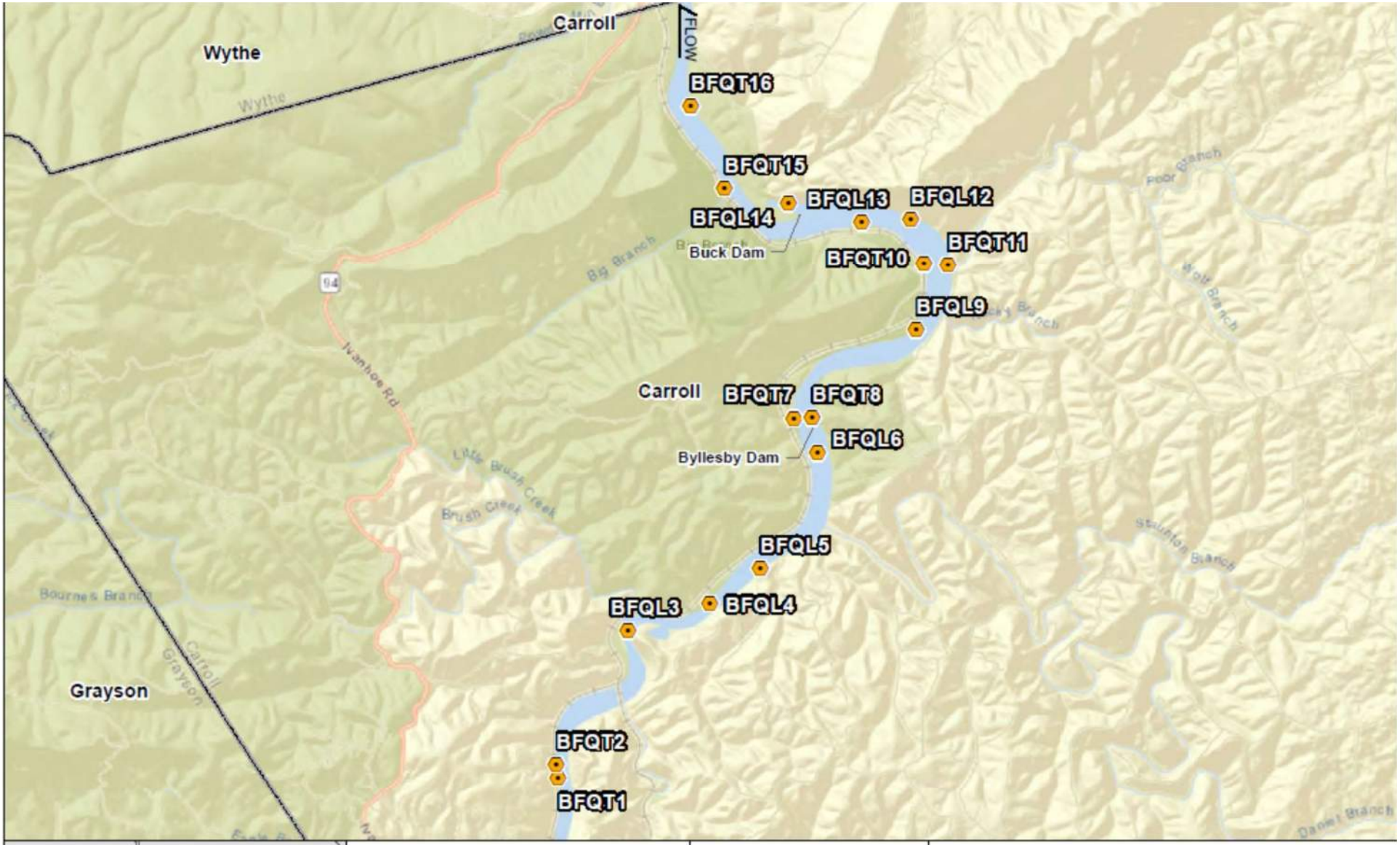
# Macroinvertebrate and Crayfish Survey

## Summary of Study Methods

- Quantitative Samples
  - 8 riffle/run sites along 100-m transects, two sites upstream of Byllesby Dam, four sites between Byllesby and Buck Dam, and two sites downstream of Buck Dam
  - Each site consists of 6 kick net sets composited into one sample
  - Each sample equals approximately 2 square meters
  - Crayfish data supplemented with seine hauls

- Qualitative Samples
  - 8 pool sites, four sites upstream of Byllesby Dam and four sites between Byllesby and Buck Dam
  - 20 dip-net grabs of representative habitats in proportion to their availability
  - Each sample covers approximately 1 linear meter of habitat





**Legend**

- Macroinvertebrate Sample Location
- County Boundary

N

0 0.75 1.5

Kilometers

Scale: 1:59,055

American Electric Power

EDGE ENGINEERING & SCIENCE

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**Byllesby-Buck Benthic Aquatic Resource**

Figure 1

Overall Byllesby-Buck project area including quantitative (BFQT) and qualitative (BFQL) macroinvertebrate survey sites on the New River in Carroll County, Virginia.

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# Macroinvertebrate and Crayfish Survey

## Summary of Study Results

- Quantitative Sites
  - Good quality habitat at seven of the eight sites; one site heavily embedded (BFQT2)
  - Habitats consisted primarily of bedrock, boulder, cobble, and gravel substrates

- Qualitative Sites
  - Relatively poor habitat at all sites
  - Habitat consisted primarily of sand, silt, and bedrock substrates

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# Macroinvertebrate and Crayfish Survey

## Summary of Study Results

- Taxonomic identification of macroinvertebrates in process
- Two native species of crayfish collected and identified in the field during survey efforts at 6 of 16 sites
  - Conhaway Crayfish (*Cambarus appalachiensis*)
  - Spiny Stream Crayfish (*Faxonius cristavarius*)
- No invasive species collected


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# Aquatic Resources: Freshwater Mussel Survey

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# Freshwater Mussel Survey

- **Study Goal:** Obtain current information on the mussel community in the New River in the vicinity of the Project to support an analysis of Project effects

- **Specific Objectives:**
  - Collect a comprehensive baseline of the existing mussel community in the Project vicinity.
  - Compare current mussel data to historical data to determine any significant changes to species composition, abundance, or distribution.

# Freshwater Mussel Survey

## Study Status

- Appalachian initiated and completed the Freshwater Mussel Survey in accordance with the schedule and methods described in the RSP and SPD.
  - Completed fall 2020
  - No further sampling required

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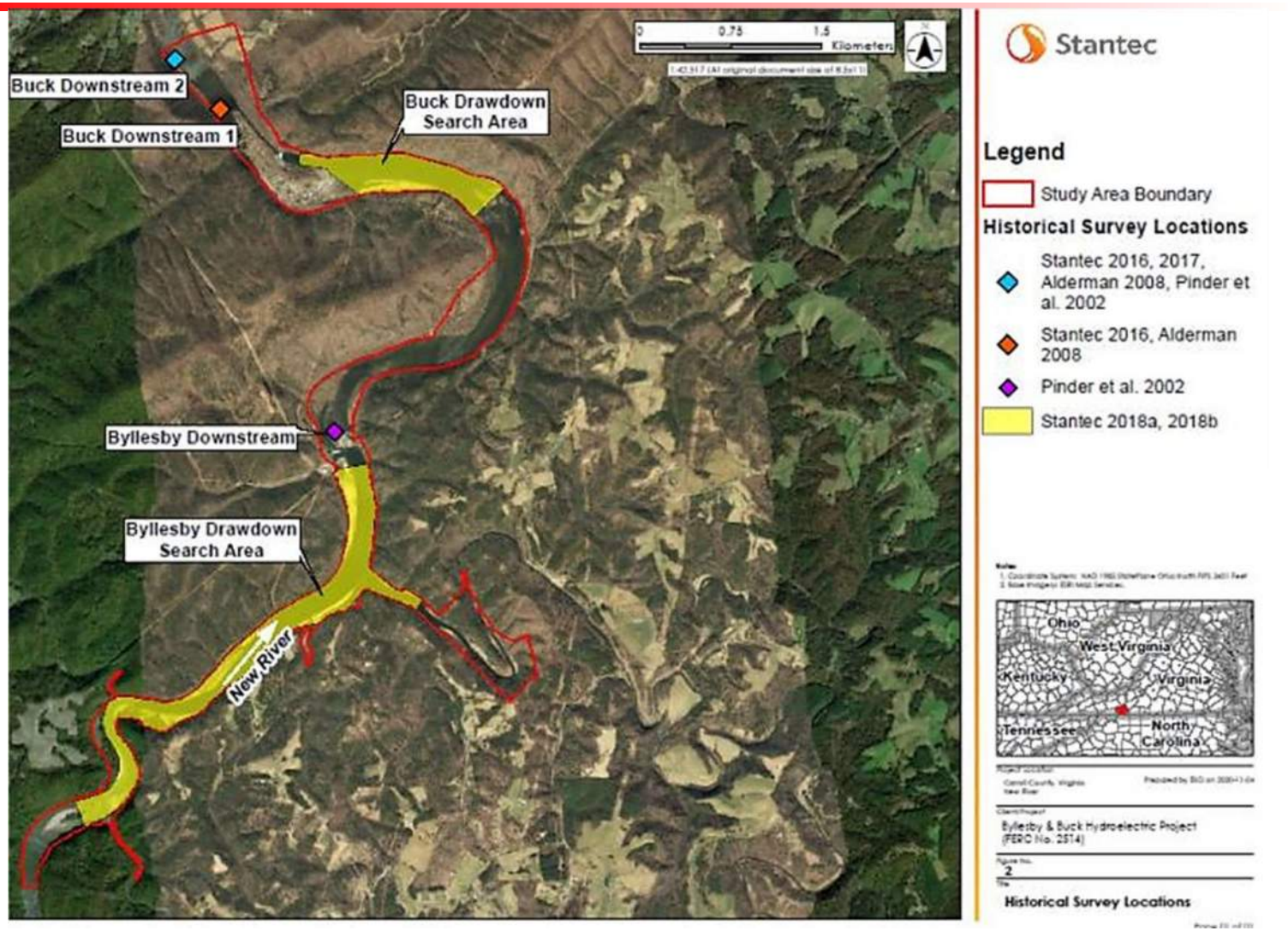
# Freshwater Mussel Survey Methods



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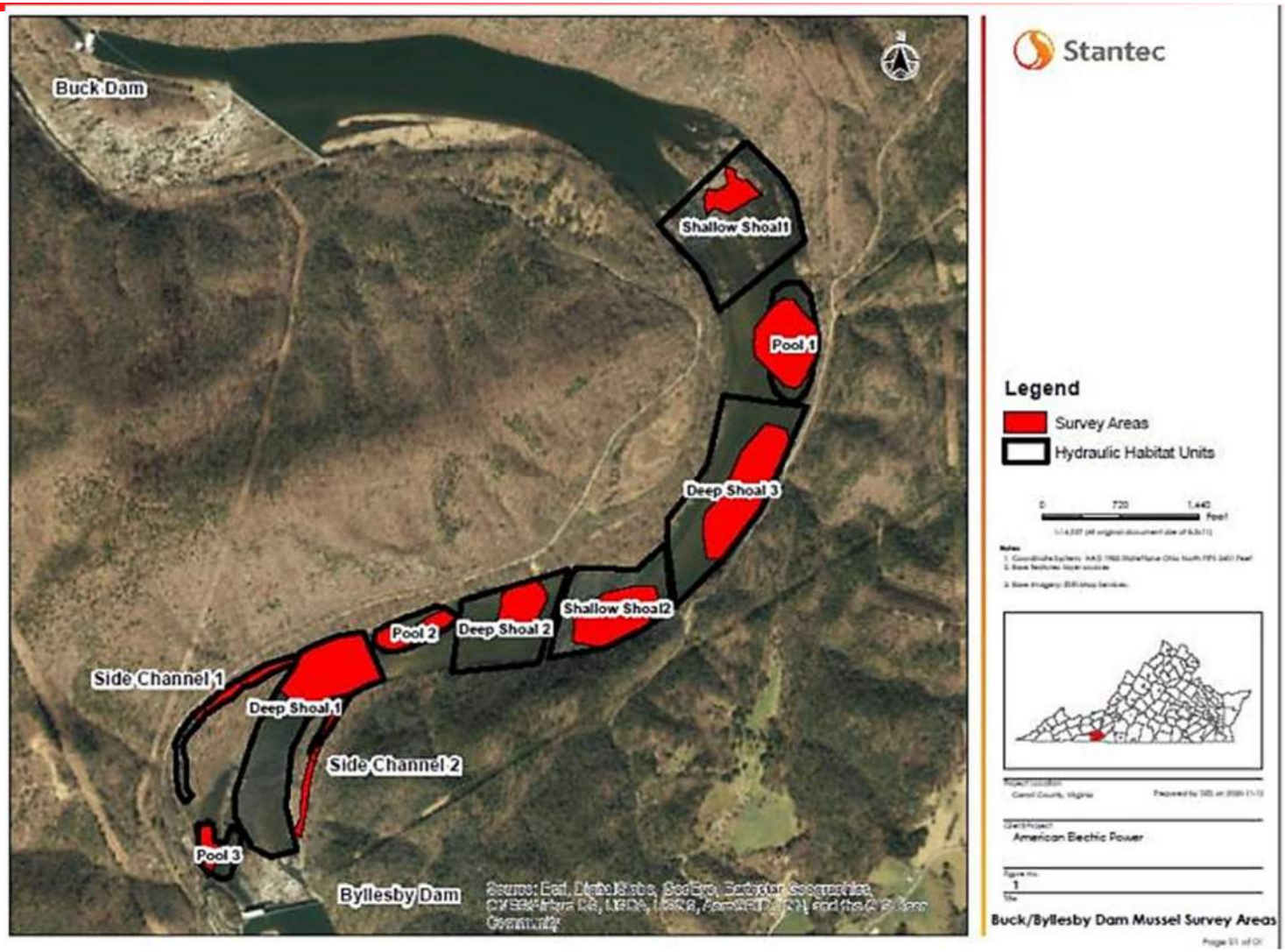
# Freshwater Mussel Survey Methods



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# Freshwater Mussel Survey Methods

- Reconnaissance level habitat assessment
- 500 m
- Visual searches of exposed river-banks for spent valves or evidence of suitable mussel habitat

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# Freshwater Mussel Survey Results

## Mussels Found In Survey Area (2020)

| Area | Species | Length (mm) | Condition |
|---|---|---|---|
| Shallow Shoal 1 | *C. tuberculata* | 48 | Live |
| Shallow Shoal 1 | *C. tuberculata* | 87 | Live |
| Shallow Shoal 1 | *C. tuberculata* | - | Weathered |
| Deep Shoal 2 | *C. tuberculata* | 85 | Live |
| Deep Shoal 2 | *C. tuberculata* | 84 | Live |
| Deep Shoal 2 | *C. tuberculata* | 95 | Live |
| Deep Shoal 2 | *C. tuberculata* | 85 | Live |
| Deep Shoal 2 | *C. tuberculata* | 78 | Live |
| Deep Shoal 2 | *C. tuberculata* | 91 | Live |
| Deep Shoal 2 | *C. tuberculata* | 64 | Live |
| Pool 1 | *E. dilatata* | - | Weathered |

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# Freshwater Mussel Survey Results

## Previous Studies

| Study | Location | Methods | Total Search Time (person-hours) |
|---|---|---|---|
| Pinder et al. 2002 | Buck 2<br>Below Byllesby | Wandering search - snorkel and/or viewscopes | 5 |
| Alderman 2008 | Buck 2<br>Buck 1 | Wandering search – snorkel, SCUBA and/or viewscopes | 9.25 |
| Stantec 2016 | Buck 2<br>Buck 1 | Transects – snorkel SCUBA<br>Quadrat excavation | 13.4 |
| Stantec 2017 | Buck 2 | Transects – snorkel SCUBA<br>Quadrat excavation | 6.7 |
| Stantec 2018a | Byllesby Drawdown Area | Wandering search – walking dewatered substrates | 27.2 |
| Stantec 2018b | Buck Drawdown Area | Wandering search – walking dewatered substrates | 15.5 |
| Stantec 2020 | Un-impounded Reach | Wandering search – snorkel SCUBA | 33.3 |

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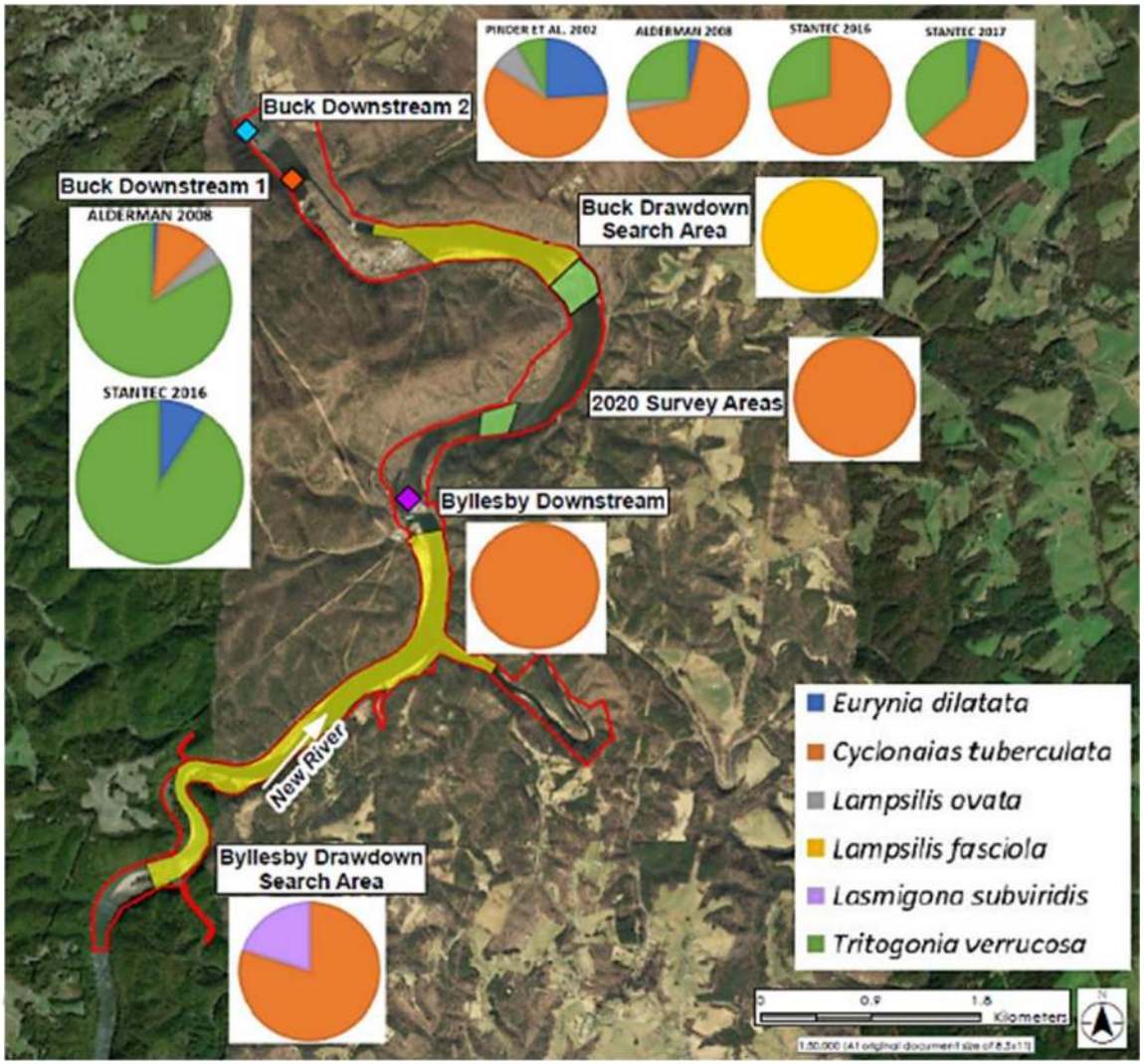
# Freshwater Mussel Survey Results



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# Freshwater Mussel Survey Results

| | Pinder et al. 2002 | Alderman 2008 | Stantec 2016 | Stantec 2017 | Stantec 2018a | Stantec 2018b | Stantec 2020 |
|---|---|---|---|---|---|---|---|
| **Location** | **Downstream of Buck** | | | | **Byllesby Pool** | **Buck Pool** | **B/N Buck/Byllesby** |
| **Species Richness** | 4 | 4 | 3 | 3 | 2 | 1 | 1 |
| **Abundance** | 26 | 275 | 53 | 82 | 5 | 1 | 9 |
| **Search effort (hours)** | 5 | 9.25 | 6.7 | 6.7 | 27.2 | 15.5 | 33.3 |
| **CPUE** | 5.2 | 29.7 | 3.9 | 11.0 | 0.18 | 0.13 | 0.27 |
| **Density (mussels/$m^2$)** | - | - | 0.24 | 0.32 | - | - | - |

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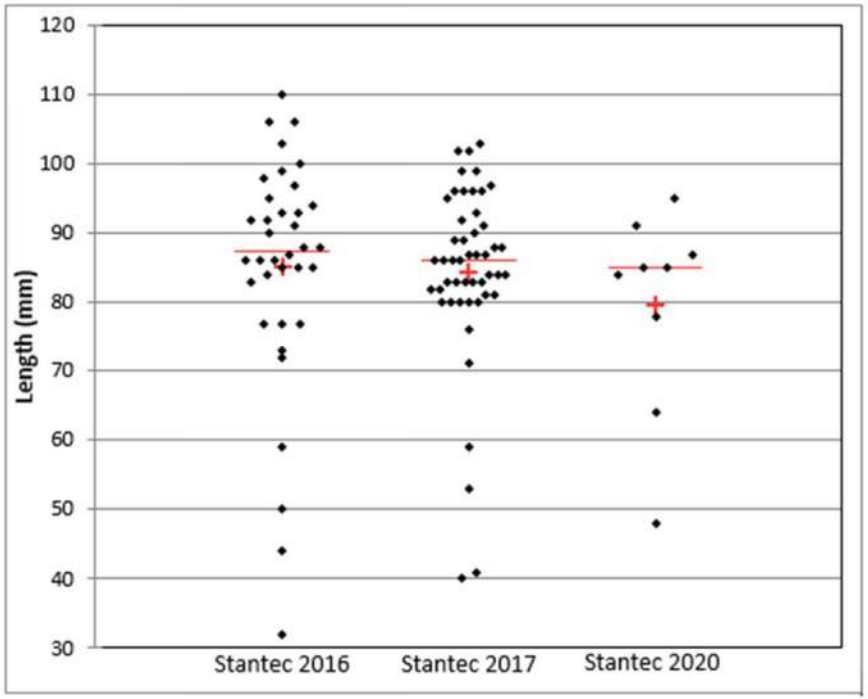
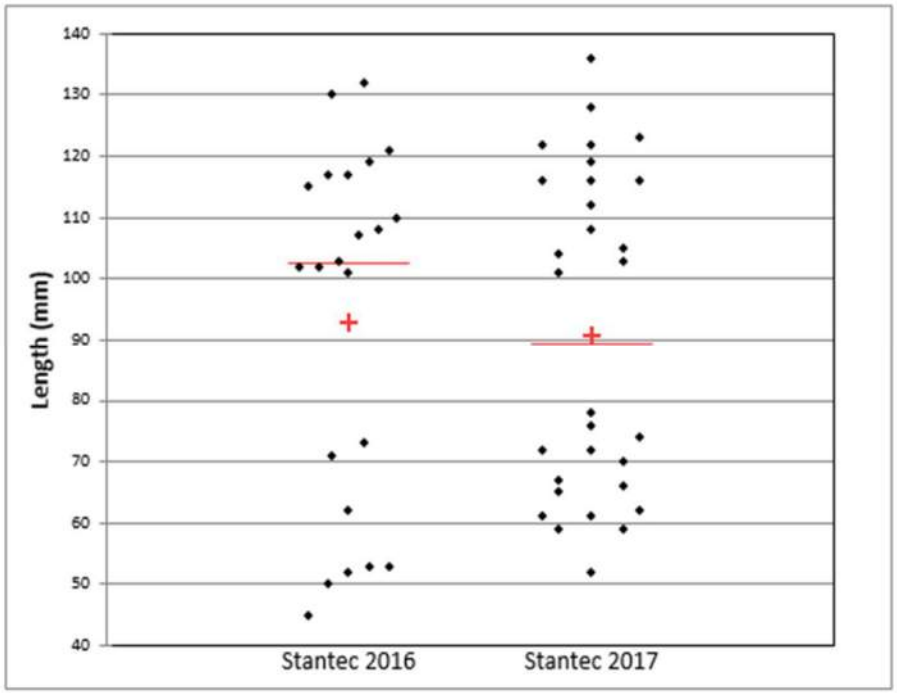
# Freshwater Mussel Survey Results




**Shell Lengths of *Cyclonaias tuberculata***
**Stantec (2016, 2017, 2020)**




**Shell Lengths of *Tritogonia verrucose***
**Stantec (2016, 2017)**

# Freshwater Mussel Survey Results

- Buck Tailrace: no evidence of mussels
- Velocity visually estimated at 3fps
- Could not safely evaluate substrate

# Freshwater Mussel Survey Conclusion

- Overall abundance and density are low
- Densities are the lowest in reach between the two dams
- Better substrate did not correspond to higher abundance in impoundment area
  - Perceived higher quality substrate in side-channels, but sparse invertebrate life observed
  - Side channels may be intermittent during summer (no data on this)

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# Variances from FERC-Approved Study Plan

| Proposed Scheduling Changes to the 2020-2021 Study Plan Schedule for the Byllesby/Buck Project (FERC No. 2514) | | |
|---|---|---|
| **Study** | **Activities** | **Proposed Timeframe for Completion (January 2021 update)** |
| Aquatic Resources Study | Desktop Literature Review | Completed (August 2020) |
| | Macroinvertebrate and Crayfish Survey | Completed (October 2020)<br>April – May 2021 |
| | Fish Community Survey | Boat Electrofishing (October) and Gill Netting (November) Completed in 2020<br>Boat and Backpack Electrofishing and Gill Netting Scheduled for Spring 2021 (April – May) |
| | Freshwater Mussel Survey | Completed (September - October 2020) |
| | Fish Impingement and Entrainment Evaluation and Turbine Blade Strike Analysis | Preliminary Impingement and Entrainment Evaluation Completed (December 2020)<br>Final Impingement and Entrainment Evaluation and Turbine Blade Strike Analysis (July 2021) |
| | Distribute Draft Aquatic Resources Study Report with the ISR/USR | ISR Completed (January 2021)<br>USR December 2021 |

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# Morning Break


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# Bypass Reach Flow and Aquatic Habitat Study

Buck Bypass Reach 9.16.2020 714 cfs

# Bypass Reach Flow and Aquatic Habitat Study

**Study Goal:** Conduct a flow and habitat assessment of the Project's tailrace and bypass reach using desktop, field survey, and hydraulic/habitat modeling methodologies

## Specific Objectives

- Delineate and quantify aquatic habitats and substrate types within the bypass reaches
- Identify and characterize locations of habitat management interest within the bypass reaches
- Determine surface water travel times and water surface elevation responses at various gate openings to:
  - Evaluate the existing ramping rates required by the existing license
  - Evaluate potential available habitat under the existing 360 cfs minimum downstream flow requirement
  - Evaluate potential seasonal minimum flow releases in the bypass reach

# Bypass Reach Flow and Aquatic Habitat Study

## Study Status

Appalachian initiated the Bypass Reach Flow and Aquatic Habitat Study in accordance with the methods described in the RSP and SPD.

**Preliminary Summary of Study Methods and Results**

- Completed desktop habitat mapping and evaluation of Project inflows
- Assembled Habitat Suitability Index (HSI) criteria
- Developed a model calibration target flow recommendation
- Collected field data during target flow releases into the Buck bypass reach
- Developed and calibrated 2-D hydraulic model of the Buck bypass reach
- Used model to simulate potential available habit in the Buck study area at target flows

# Byllesby Study Area

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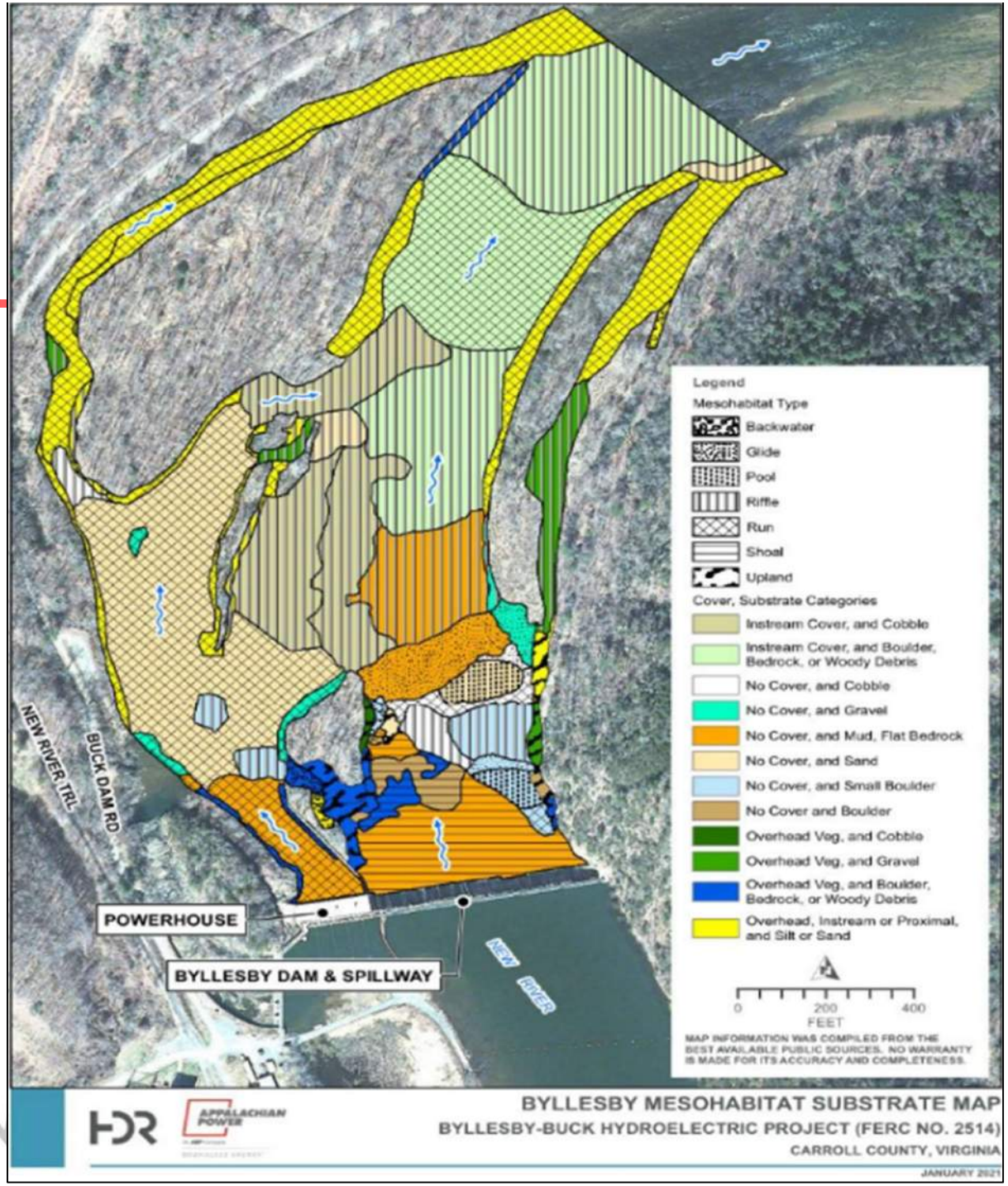
# Byllesby Mesohabitat Substrate Map



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# Byllesby Aquatic Habitat Characteristics

| Habitat Characteristic | Area (acres) | Percent (%) |
|---|---|---|
| **Cover** | | |
| No Cover | 16.0 | 39.9 |
| Instream Cover | 15.0 | 37.4 |
| Overhead Vegetation | 9.1 | 22.7 |
| **Substrate** | | |
| Boulder, Bedrock, or Woody Debris | 11.6 | 28.9 |
| Sand | 6.9 | 17.2 |
| Silt or Sand | 6.8 | 16.9 |
| Mud or Flat Bedrock | 5.8 | 14.6 |
| Cobble | 5.5 | 13.6 |
| Boulder | 1.9 | 4.6 |
| Gravel | 1.7 | 4.2 |
| **Mesohabitat** | | |
| Run | 17.7 | 44.2 |
| Riffle | 16.4 | 41.0 |
| Shoal | 2.9 | 7.2 |
| Glide | 1.3 | 3.3 |
| Upland | 0.9 | 2.2 |
| Pool | 0.6 | 1.4 |
| Backwater | 0.5 | 0.7 |

Byllesby Bypass Reach 7.31.2019 Leakage Flow

Byllesby Downstream Reach 8.29.2019

# Buck Study Area

**Figure 1 of 3**
Buck Mesohabitat Substrate Map (Upper Bypass Reach)

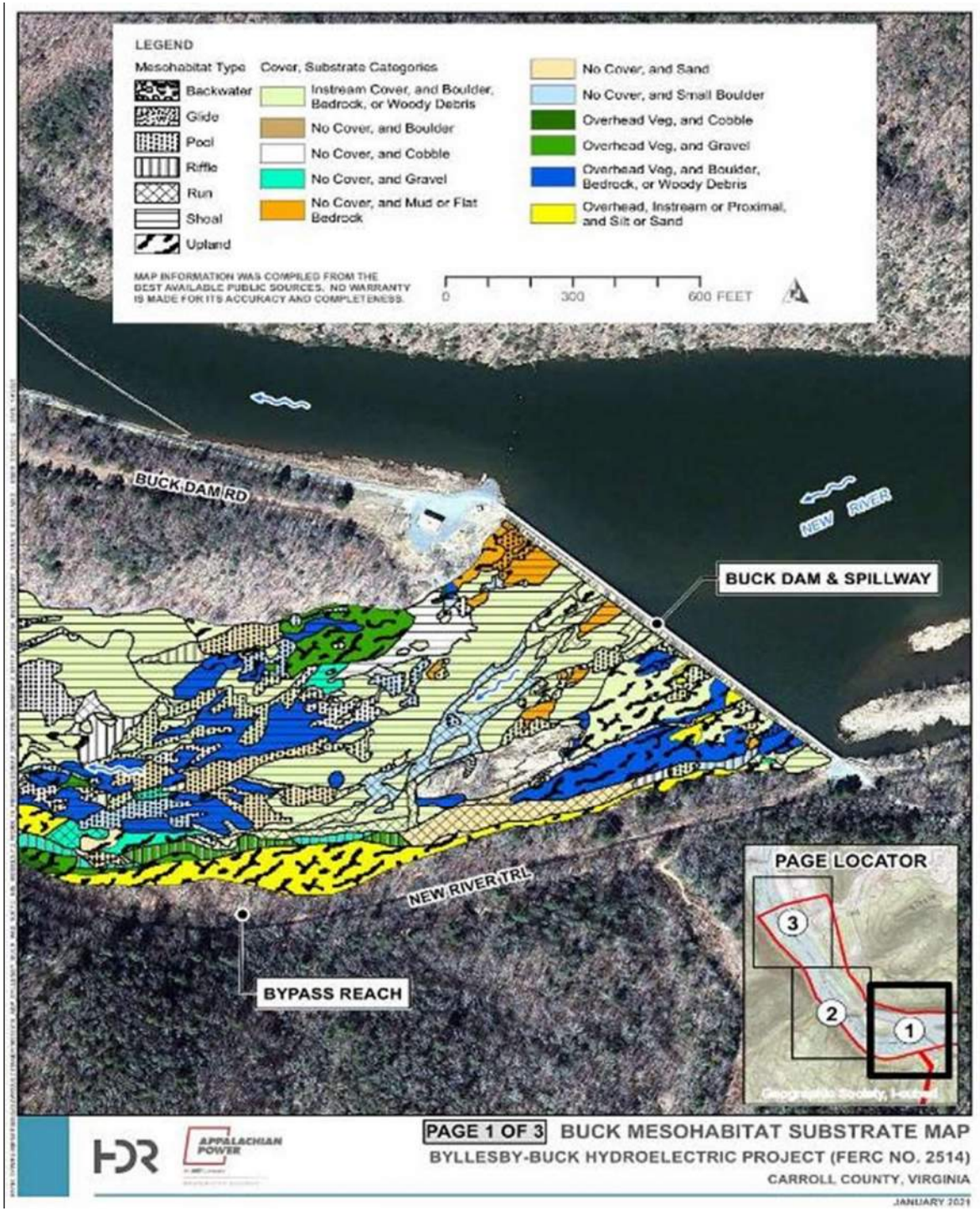


**Figure 2 of 3**
Buck Mesohabitat Substrate Map (Lower Bypass Reach)

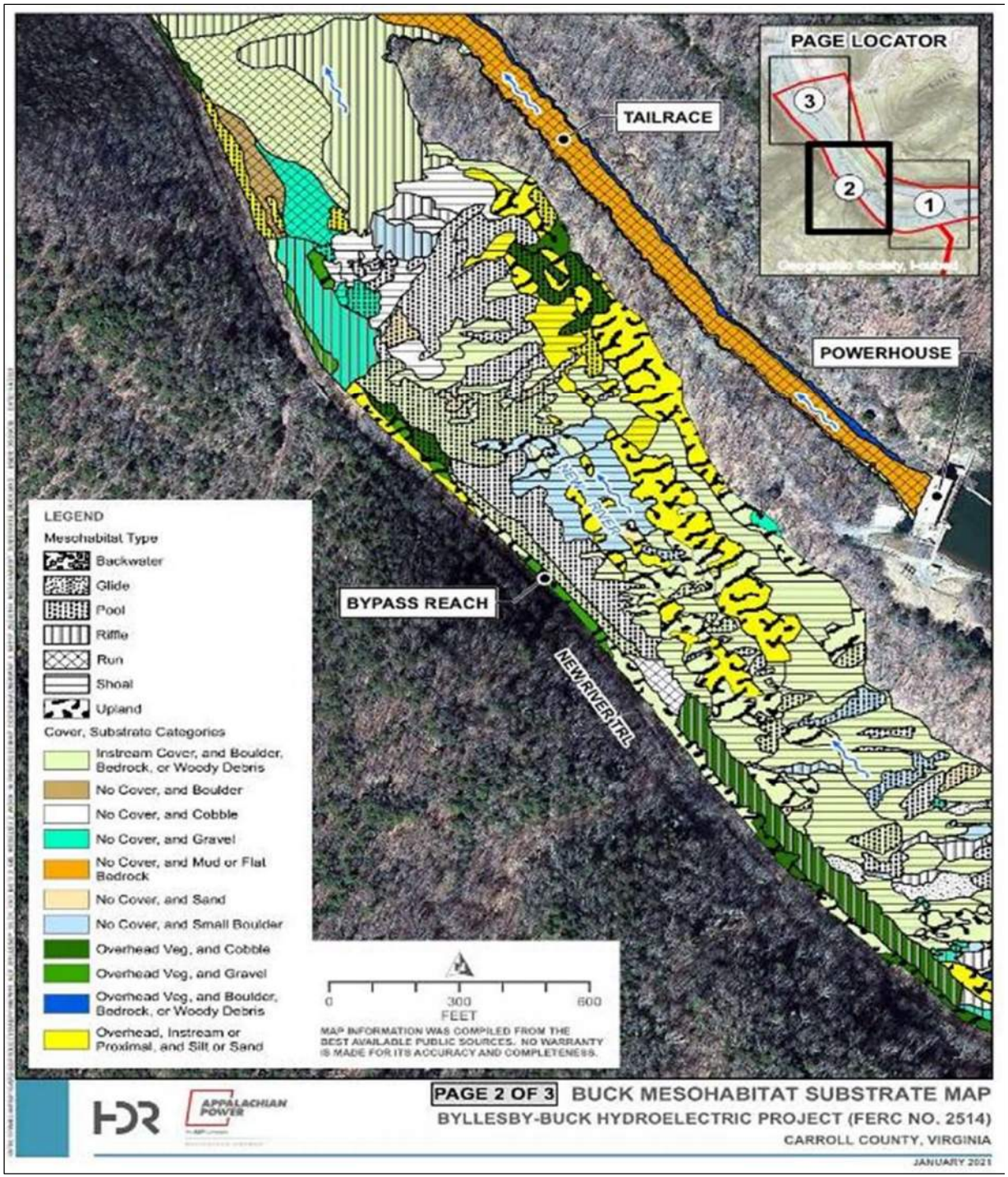
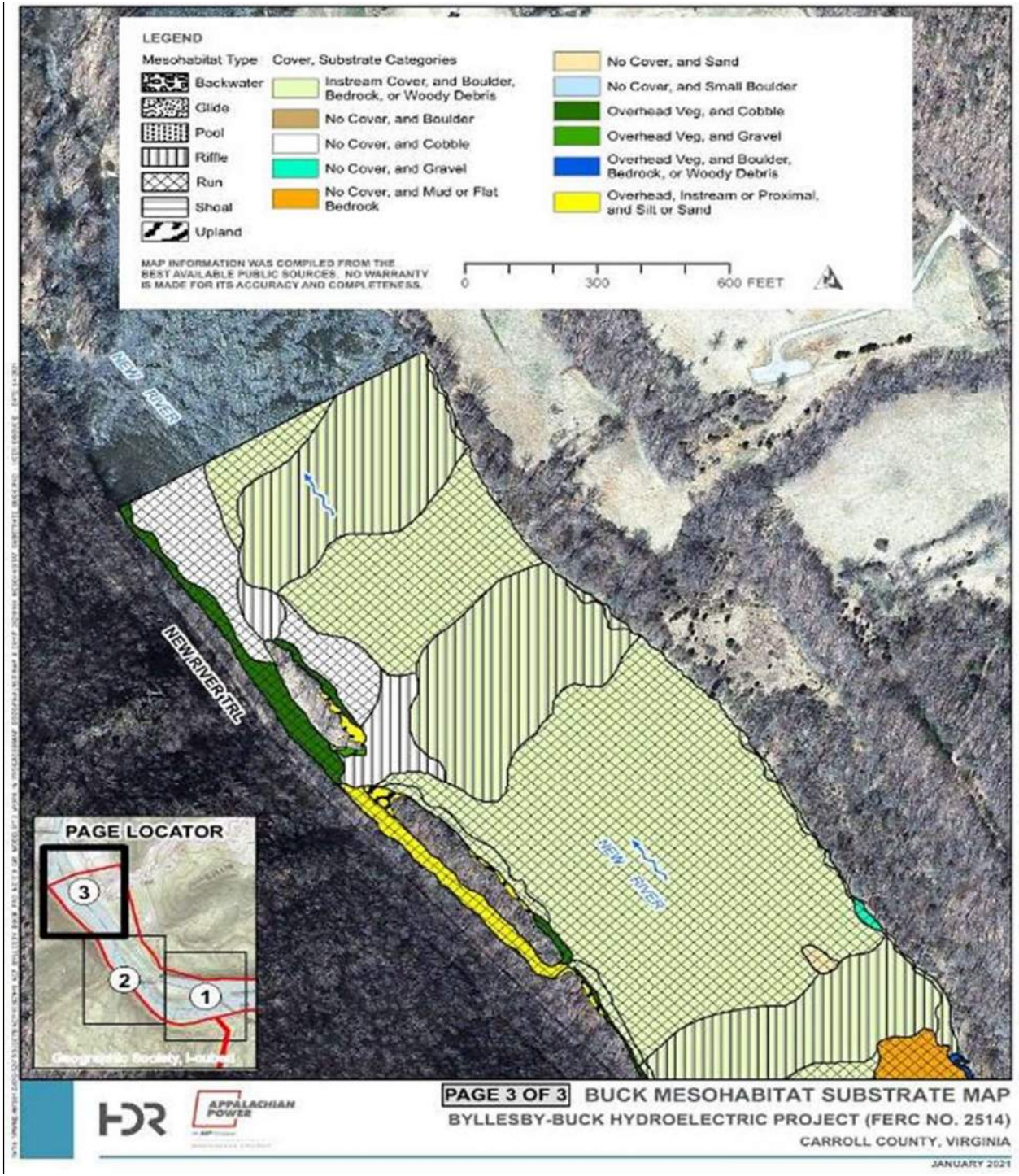


**Figure 3 of 3**
Buck Mesohabitat Substrate Map (Lower Study Area Boundary)



# Buck Aquatic Habitat Characteristics

| Habitat Characteristic | Area (acres) | Percent (%) |
|---|---|---|
| **Cover** | | |
| Instream Cover | 65.8 | 66.2 |
| No Cover | 24.5 | 24.7 |
| Overhead Vegetation | 9.1 | 9.1 |
| **Substrate** | | |
| Boulder, Bedrock, or Woody Debris | 61.6 | 61.9 |
| Cobble | 15.0 | 15.1 |
| Silt or Sand | 8.0 | 8.1 |
| Gravel | 4.3 | 4.3 |
| Small Boulder | 3.8 | 3.8 |
| Mud or Flat Bedrock | 3.8 | 3.8 |
| Sand | 2.6 | 2.7 |
| Boulder | 0.4 | 0.4 |
| **Mesohabitat** | | |
| Run | 31.1 | 31.2 |
| Shoal | 20.6 | 20.7 |
| Riffle | 20.2 | 20.4 |
| Upland | 14.5 | 14.6 |
| Pool | 12.6 | 12.7 |
| Glide | 0.4 | 0.4 |
| Backwater | 0.0 | 0.0 |

Buck Upper Bypass Reach
7.31.2019 Leakage Flow

Buck Lower Bypass Reach
8.17.2020 Tainter Gates #1 & #4 Partially Open

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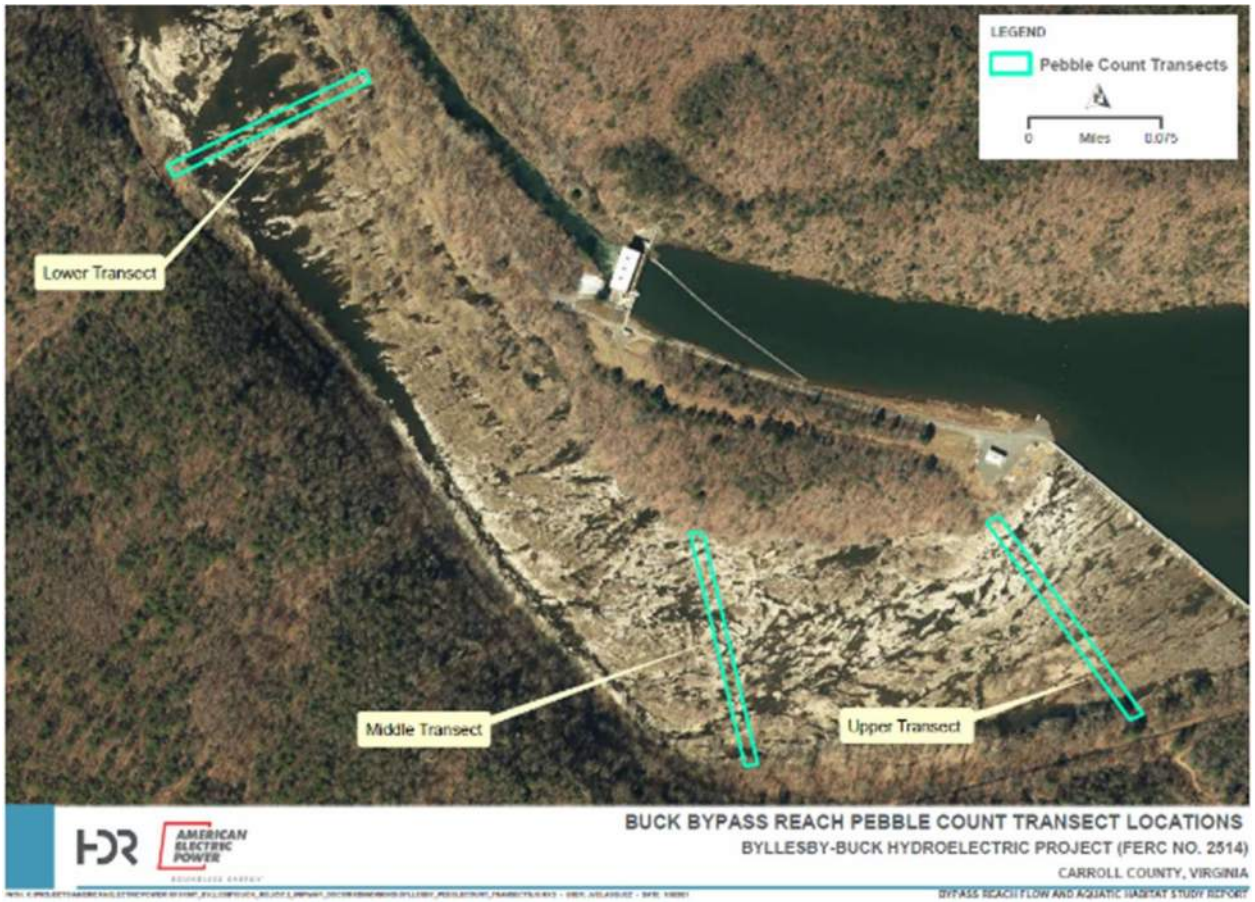
# Particle Size Distribution Results – Buck Bypass




**Percent Bedrock**

Upper Transect 52%
Middle Transect 27%
Lower Transect 22%

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# Species of Interest Walleye and Guilds

| Species or Guild | Life Stage/ Category | Representative |
|---|---|---|
| Walleye | Adult | -- |
| | Juvenile | -- |
| | Fry | -- |
| | Spawning | -- |
| Shallow-Slow Guild | Fine substrate, no cover | Redbreast Sunfish spawning |
| | All substrate with aquatic vegetation | Silver Redhorse Young-of-Year |
| | Coarse substrate | Generic shallow-slow guild |
| Shallow-Fast Guild | Moderate velocity with coarse substrate | Generic shallow-fast guild |
| Deep-Slow Guild | Cover | Redbreast Sunfish Adult |
| | No cover | Generic deep-slow guild |
| Deep-Fast Guild | Slightly weighted for fine substrate, Cover | Silver Redhorse adult |
| | Coarse-mixed substrate | Shorthead Redhorse adult |

Walleye
Courtesy: Virginia DWR

Redbreast Sunfish
Courtesy: Virginia DWR

Silver Redhorse
Courtesy: USGS

Shorthead Redhorse
Courtesy: Iowa DNR

# 2-D Hydraulic Model Calibration Flows

Buck Upper Bypass Reach 9.10.2020 210.7 cfs

**Measured Flows:**

- Leakage: 17.1 cfs
- Low: 210.7 cfs (shown)
- Middle: 354 cfs
- High: 714 cfs

- Level loggers also recorded water surface elevations during higher bypass flow events

Buck Upper Bypass Reach
9.10.2020 210.7 cfs

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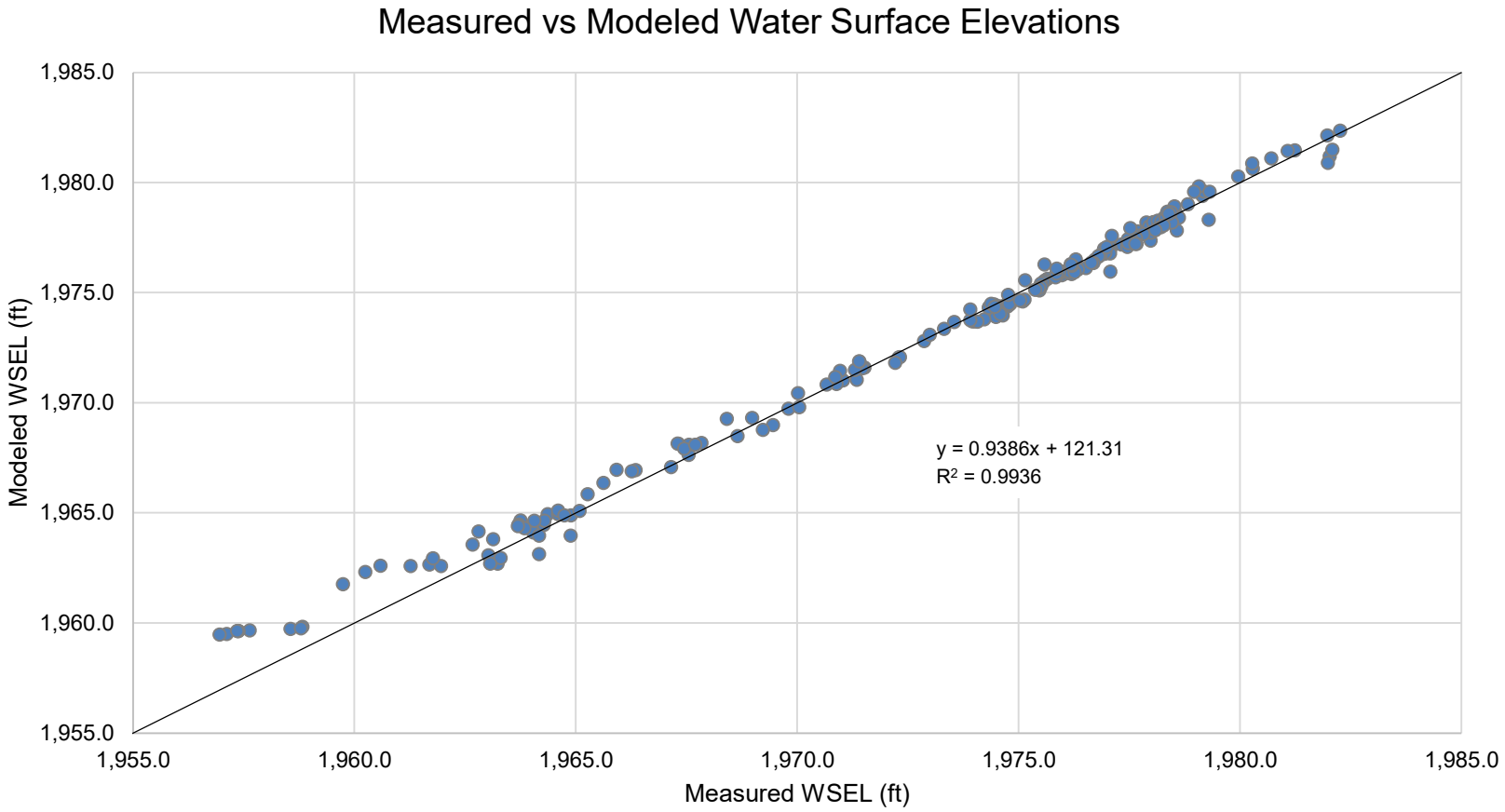
# 2-D Hydraulic Model Calibration Results: WSEL



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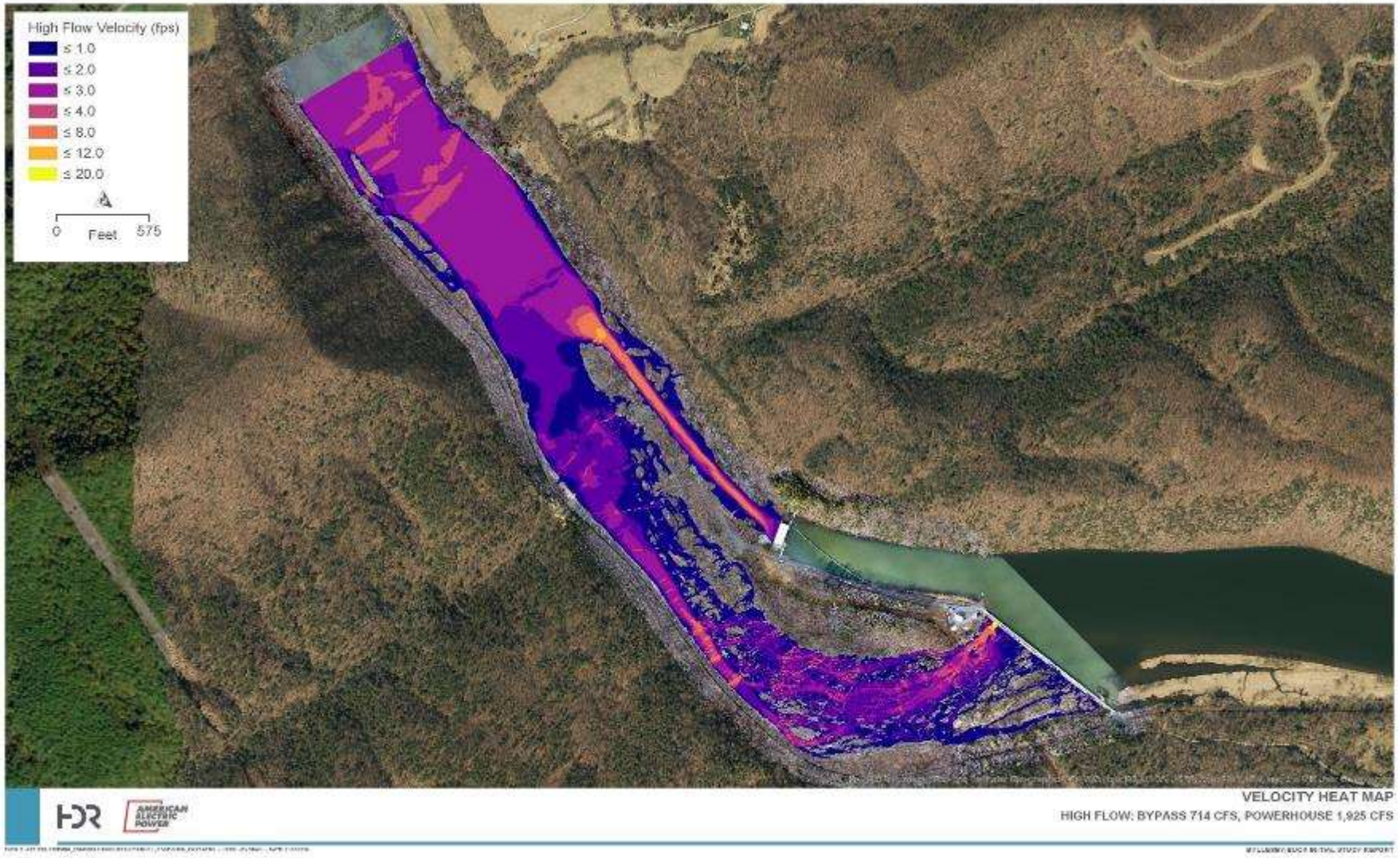
# 2-D Hydraulic Model Calibration Results: Velocity



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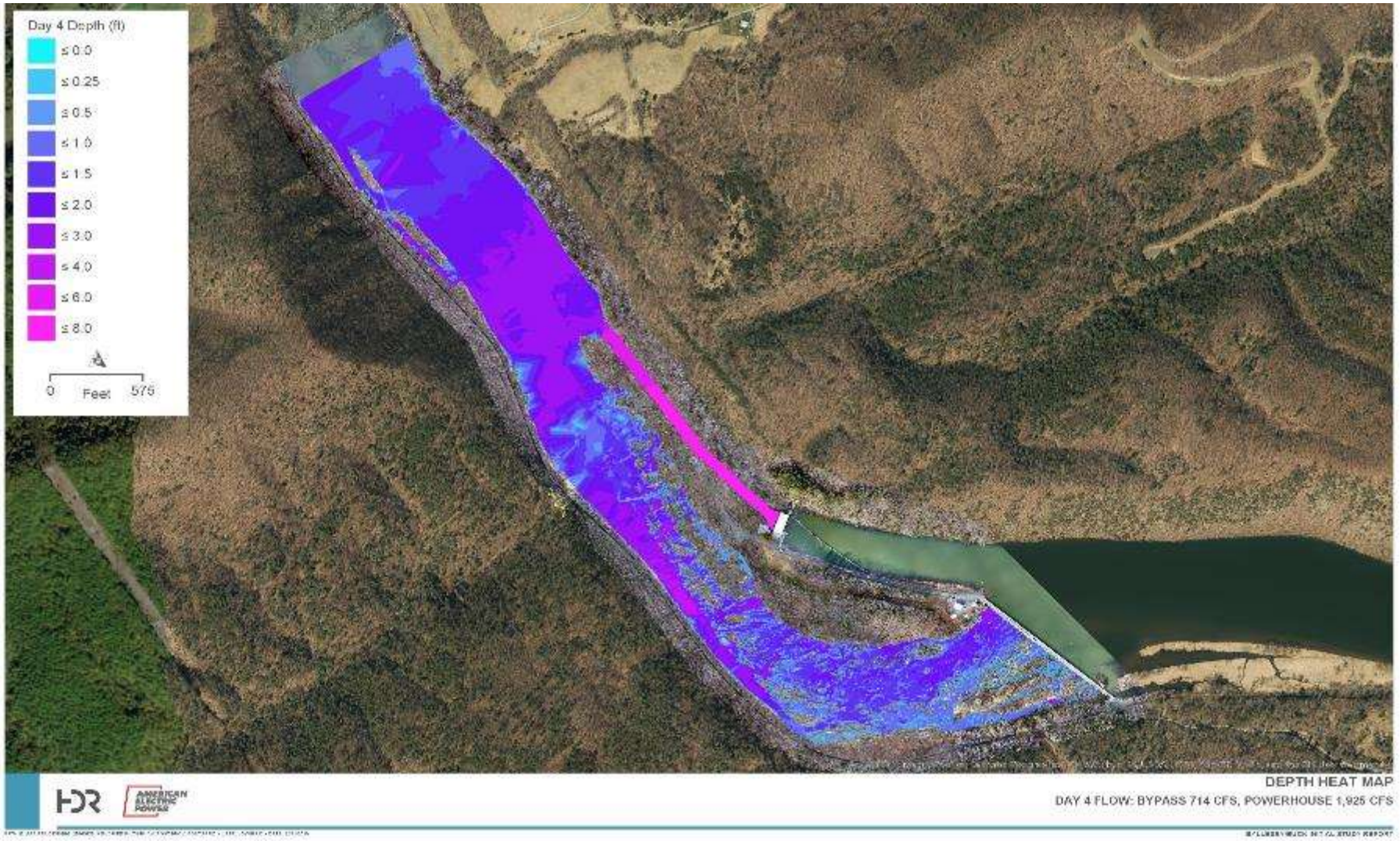
# 2-D Hydraulic Model Calibration Results: Depth



# 2-D Hydraulic Model Calibration Results: Travel Time

| Bypass Reach Flow | Level Logger Time (hr:min) | Model Time (hr:min) | Delta (hr:min) |
|---|---|---|---|
| Day 1 (Leakage) | N/A | N/A | N/A |
| Day 2 (Low) | 2:30 | 2:25 | -0:05 |
| Day 3 (Mid) | 1:40 | 1:50 | +0:10 |
| Day 4 (High) | 1:00 | 1:15 | +0:15 |

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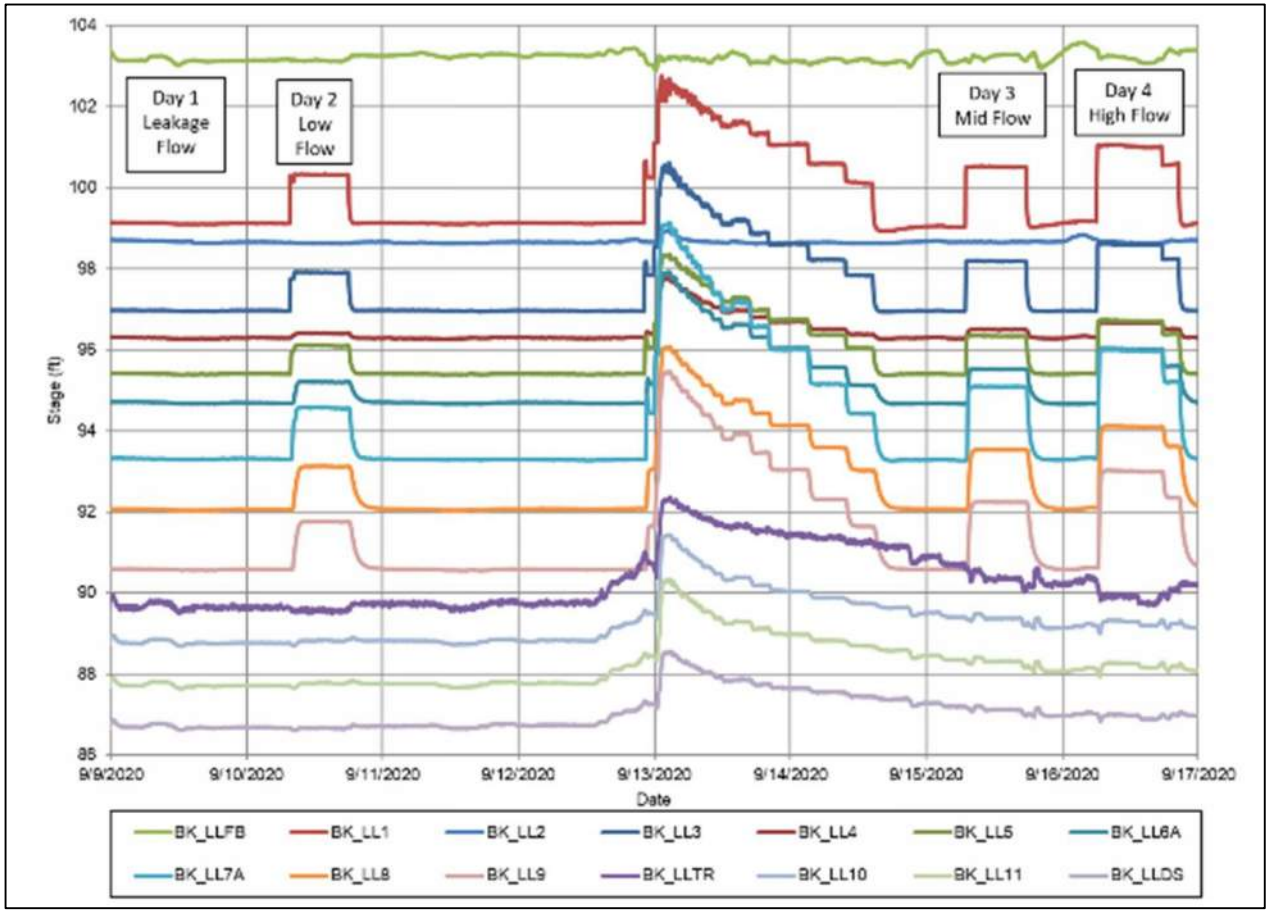
# Buck Bypass Reach: Travel Time and Water Surface Elevations

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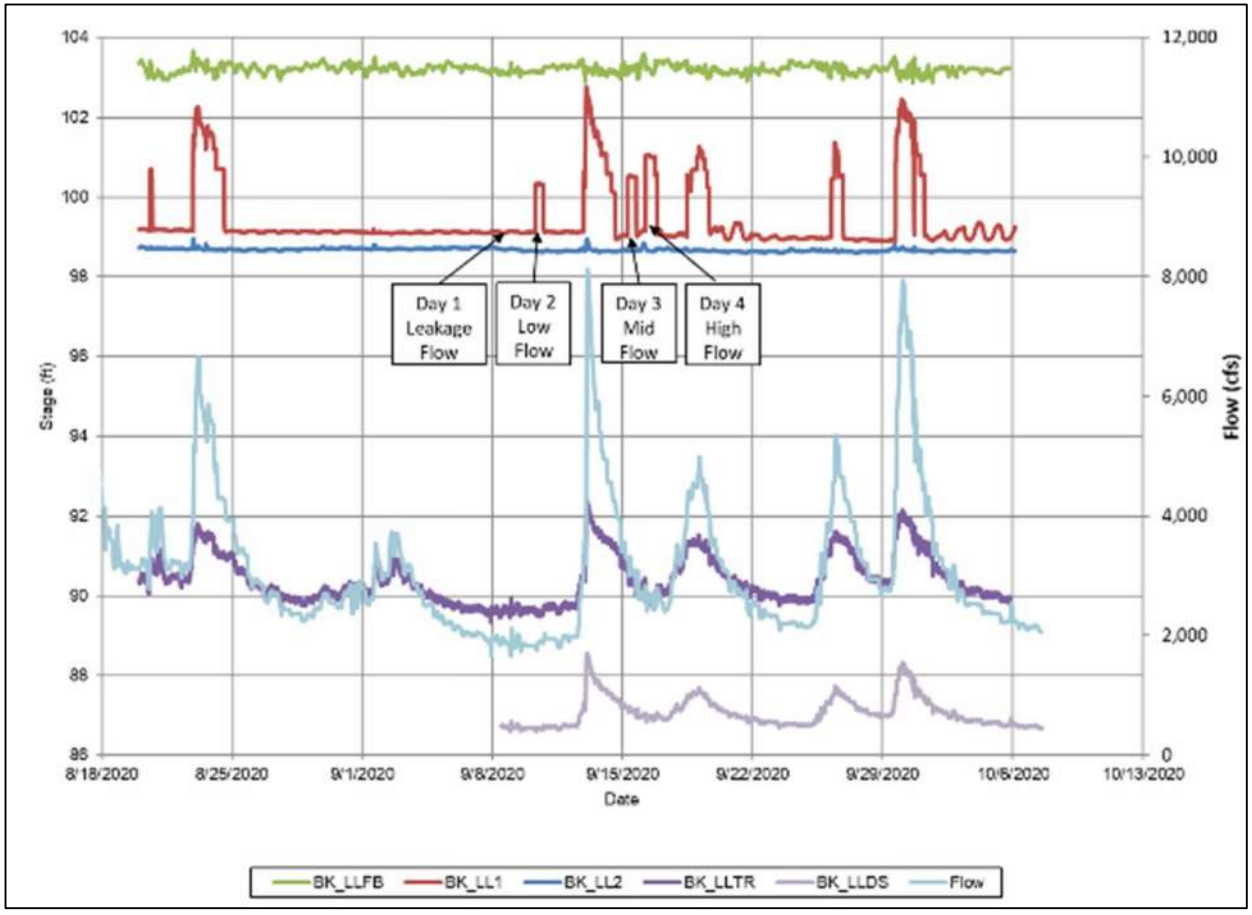
# Buck Bypass Reach: Travel Time and Water Surface Elevations

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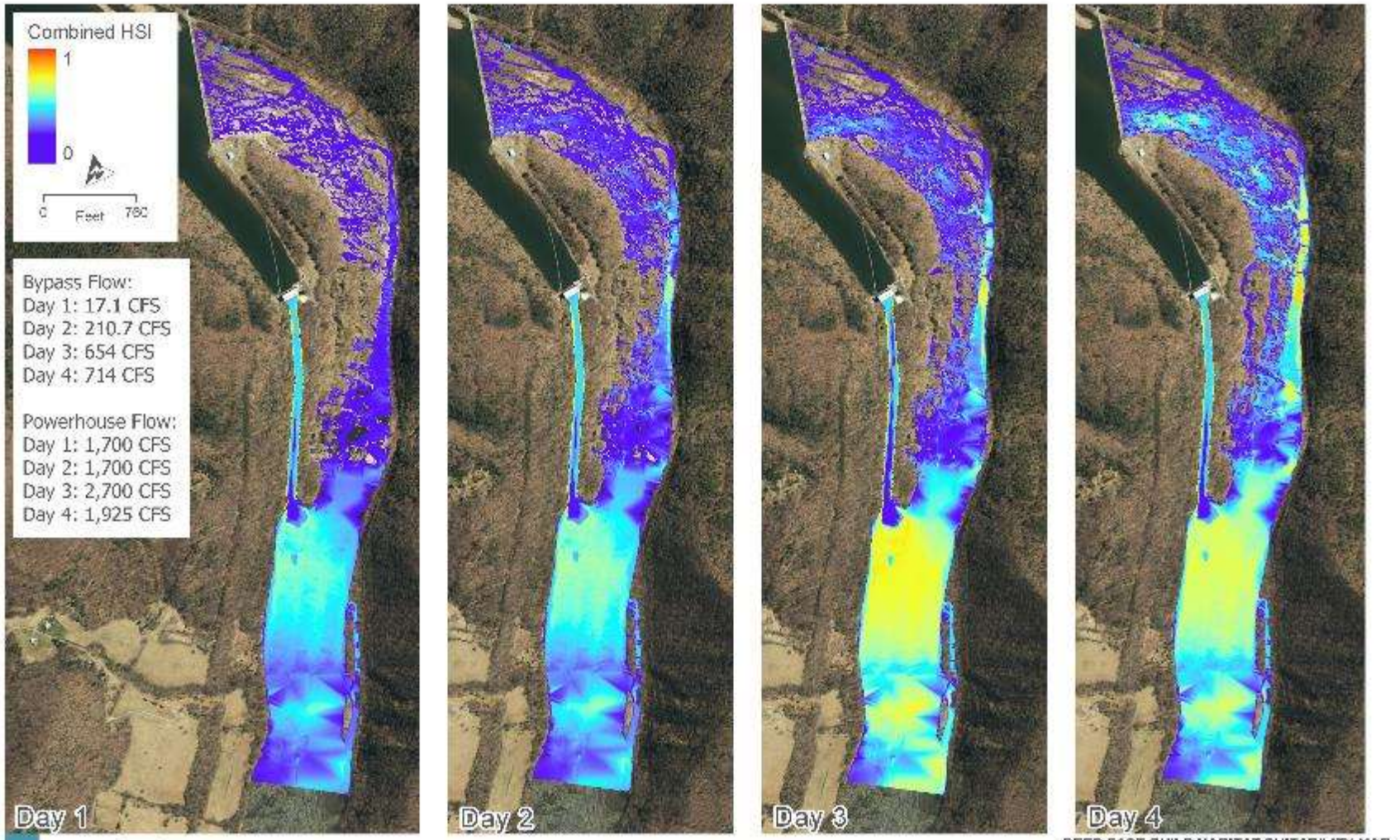
# Habitat Results



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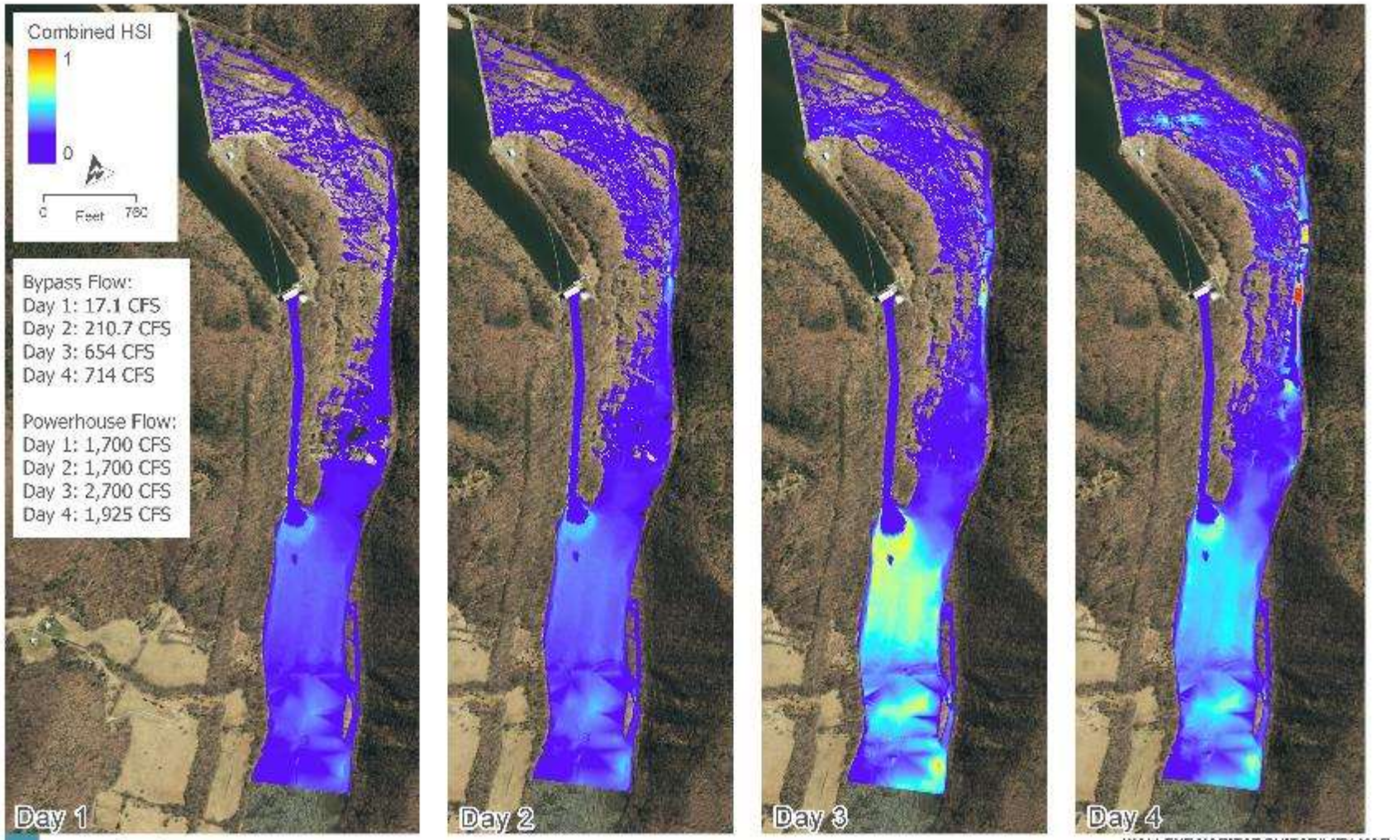
# Habitat Results



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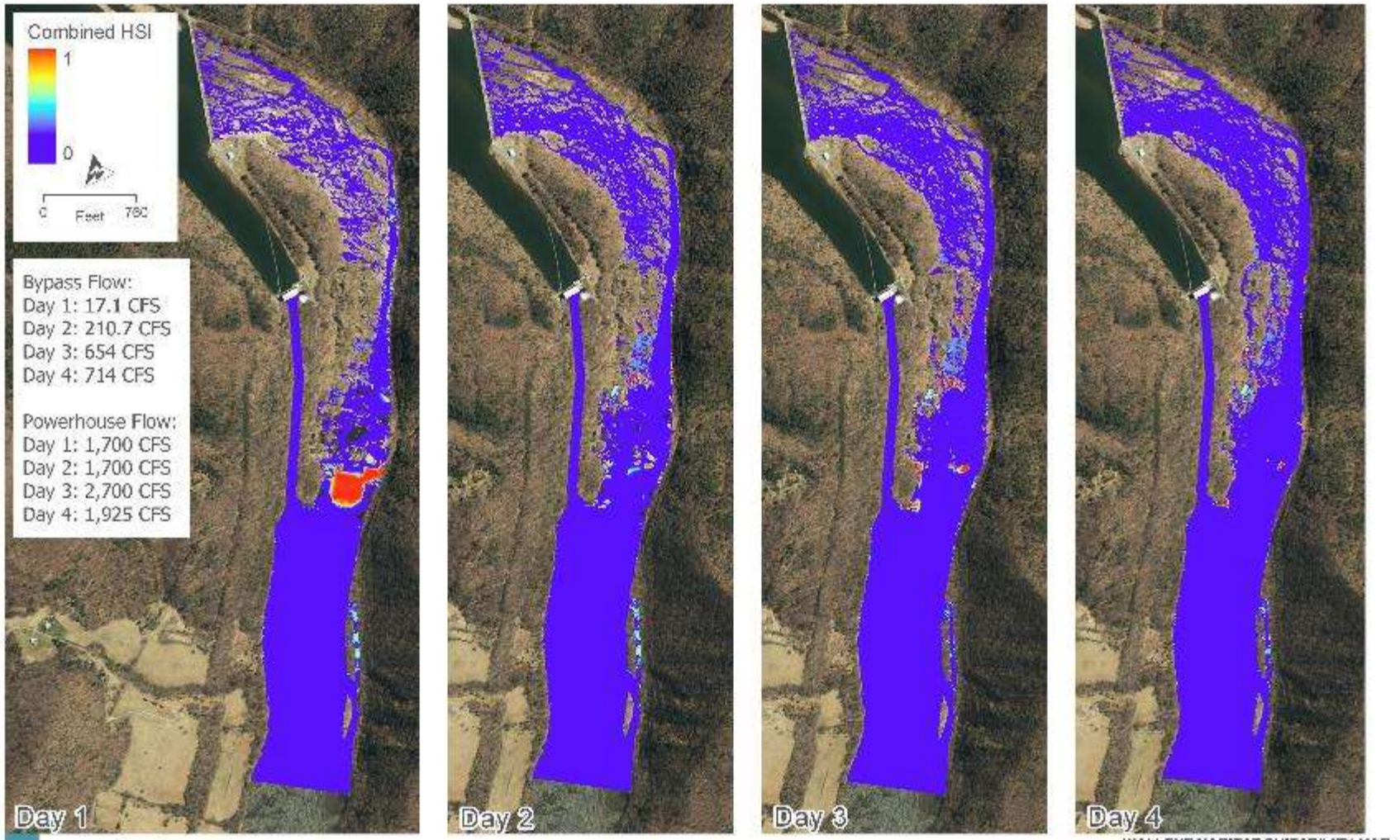
# Habitat Results



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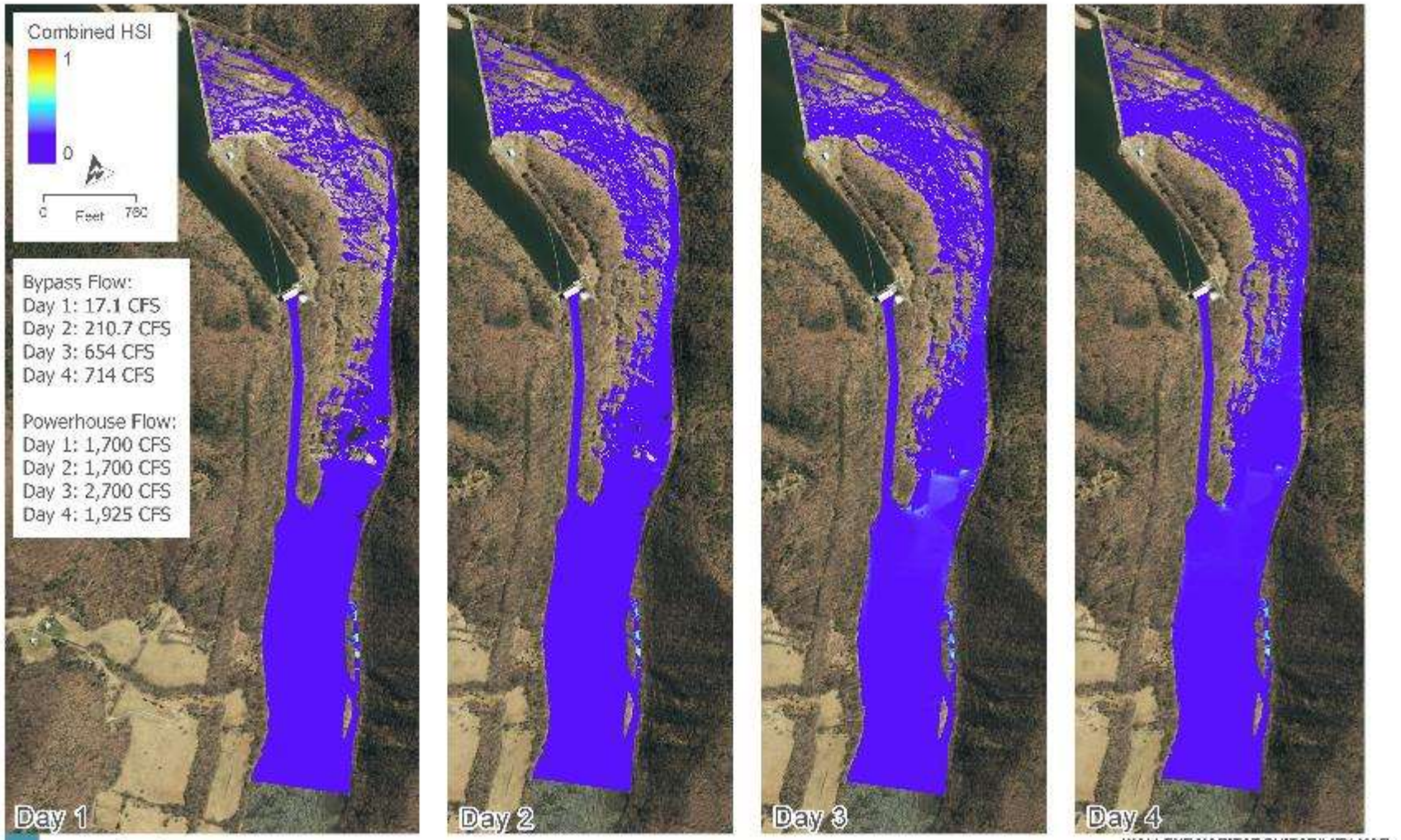
# Habitat Results




WALLEYE HABITAT SUITABILITY MAP
LIFESTAGE: JUVENILE

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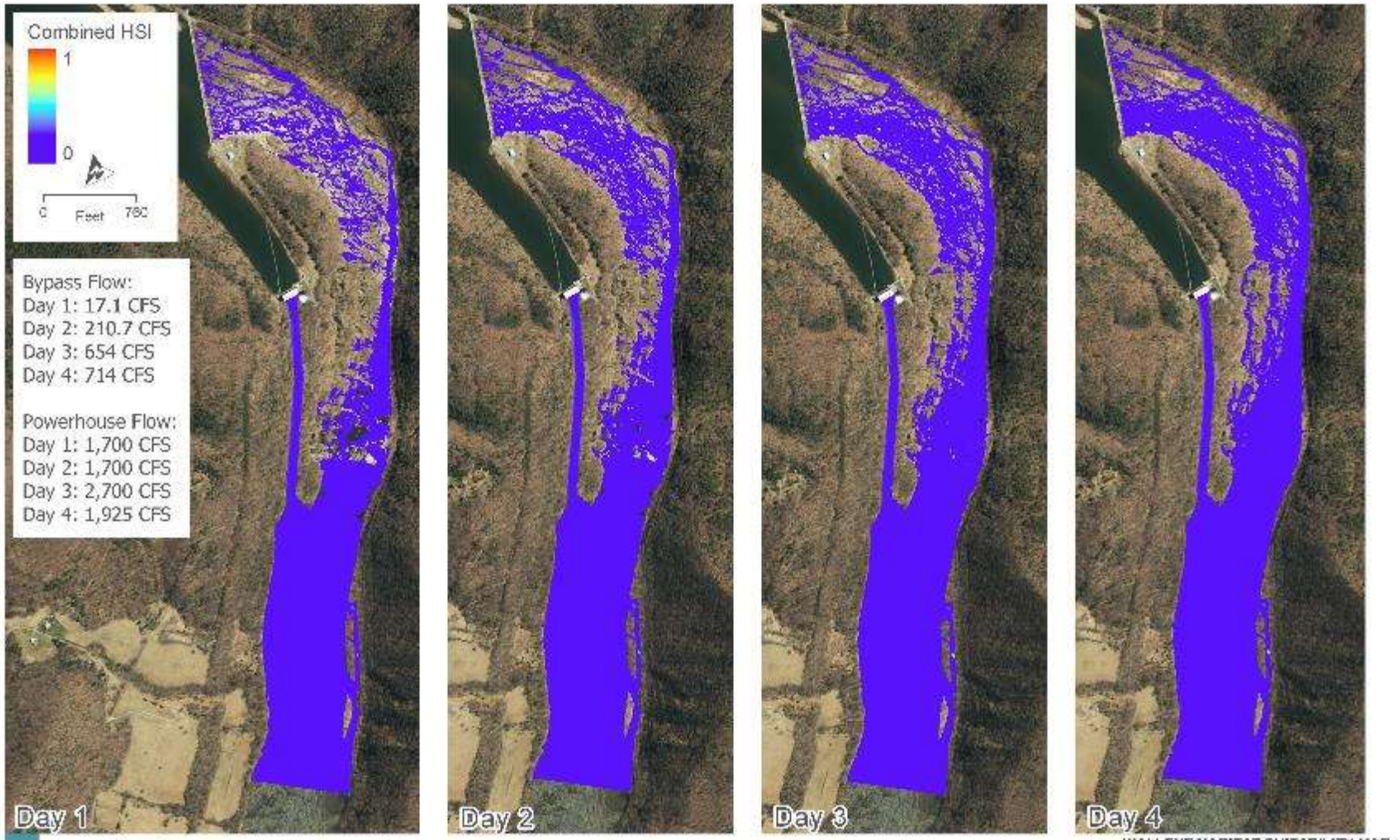
# Habitat Results



# Planned (2021) Study Activities at Buck

- Ability to simulate potential aquatic habitat under various bypass flow scenarios
- Evaluate existing 360 cfs minimum downstream flow requirement
- Evaluate potential seasonal minimum flow releases in the bypass reach

Buck Bypass Reach 9.9.2020 Leakage Flow

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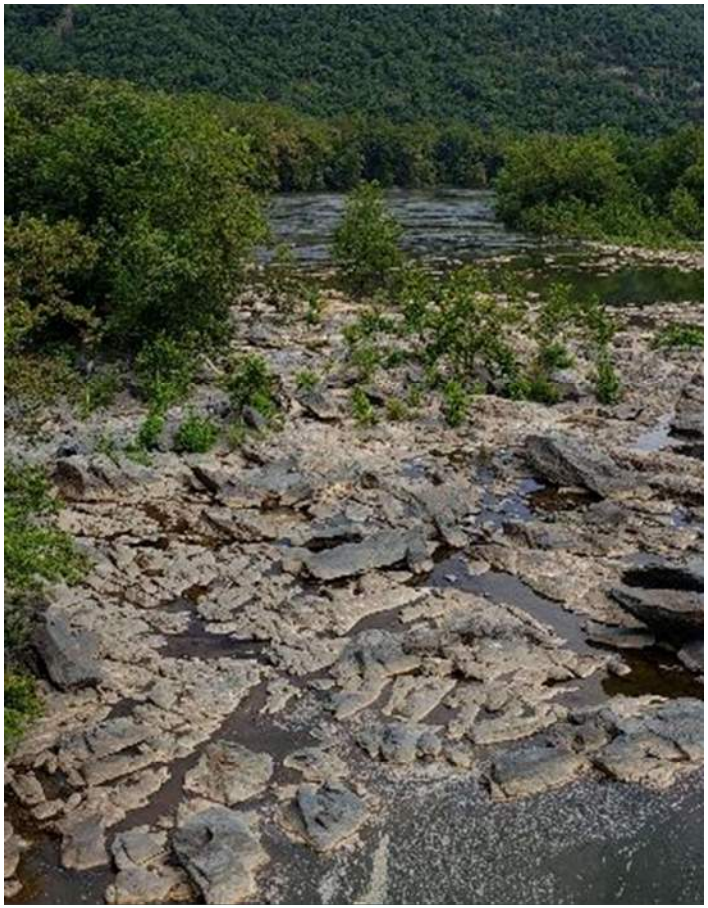
# Planned (2021) Study Activities at Byllesby

- Collect model calibration data at steady-state target flows
- Develop 2-D hydraulic model (Innovyze Infoworks Integrated Catchment Model)
- Simulate potential aquatic habitat under various bypass flow scenarios
- Evaluate existing 360 cfs minimum downstream flow requirement
- Evaluate potential seasonal minimum flow releases in the bypass reach



Byllesby Bypass
Reach 7.31.2019
Leakage Flow

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# Variances from FERC-approved Study Plan

| Proposed Scheduling Changes to the 2020-2021 Study Plan Schedule for the Byllesby/Buck Project (FERC No. 2514) | | |
|---|---|---|
| **Study** | **Activities** | **Proposed Timeframe for Completion (January 2021 update)** |
| Bypass Reach Flow and Aquatic Habitat Study | Topographic Mapping and Photogrammetry Data Collection | Completed (January 2020) |
| | Desktop Habitat Assessment | Completed (August 2020) |
| | Mesohabitat Mapping and Substrate Characterization Field Data Collection | Buck Completed (September 2020)<br>Byllesby June – August 2021 |
| | Distribute Proposed Flow Test Scenario Framework to Interested Parties for Review | Completed (August 2020) |
| | Conduct Flow and Water Level Assessment and Hydraulic Modeling | Buck Completed (December 2020)<br>Byllesby June – December 2021 |
| | Distribute Draft Study Report with the ISR/USR | ISR Completed (January 2021)<br>USR December 2021 |

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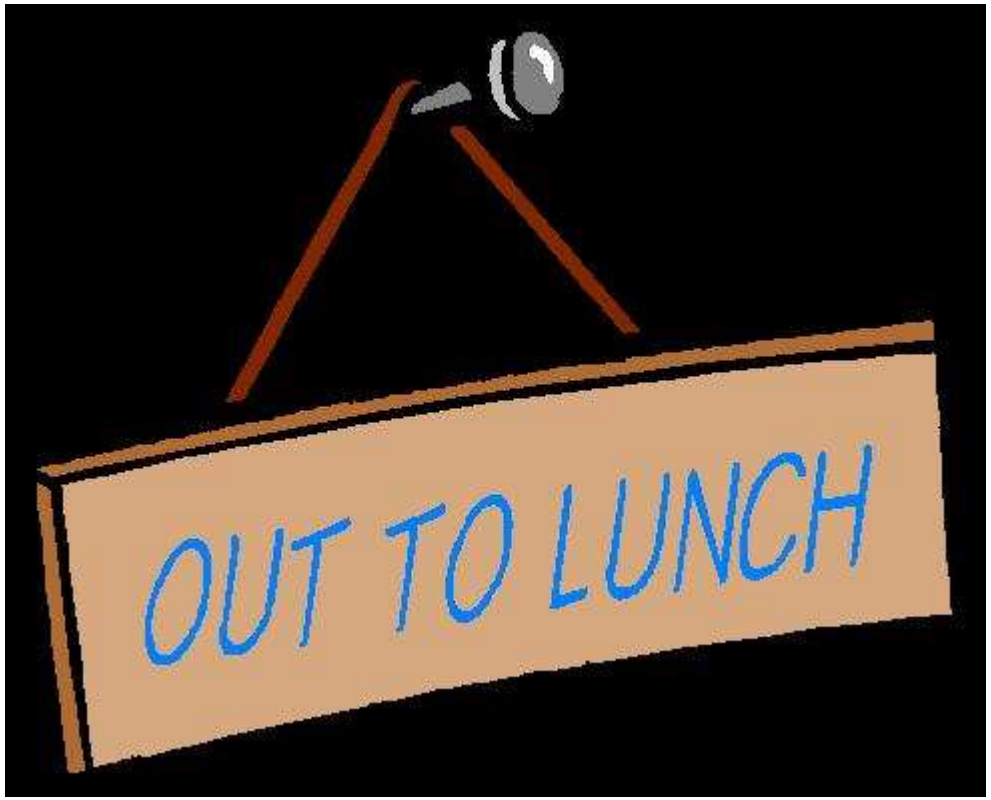
# 30-Minute Lunch Break



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# Water Quality Study

Byllesby Forebay 7.31.2019

# Water Quality Study

**Study Goal:** Conduct a study to support an analysis of the potential Project-related effects on water quality

## Specific Objectives:

- Gather baseline water quality data sufficient to determine consistency of existing Project operations with applicable Virginia state water quality standards and designated uses
- Provide data to determine the presence and extent, if any, of temperature or dissolved oxygen (DO) stratification in the Byllesby and Buck impoundments
- Provide data to support a Virginia Water Protection Permit application (CWA Section 401 Certification)
- Provide information to support evaluation of whether additional or modified protection, mitigation, and enhancement (PM&E) measures may be appropriate for the protection of water quality at the Project

# Water Quality Study

## Study Status

Appalachian has initiated the Water Quality Study in accordance with the schedule and methods described in the RSP and SPD.

## Summary of Study Methods and Results

- Study period: August 17 – October 8, 2020
- Monitoring locations:
  - Byllesby tailrace location
  - Buck forebay, tailrace, and bypass reach locations
- Temperature and DO data collected at 15-minute intervals
- Discrete data collected during equipment installation, download events, and demobilization (temperature, DO, pH, and specific conductivity)
- Vertical profile data collected during discrete data collection events

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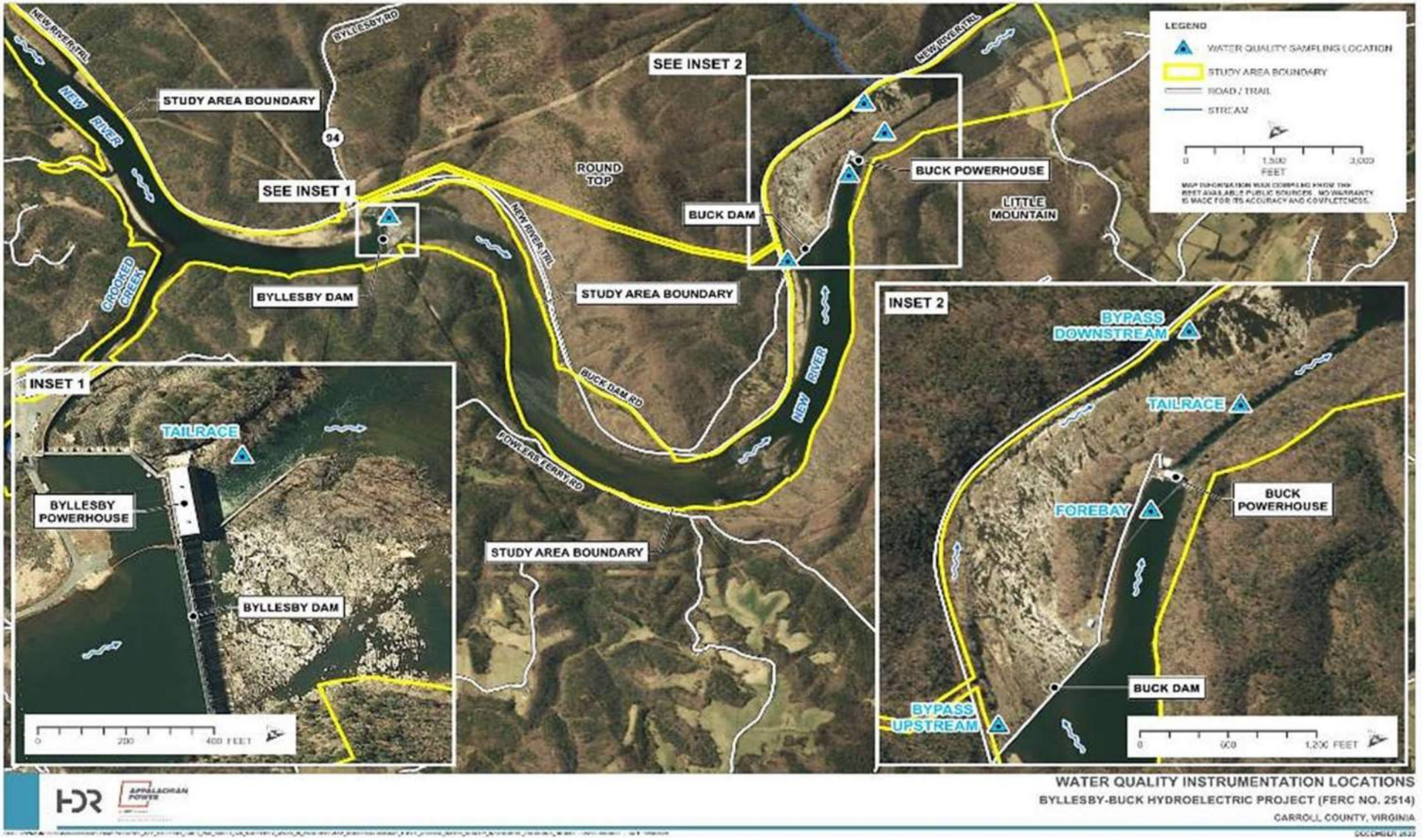
# Water Quality Study Area



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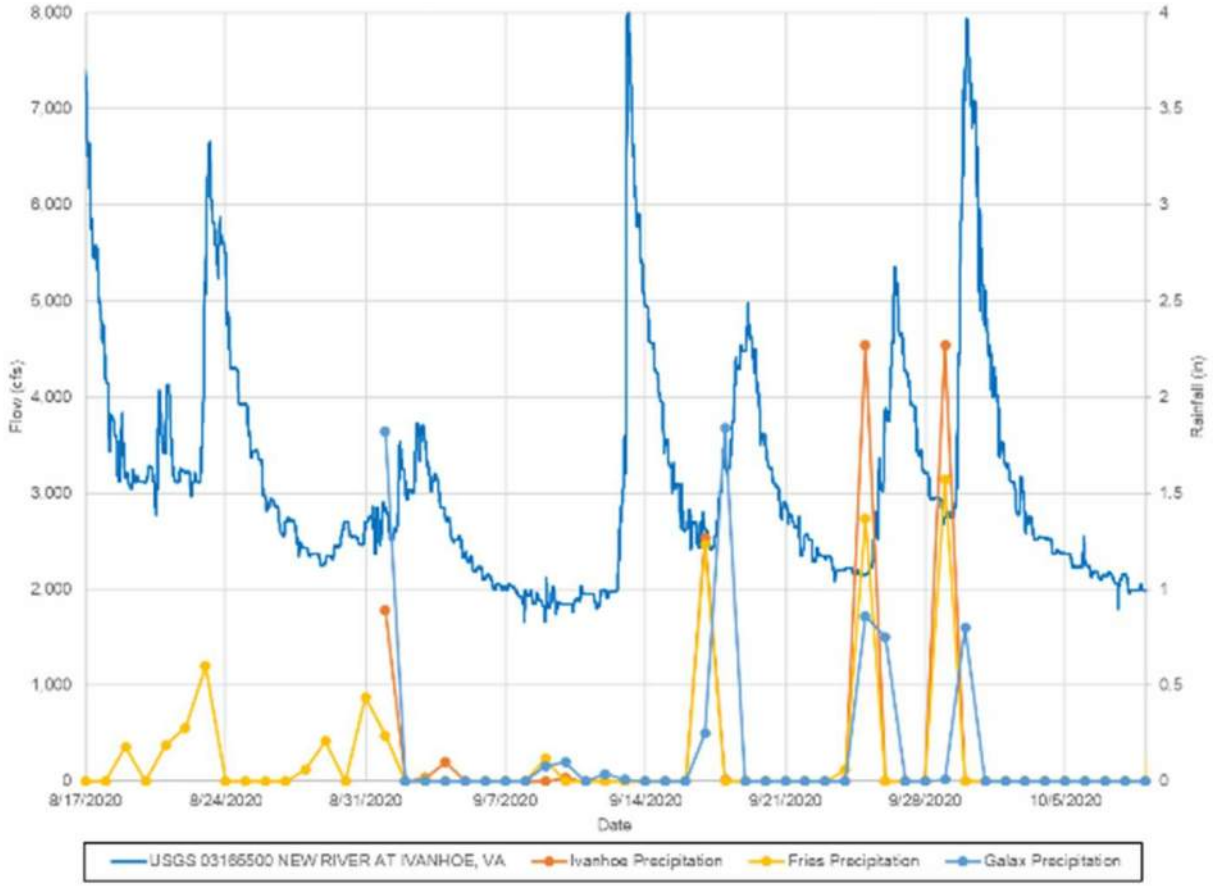
# Project Hydrology

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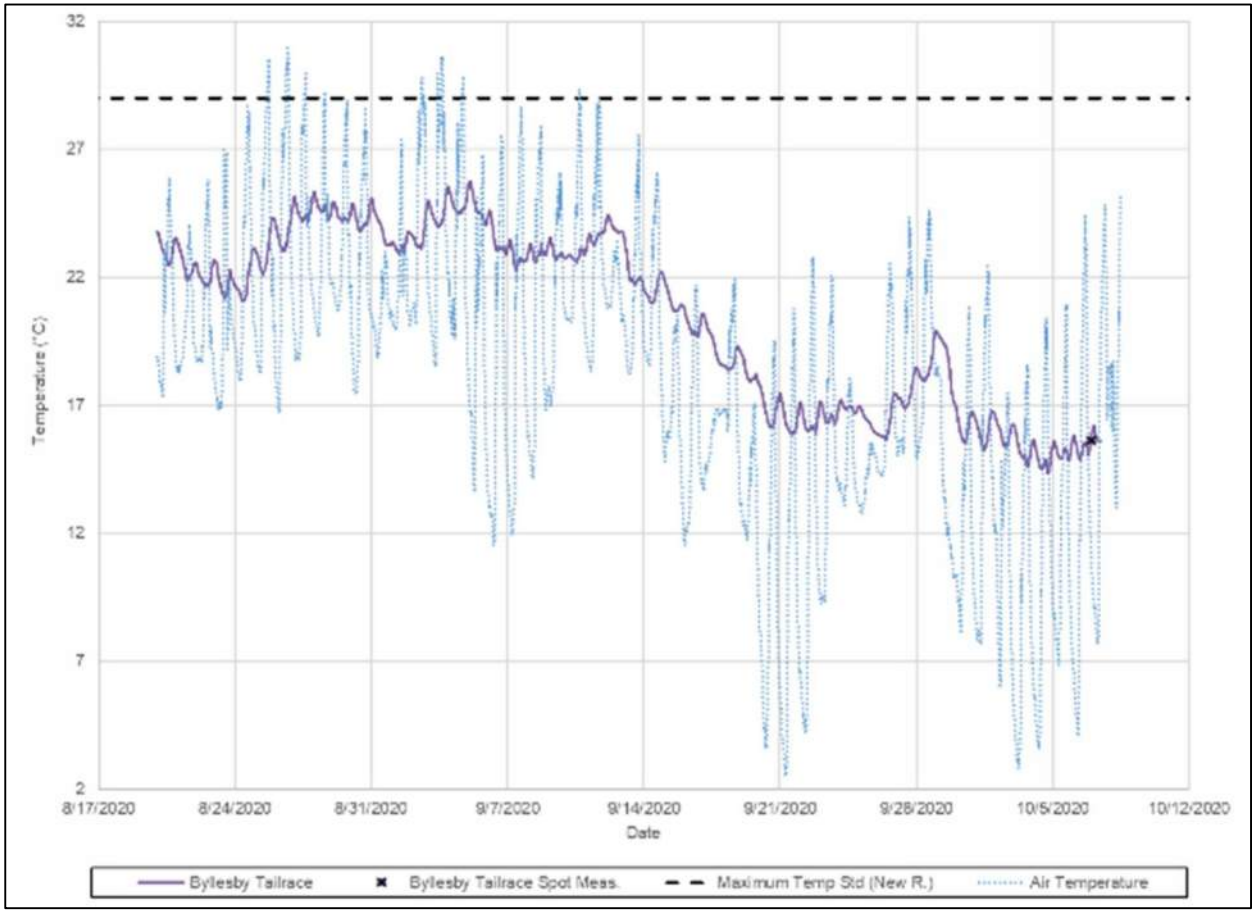
# Air & Water Temperatures Byllesby Tailrace

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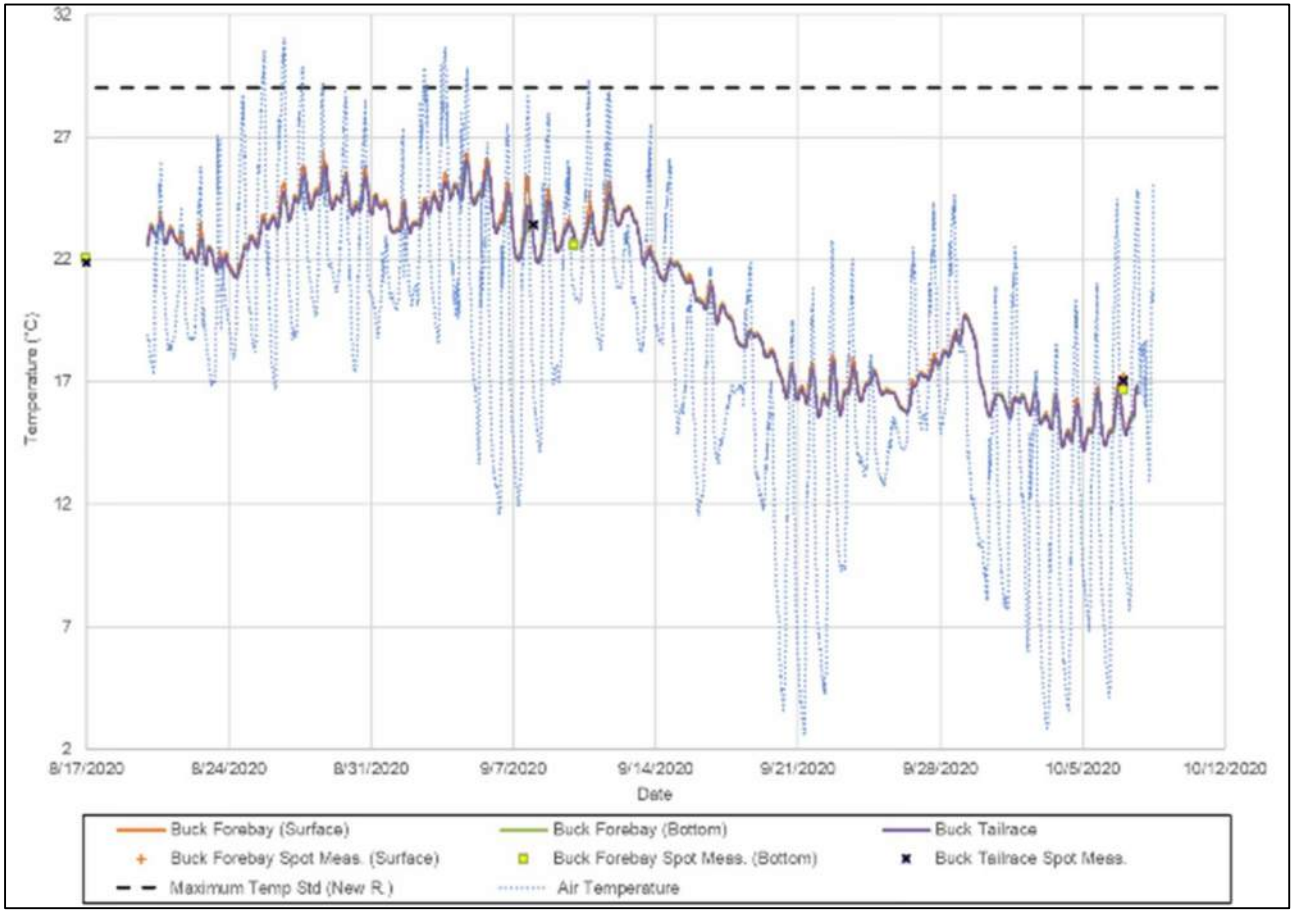
# Air & Water Temperatures Buck Forebay and Tailrace

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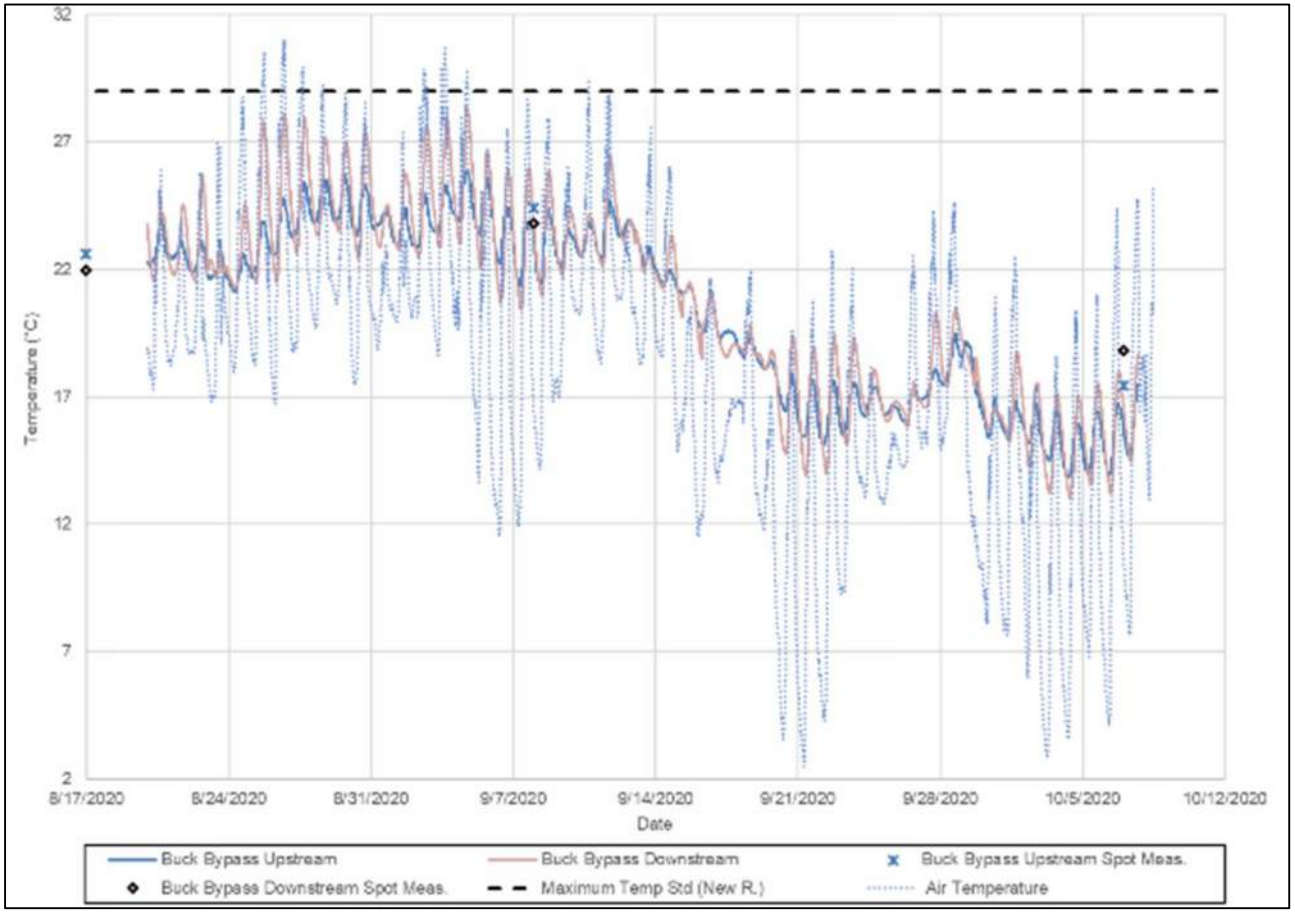
# Air & Water Temperatures
# Buck Bypass Reach

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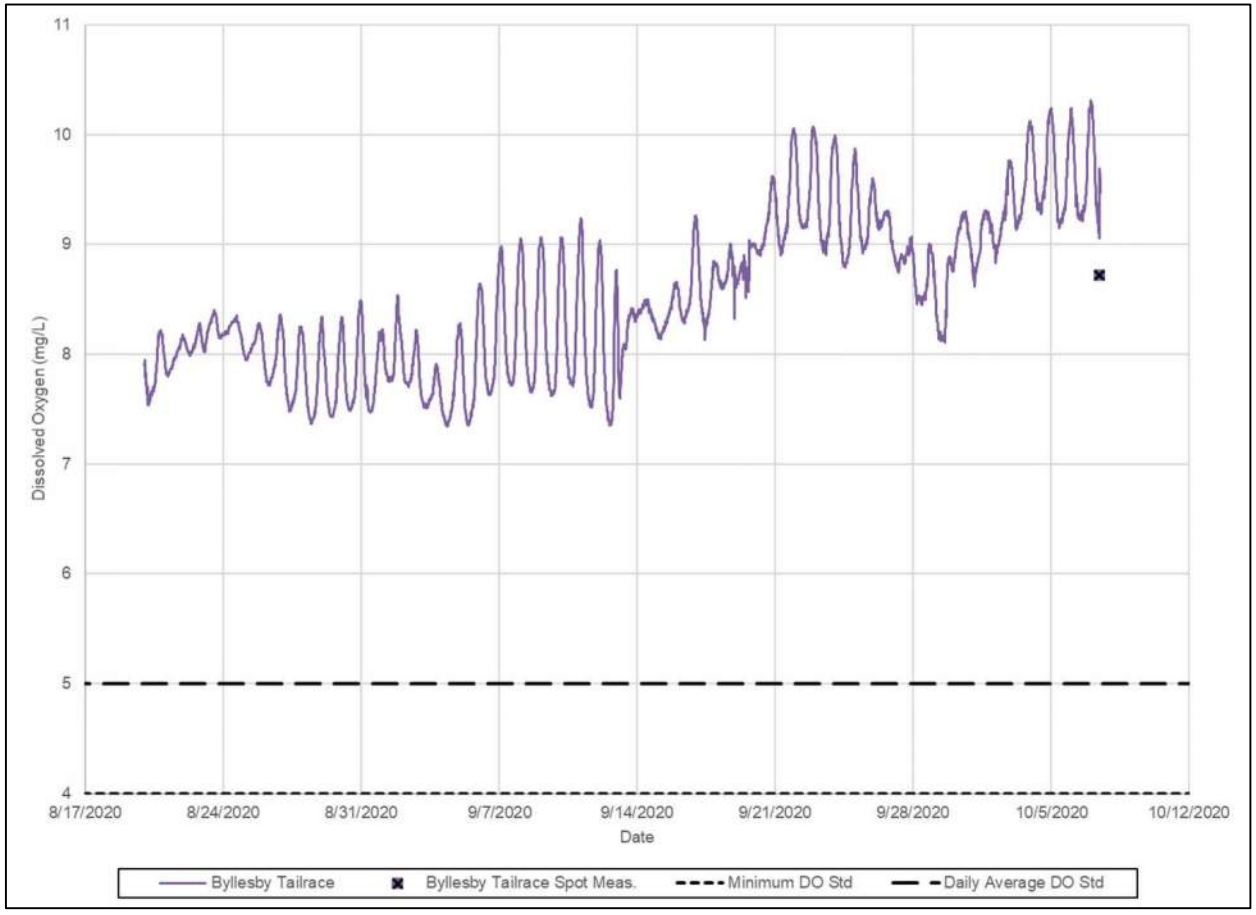
# Dissolved Oxygen Byllesby Tailrace

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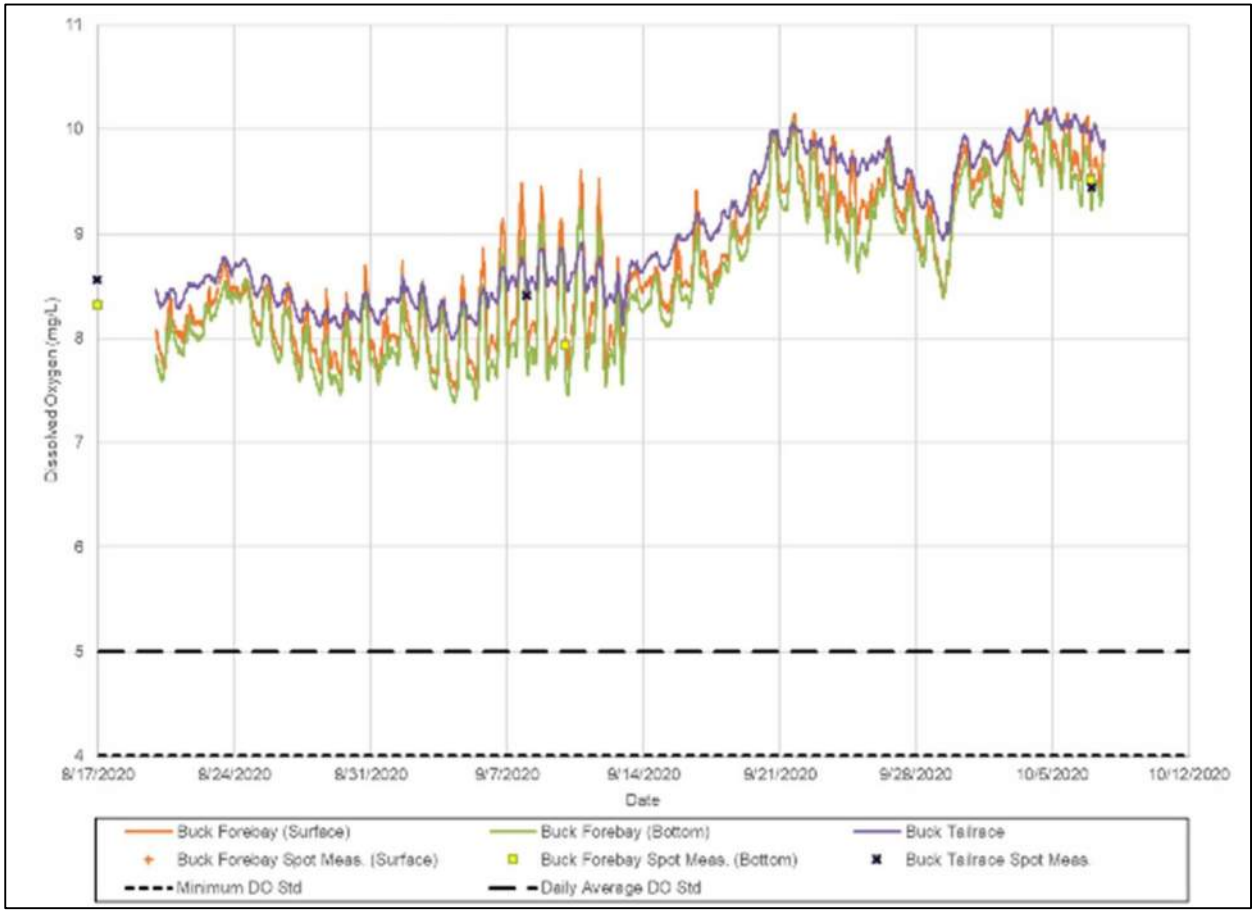
# Dissolved Oxygen
# Buck Forebay and Tailrace

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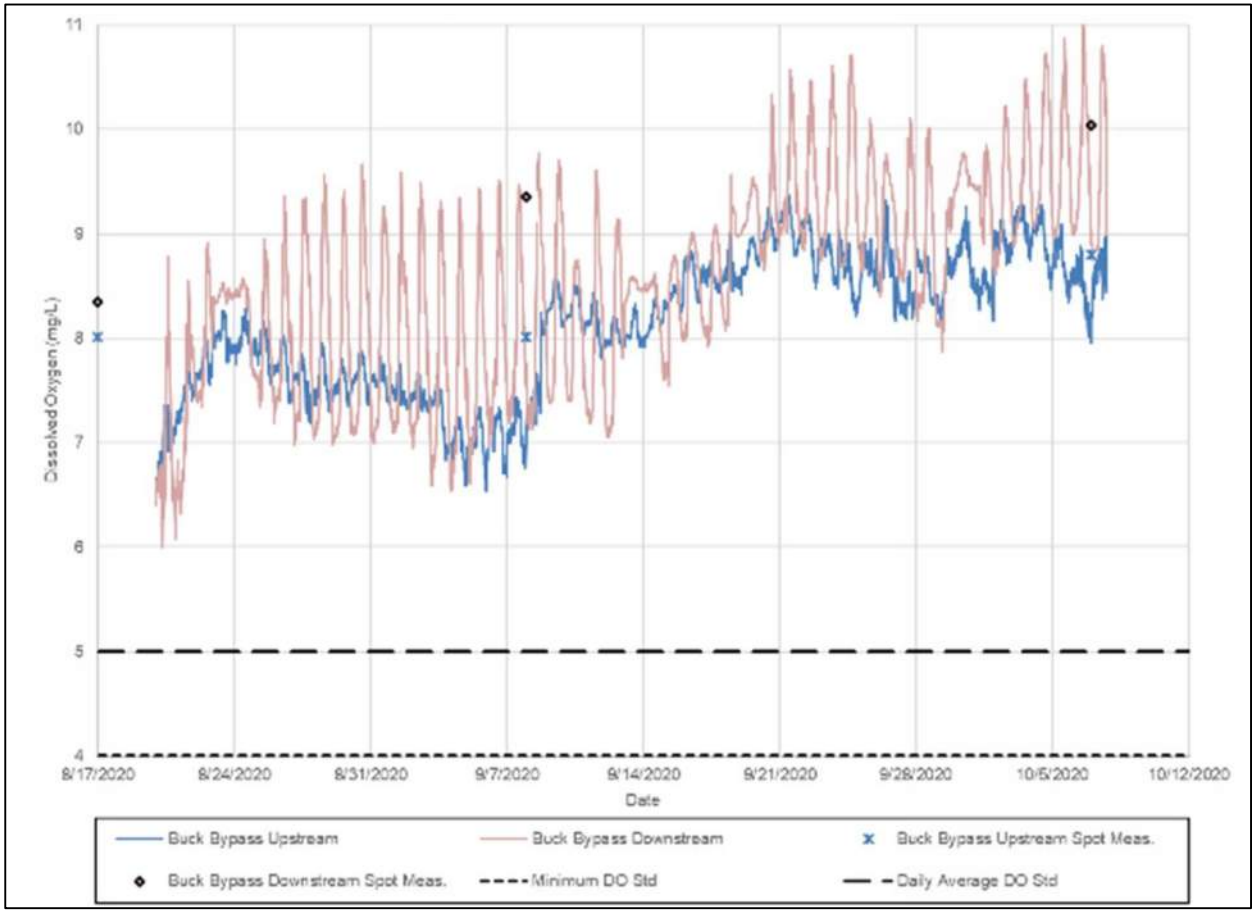
# Dissolved Oxygen Buck Bypass Reach

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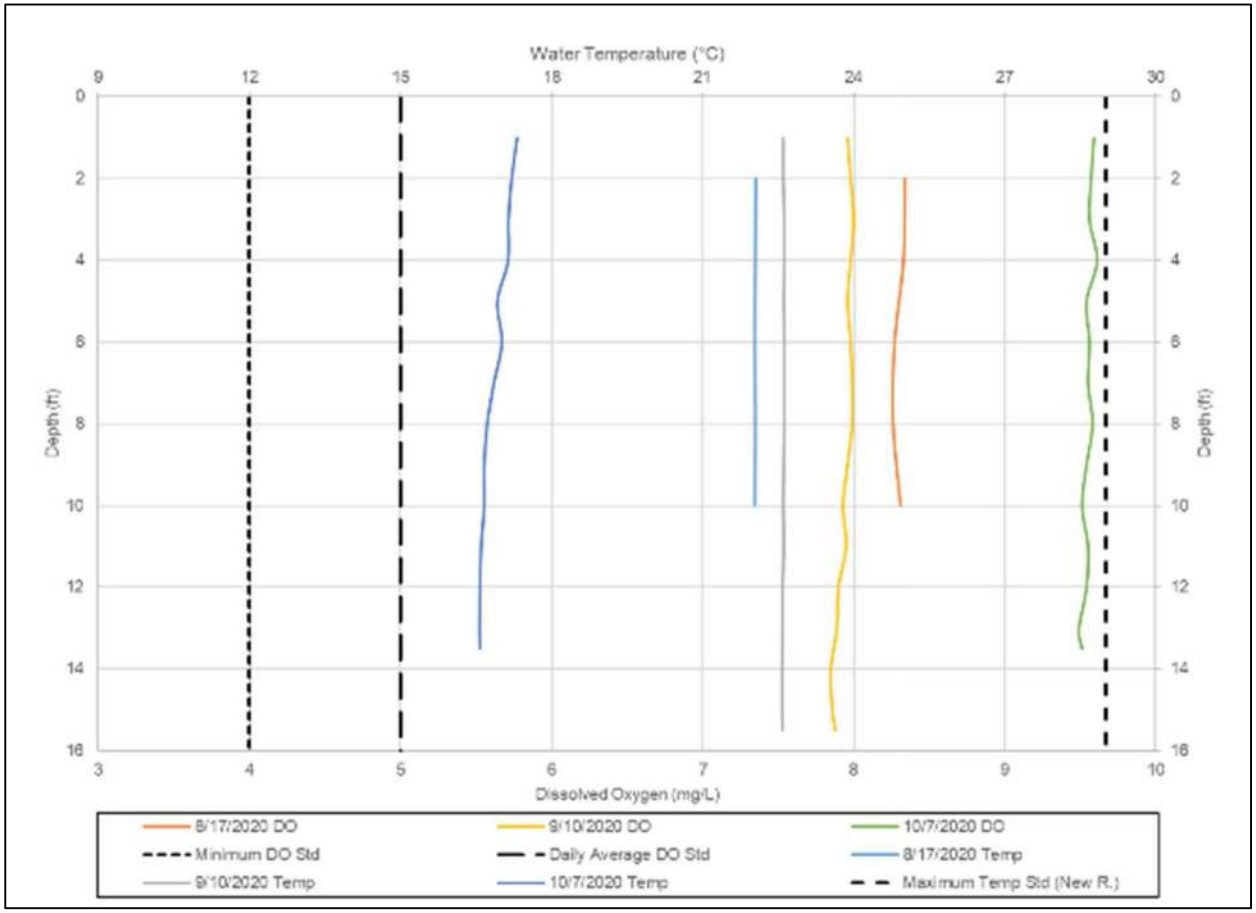
# Buck Forebay Vertical Profiles Temperature and DO

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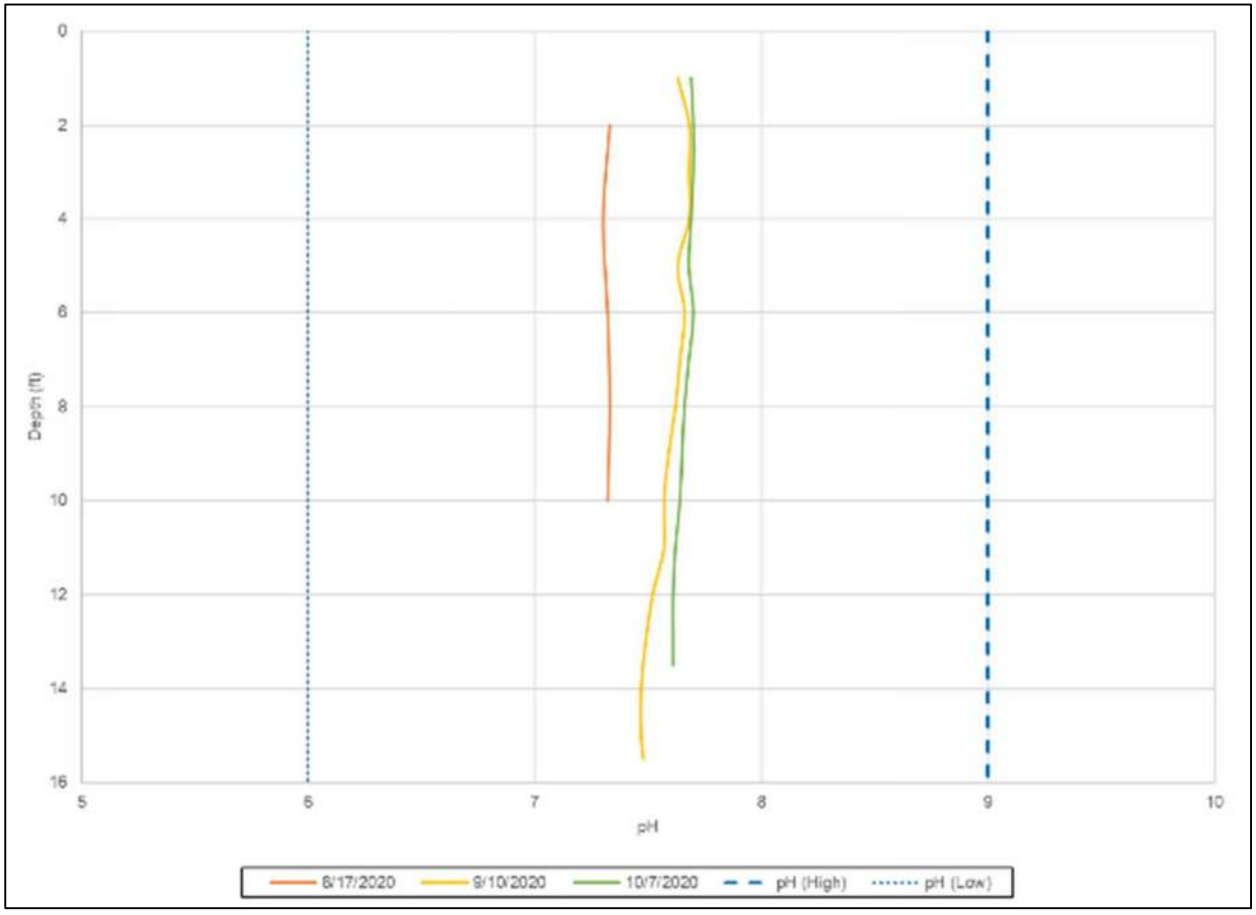
# Buck Forebay Vertical Profiles
# pH



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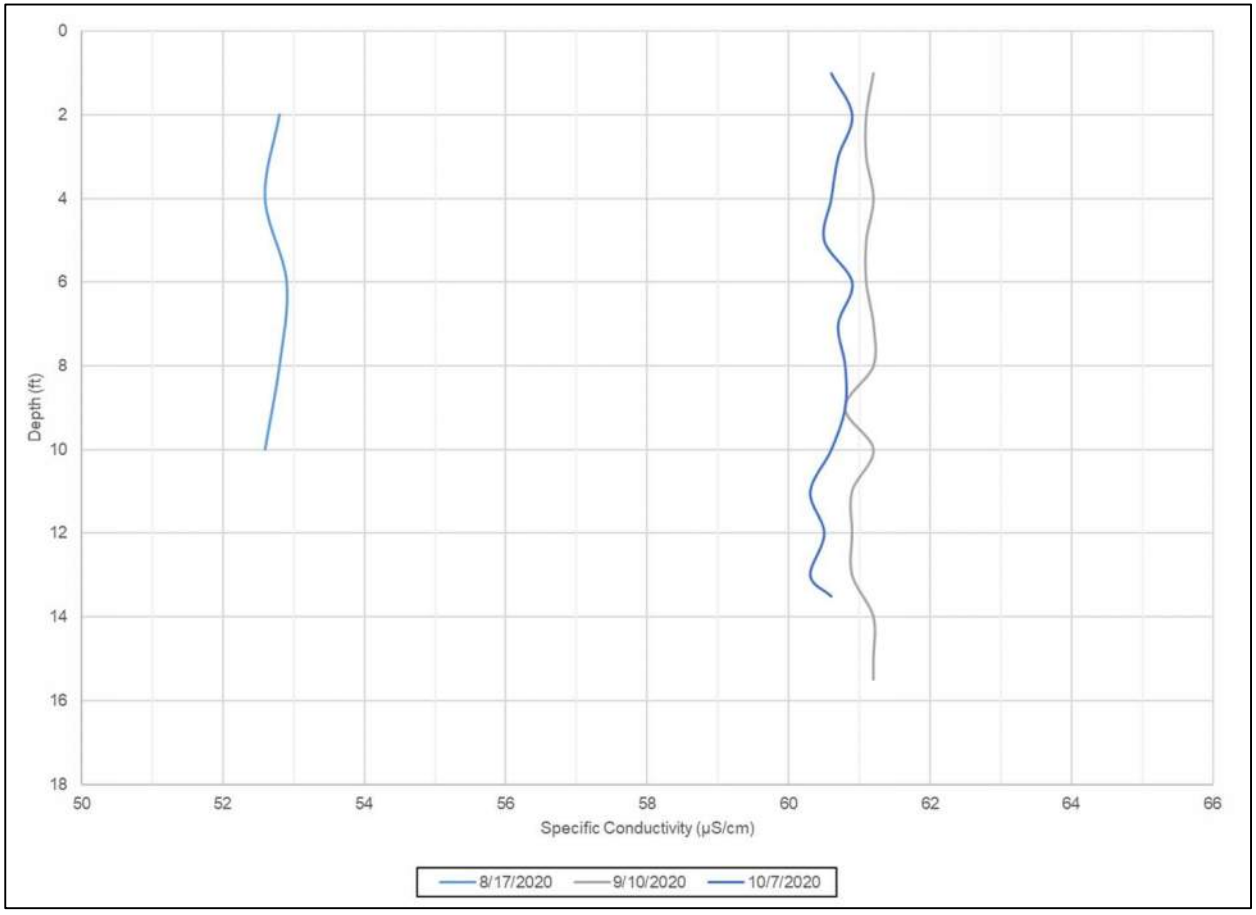
# Buck Forebay Vertical Profiles
# Specific Conductivity



# Water Quality Study Summary and Conclusions

- Water temperatures, DO concentrations, and pH measurements met Virginia Class IV (New River) water quality standards
- Specific conductivity range is suitable for aquatic species
- Little to no thermal or DO stratification at the Byllesby and Buck forebay monitoring locations
- As a result, no need for additional PM&E measures to protect water quality at the Project

Buck Bypass Reach Side Channel Area 9.9.2020 Leakage Flow

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# Additional Water Quality Data Needs (Byllesby)

Byllesby Forebay
7.31.2019

- Water quality measurements in the Byllesby tailrace met Virginia Class IV standards
- Project inflows were higher than normal during the 2020 data collection period preventing installation of the Byllesby upstream, forebay, and bypass reach water quality monitoring locations
- Recommend installing monitoring equipment at these three monitoring locations during July-September 2021 to capture the warmer, typically lower flow, summer months

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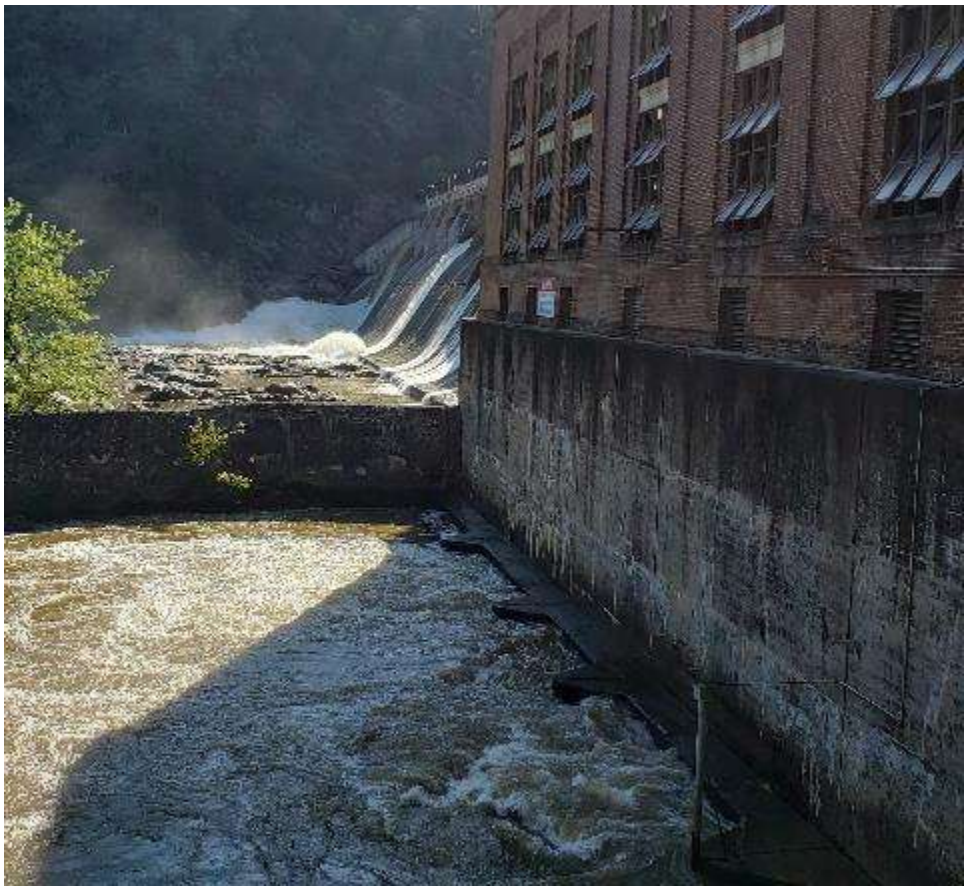
# Additional Water Quality Data Needs (Buck & Byllesby)



- Conduct monthly chlorophyll a grab samples at 1-meter depth in the forebay of each development during July, August, and September 2021
- Conduct 1-week turbidity study (as described in the RSP) in the forebay and tailrace of each development during a low flow period in Q2 or Q3 2021

Byllesby Powerhouse and Tailrace (foreground); Main Spillway (background) 8.18.2020

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# Variances from FERC-approved Study Plan

The Water Quality Study was conducted in conformance with the Commission's SPD.

| Proposed Scheduling Changes to the 2020-2021 Study Plan Schedule for the Byllesby/Buck Project (FERC No. 2514) | | |
|---|---|---|
| **Study** | **Activities** | **Proposed Timeframe for Completion (January 2021 update)** |
| Water Quality Study | Study Planning and Existing Data Review | Completed (July 2020) |
| | Continuous and Monthly Water Quality Monitoring (Dissolved Oxygen and Temperature) | Buck Completed (August – October 2020)<br>Byllesby July – September 2021 |
| | Turbidity Monitoring Study | July – September 2021 |
| | Distribute Draft Study Report with the ISR/USR | ISR Completed (January 2021)<br>USR December 2021 |

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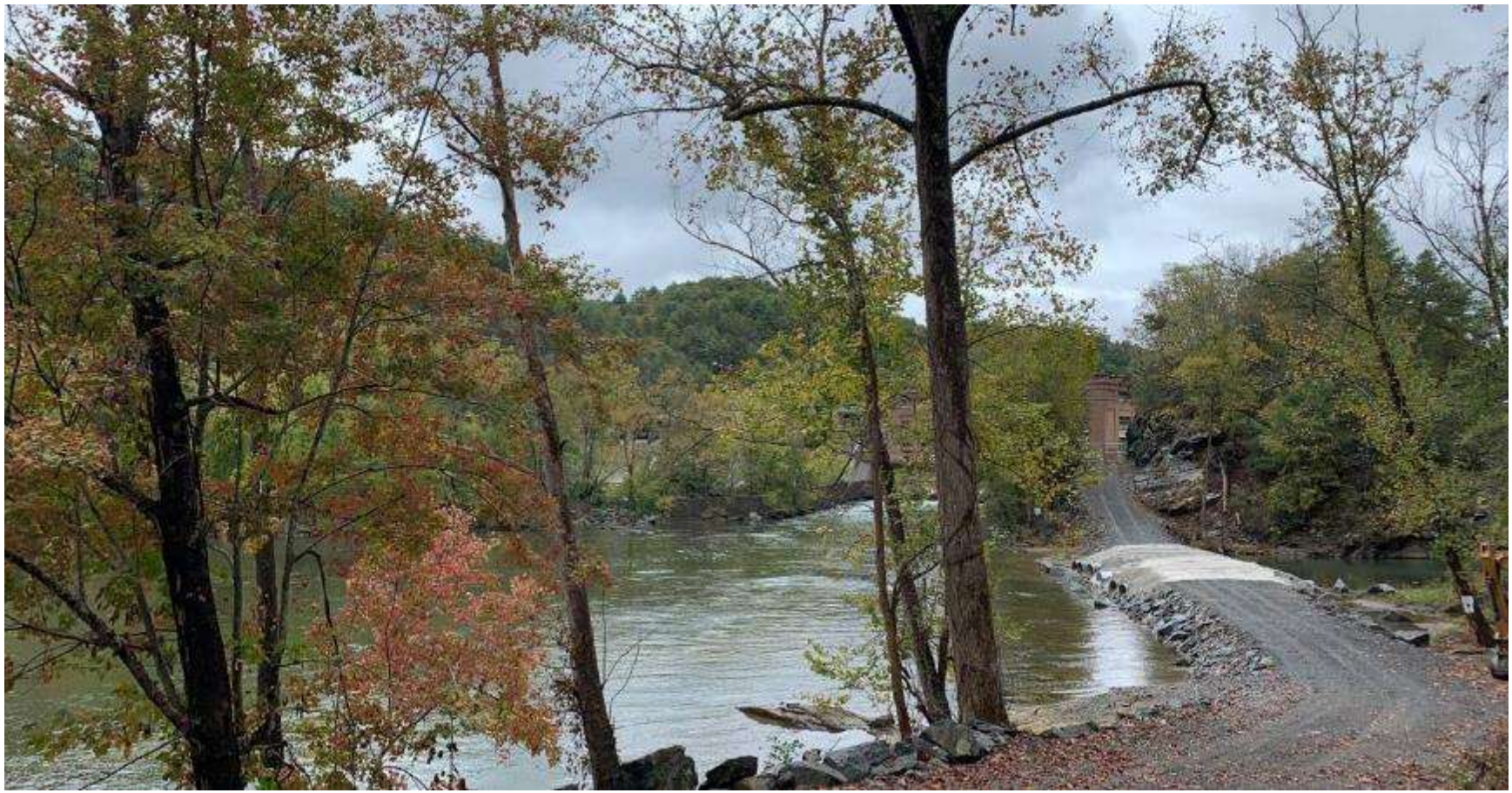
# Recreation Study



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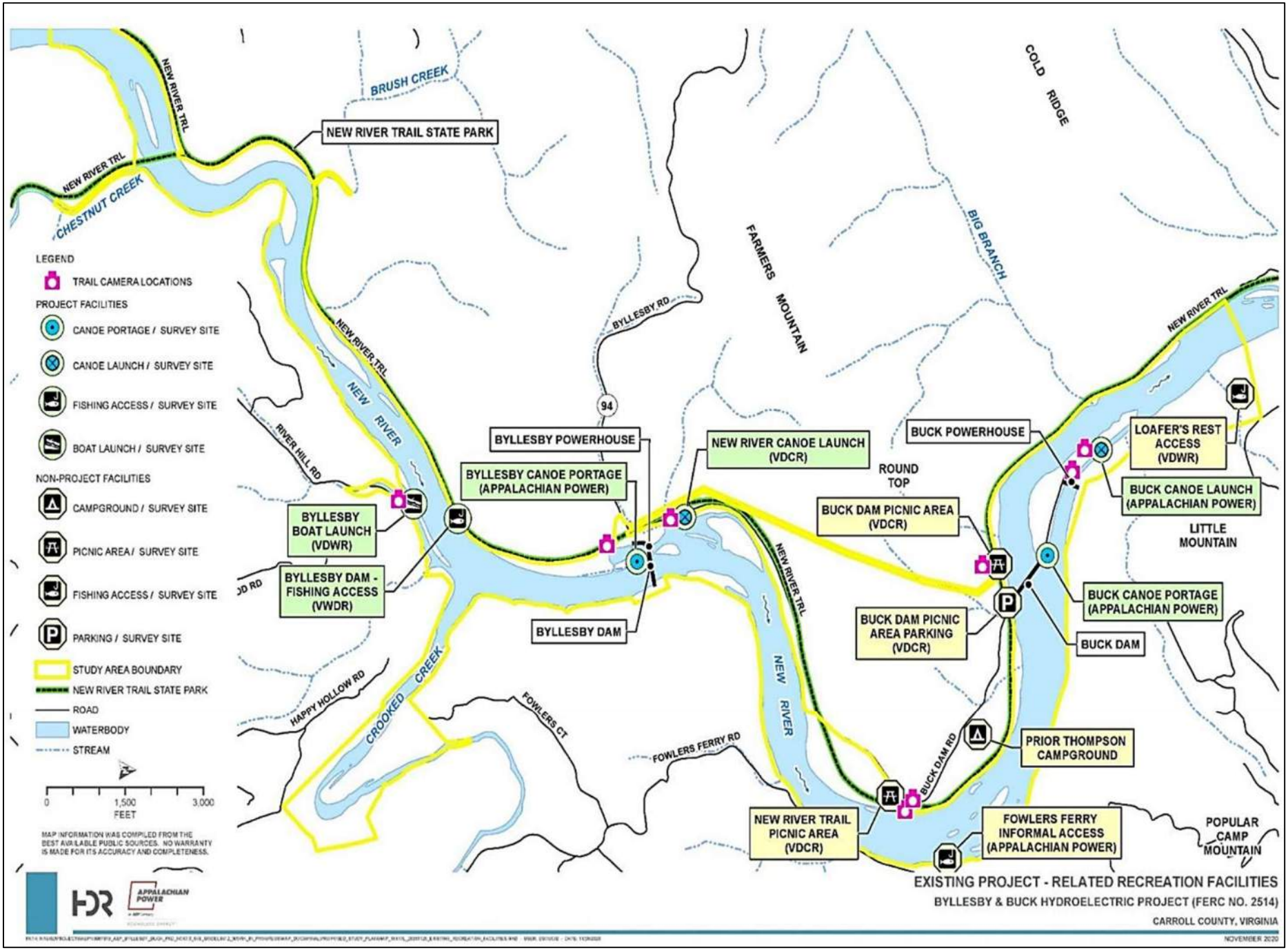
# Recreation Study

## Study Status

Appalachian completed the Recreation Study in accordance with the methods described in the RSP and SPD.

The approved Study Plan defines four primary tasks for the Recreation Study:

- Recreation Facility Inventory and Condition Assessment
- Site Visit with Stakeholders
- Recreation Use Visitor Online Survey
- Recreation Use Documentation


NEW RIVER TRAIL STATE PARK
BRUSH CREEK
NEW RIVER TRL
CHESTNUT CREEK
COLD RIDGE
FARMERS MOUNTAIN
BIG BRANCH
BYLLESBY RD
94
NEW RIVER
RIVER HILL RD
BYLLESBY POWERHOUSE
BYLLESBY CANOE PORTAGE (APPALACHIAN POWER)
NEW RIVER CANOE LAUNCH (VDCR)
BUCK POWERHOUSE
ROUND TOP
LOAFER'S REST ACCESS (VDWR)
BUCK CANOE LAUNCH (APPALACHIAN POWER)
LITTLE MOUNTAIN
BUCK DAM PICNIC AREA (VDCR)
BYLLESBY BOAT LAUNCH (VDWR)
BYLLESBY DAM - FISHING ACCESS (VWDR)
BYLLESBY DAM
BUCK DAM PICNIC AREA PARKING (VDCR)
BUCK CANOE PORTAGE (APPALACHIAN POWER)
BUCK DAM
CROOKED CREEK
HAPPY HOLLOW RD
FOWLERS CT
FOWLERS FERRY RD
BUCK DAM RD
PRIOR THOMPSON CAMPGROUND
NEW RIVER TRAIL PICNIC AREA (VDCR)
FOWLERS FERRY INFORMAL ACCESS (APPALACHIAN POWER)
POPULAR CAMP MOUNTAIN
LEGEND
TRAIL CAMERA LOCATIONS
PROJECT FACILITIES
CANOE PORTAGE / SURVEY SITE
CANOE LAUNCH / SURVEY SITE
FISHING ACCESS / SURVEY SITE
BOAT LAUNCH / SURVEY SITE
NON-PROJECT FACILITIES
CAMPGROUND / SURVEY SITE
PICNIC AREA / SURVEY SITE
FISHING ACCESS / SURVEY SITE
PARKING / SURVEY SITE
STUDY AREA BOUNDARY
NEW RIVER TRAIL STATE PARK
ROAD
WATERBODY
STREAM
0
1,500
3,000
FEET
MAP INFORMATION WAS COMPILED FROM THE BEST AVAILABLE PUBLIC SOURCES. NO WARRANTY IS MADE FOR ITS ACCURACY AND COMPLETENESS.
APPALACHIAN POWER
EXISTING PROJECT - RELATED RECREATION FACILITIES
BYLLESBY & BUCK HYDROELECTRIC PROJECT (FERC NO. 2514)
CARROLL COUNTY, VIRGINIA
NOVEMBER 2020

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# Project and Non-Project Recreation Facilities Studied

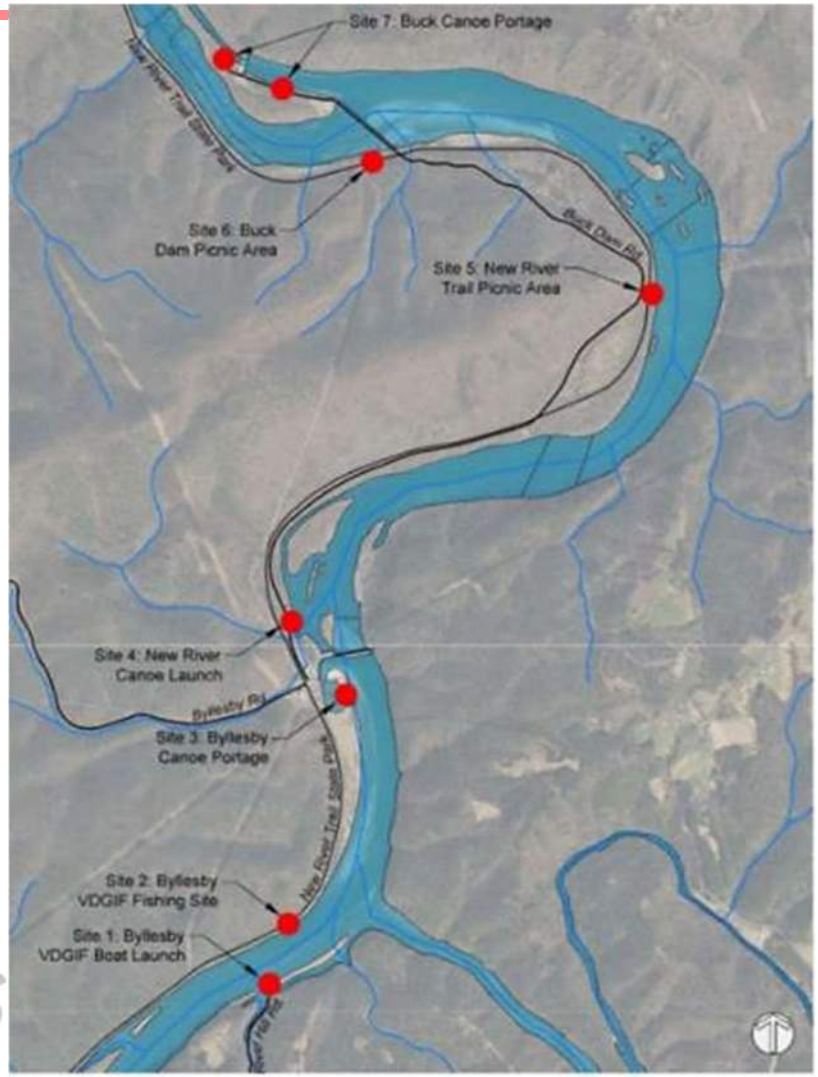
| Recreation Facility | Recreation Facility Inventory and Condition Assessment | Site Visit with Stakeholders | Recreation Visitor Use Online Survey | Recreational Use Documentation - Trail Camera |
|---|---|---|---|---|
| **Byllesby Development** | | | | |
| Byllesby VDWR Boat Launch | X | X | X | X |
| Byllesby Canoe Portage | X | X | X | X |
| New River Canoe Launch | X | X | X | X |
| VWDR Fishing Site | X | | | |
| **Buck Development** | | | | |
| Buck Dam Picnic Area | X | X | X | X |
| New River Trail Picnic Area | X | X | X | X (Upper and Lower) |
| Buck Dam Canoe Portage | X | X | X | X |
| Loafer's Rest | | | X | X (Buck tailrace) |

# Recreation Study: Recreation Facility Inventory and Condition Assessment

**Study Methods:**

Land Planning Design Associates (LPDA), conducted a Recreation Facility Inventory and Condition Assessment of seven Project and Non-Project recreation facilities.

LPDA recorded specific criteria for each facility and completed a qualitative assessment of the condition of the facilities.



# Byllesby VDWR Boat Launch (Project Facility)

Includes a 16-ft wide concrete boat ramp with a gentle slope, concrete walkway, crushed gravel parking area, and signage. Amenities are in good condition.

Potential enhancements:

- Update and replace signage.

Photo 1-1: Entrance into parking lot

Photo 1-2: Boat Ramp

# VDWR Fishing Site (Project Facility)

Includes a fire pit and grill, bench, lantern hook, and trash can (aged). Access to the water is difficult with a steep slope. Accessed by the New River Trail which is 0.6 miles upstream from the Byllesby Canoe Launch parking lot.

Potential enhancements:

- Maintenance or replacement of amenities.
- Add signage.

Photo 2-1: Fishing site with fire ring/grill, bench and lantern hook.

Photo 2-4: Rough wood bench and lantern hook with chipping paint.

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# Byllesby Canoe Portage (Project Facility)

Includes a 0.2-mile portage path, 12-space gravel parking area, a put-in, a large wetland, and multiple signs. The portage take-out is poorly defined with limited amenities. The trash can is older but is being serviced and is lined. Signage is faded.

Potential enhancements identified for this site were as follows:

- Update and replace signage.

Photo 3-8: Trail leading from gate toward the river and portage

Photo 3-1: Parking Lot and portage sign

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# New River Canoe Launch (Project Facility)

Includes a 10-space gravel parking area, portage/no-fishing signs, a gate, and a canoe portage in a relatively flat, sandy area. The signage at this facility is in good condition with adequate directional information.

No potential enhancements identified for this site.

Photo 4-3: Canoe portage put-in and maintenance road accessing it from the parking area

Photo 4-4: Canoe portage put-in

# New River Trail Picnic Area (Non-Project Facility)

Upper area includes a picnic table shelter, bike rack and hitching trail. An informal car pull-off and trail accessing the picnic area. The bike rack, hitching rail, and shelter (ADA accessible) is in good condition.

Lower area includes trash can, barbeque grill (severely corroded), picnic table, bird nesting box, two lantern hooks, two fire rings, and three benches. The trash can is in good condition and is regularly serviced. One bench is missing a slat and the lantern hook is older but usable.

Potential enhancements:

- Maintenance or replacement of amenities at lower area.

Photo 5-2: Picnic shelter, bike rack and hitching rail

Photo 5-4: Lower picnic area

# Buck Dam Picnic Area (Non-Project Facility)

Includes a parking area with a trash can, kiosk with regulation signs and old machinery. The trash can is dented and aged, but usable/regularly serviced.

Stone trail to a separate area that includes a picnic table shelter, bike rack, an accessible Porta Potty, and hitching rail.

- The picnic shelter is in good condition while the table is older but usable.
- Paint on the hitching rail and bike rack is chipped but the amenities are usable.

Potential enhancements:

- Improved signage for educational and safety purposes.

Photo 6-3: Kiosk at parking area displays New River Trail State Park map and posted regulations

Photo 6-8: Picnic shelter with bike rack and hitching post

# Buck Dam Canoe Portage (Project Facility)

Includes a take-out above and a put-in below Buck Dam. Portage route via an asphalt maintenance road, gravel access road, and a gravel walking trail (0.27 miles). There is an unlined trash can at the put-in. The signage is in good condition.

Potential enhancements :

- Improved safety and regulatory signage are recommended at this site.

Photo 7-1: Upper canoe portage take-out. Note that water elevation was low when picture was taken, so the put-out length is not usually this long.

Photo 7-9: Water access at put-in location facing downstream. Note the steep access, deep water, and narrow land strip.

# Recreation Study: Site Visit with Stakeholders to Discuss Existing and Future Recreational Opportunities

- Documentation of the virtual meeting (October 21, 2020) and site visit (October 28, 2020) are included in Attachment 2 of the ISR.
- An informal area known locally as Fowler's Ferry was identified as an area that agencies are potentially interested in developing for future recreational use.

# Recreation Study: Recreation Visitor Use Online Survey

## Summary of Study Methods

- Provides a method for existing and potential recreation visitors to the Study Area to respond and provide feedback on recreation opportunities and Project and Non-Project facilities.
- Outreach methods included: posted signs, coordinated with stakeholders, included in ILP Progress Report, and social media.
- From April 21, 2020 to December 1, 2020, Appalachian received 142 responses to the online survey.

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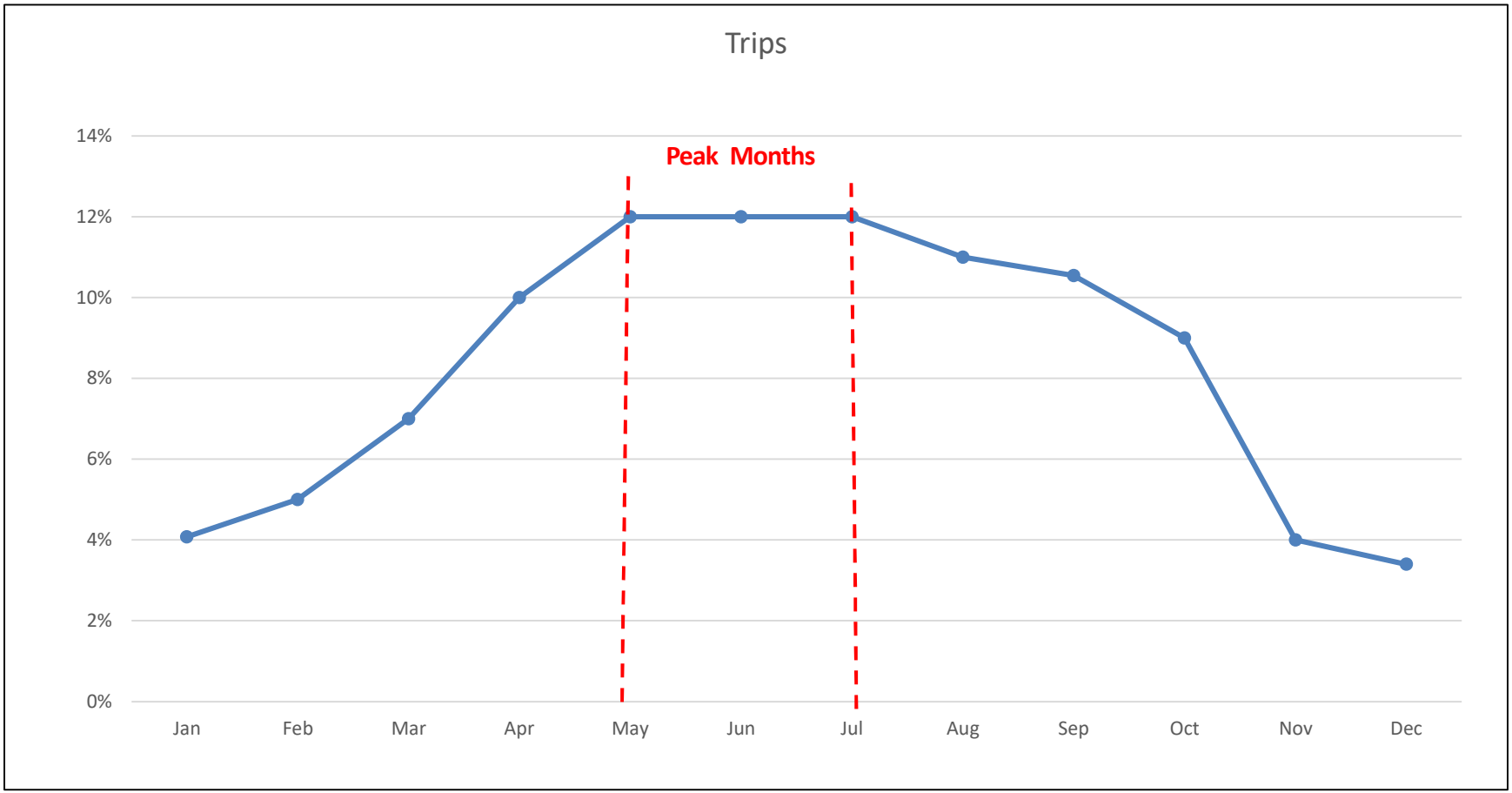
# Monthly Recreation Activity for Project and Non-Project Facilities



# Summary for Primary Recreation Activities at all Project and Non-Project Facilities

| Primary Activity | Use (%) |
|---|---|
| Fishing | 48 |
| Canoeing/kayaking | 20 |
| Sight-seeing | 11 |
| Biking | 9 |
| Picnicking | 4 |
| Hiking | 2 |
| Hunting | 2 |
| Wildlife Viewing | 2 |
| Swimming | 1 |

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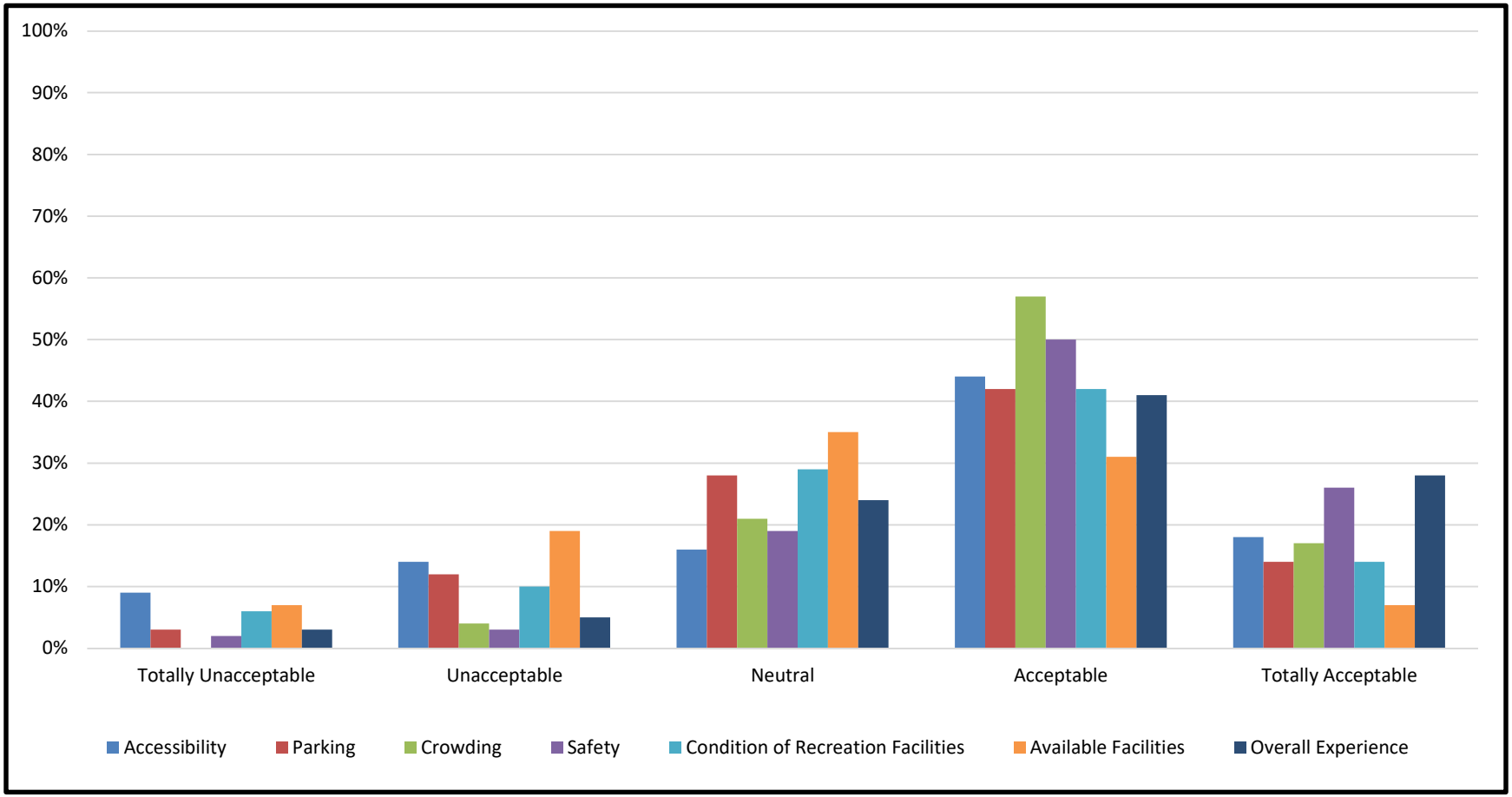
# Online Survey Summary for Overall Rating on All Visits at Project and Non-Project Facilities



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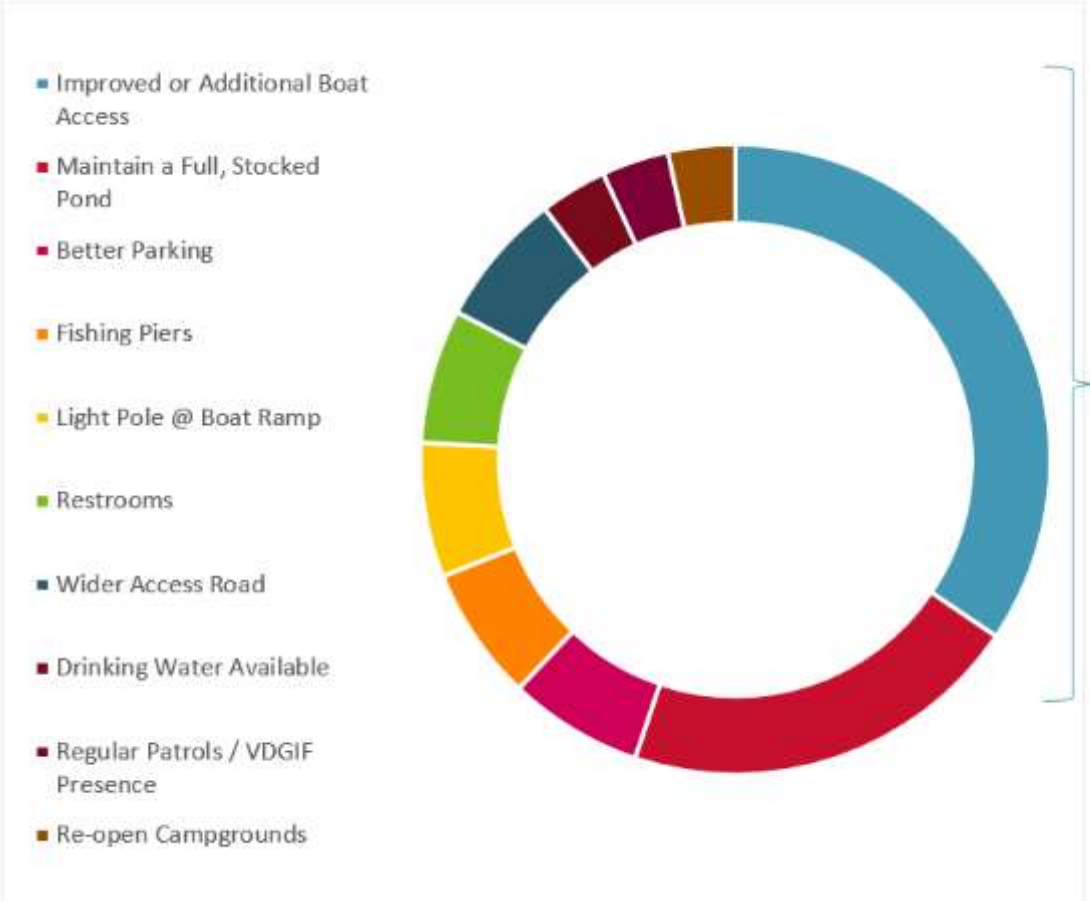
# Byllesby Boat Launch: Suggested Improvement Online Responses




| Improvement Suggestions | # |
|---|---|
| Improved or Additional Boat Access | 10 |
| Maintain a Full, Stocked Pond | 6 |
| Fishing Piers | 2 |
| Light Pole @ Boat Ramp | 2 |
| Better Parking | 2 |
| Restrooms | 2 |
| Drinking Water Available | 1 |
| Regular Patrols / VDGIF Presence | 1 |
| Re-open Campgrounds | 1 |
| Wider Access Road | 1 |

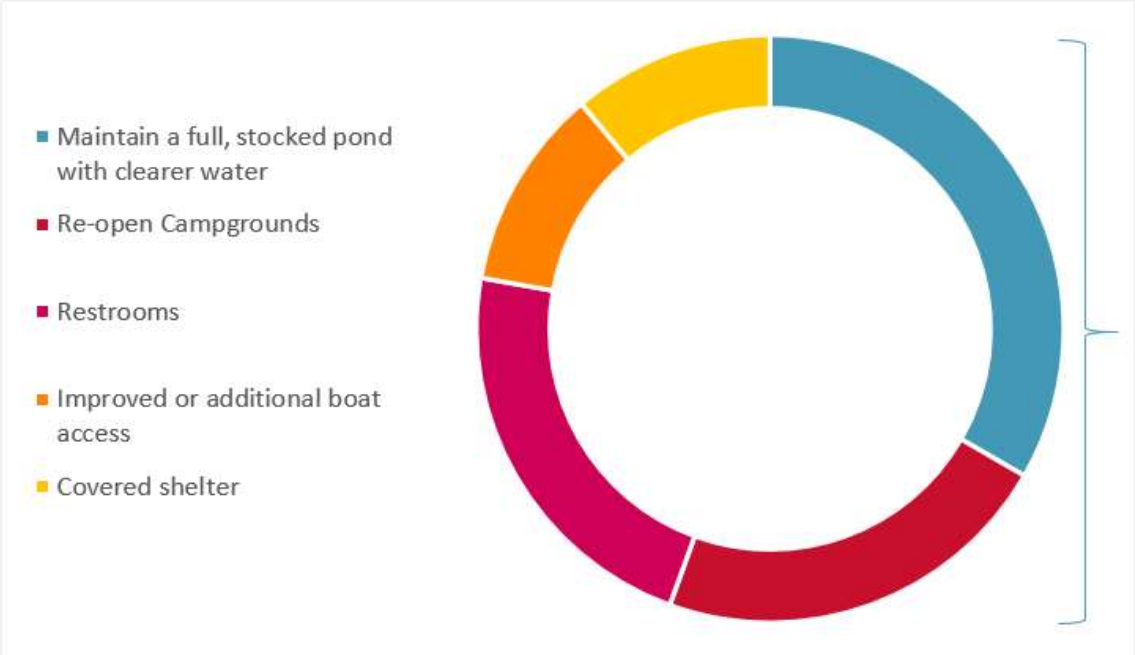
# Byllesby Canoe Portage: Suggested Improvement Online Responses

There were only four online survey overall respondents for the Byllesby Canoe Portage.

Type(s) of recreation facilities or improvements respondents believe are needed and at what specific location(s) at the Byllesby-Buck Project: *(verbatim responses)*

| |
|---|
| • Easier public access and Portage options for kayak/canoe around both dams. |
| • A good boat launch on the power plant side of the river would be awesome. |

# New River Canoe Launch: Suggested Improvement Online Responses




| Improvement Suggestions | # |
|---|---|
| Maintain a full, stocked pond w/ clearer water | 3 |
| Re-open Campgrounds | 2 |
| Restrooms | 2 |
| Improved or additional boat access | 1 |
| Covered shelter | 1 |

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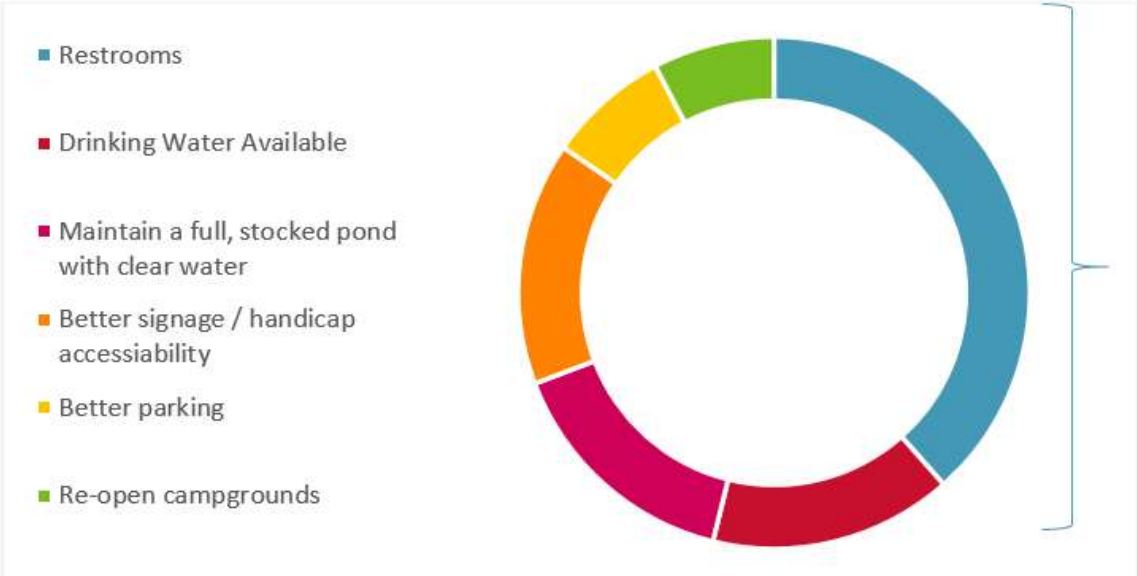
# New River Trail Picnic Area: Suggested Improvement Online Responses




| Improvement Suggestions | # |
|---|---|
| Restrooms | 5 |
| Drinking Water Available | 2 |
| Maintain a full, stocked pond with clear water | 2 |
| Better signage / handicap accessibility | 2 |
| Better parking | 1 |
| Re-open campgrounds | 1 |

# Buck Dam Picnic Area: Suggested Improvement Online Responses

There were 10 online survey respondents from the Buck Dam Picnic Area.

Type(s) of recreation facilities or improvements respondents believe are needed and at what specific location(s) at the Byllesby-Buck Project: *(verbatim responses)*

| |
|---|
| • more public parking at the Byllesby dam canoe portage |
| • We need to be able to float from below Byllesby dam to above buck without having to go below buck dam Need to be a Portage above buck so you dont have go below |
| • Campgrounds need mowed and maintained. we used to camp there weeks at a time |
| • More bathrooms always plus no matter location in state of Virginia. |

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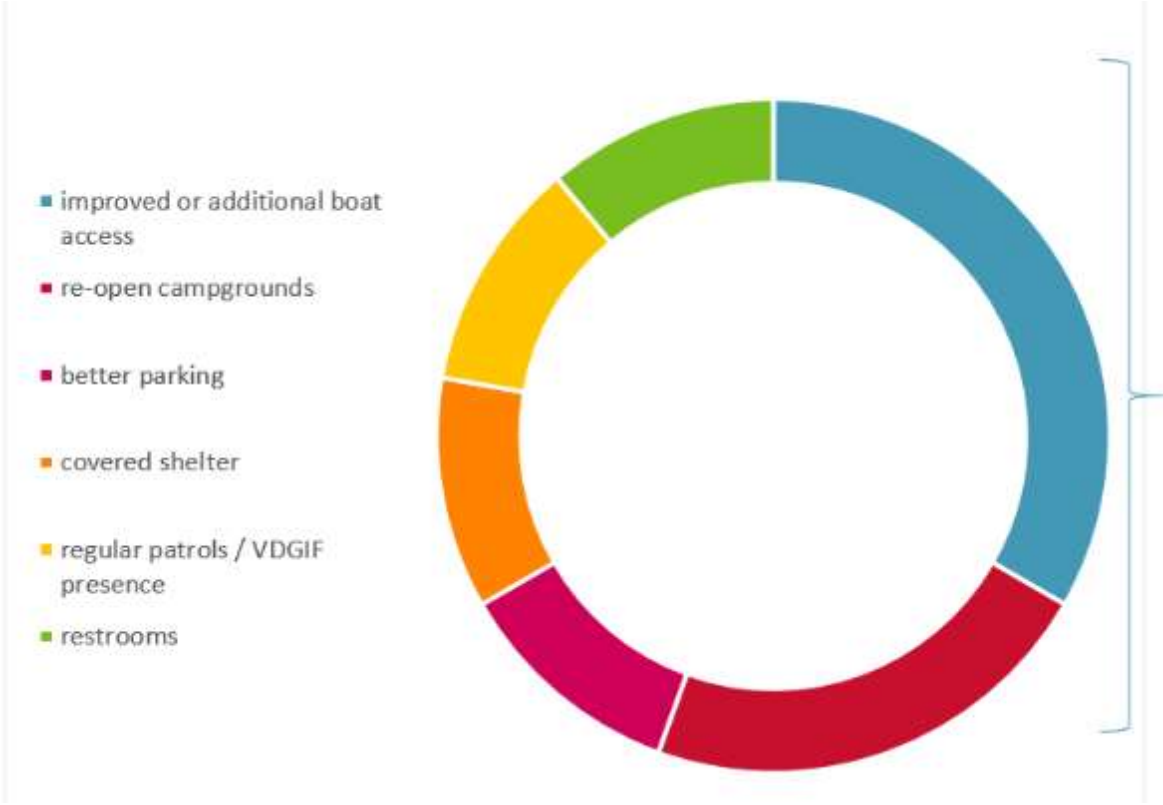
# Buck Dam Canoe Portage: Suggested Improvement Online Responses




| Improvement Suggestions | # |
|---|---|
| improved or additional boat access | 3 |
| re-open campgrounds drinking water available | 2 |
| better parking | 1 |
| covered shelter | 1 |
| regular patrols / VDGIF presence | 1 |
| restrooms | 1 |

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# Recreation Study: Recreation Use Documentation

## Summary of Study Methods

- Full year of Project and Non-Project recreation facility usage with motion-activation trail cameras.
- Eight trail cameras were installed from October 2019 - November 2020.
- Recorded time, temperature, date, and vehicle usage.

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# Recreation Study: Recreation Use Documentation

| Recreation Facility | Project or Non-Project Facility | Purpose | Number of Cameras |
|---|---|---|---|
| Byllesby VDWR Boat Launch (Camera 1) | Project Facility | Collect data on vehicles entering and exiting the parking area | 1 |
| Byllesby Canoe Portage (Camera 2) | Project Facility | Collect data on visitors utilizing New River Trail parking area and canoe portages | 1 |
| New River Canoe Launch (Camera 3) | Project Facility | Collect data on visitors utilizing canoe portage | 1 |
| Buck Dam Picnic Area (Camera 6) | Non-Project Facility | Collect data on visitors utilizing the picnic area, bike rack, and hitching post | 1 |
| New River Trail Picnic Area (Cameras 4 and 5) | Non-Project Facility | Collect data on visitors utilizing the picnic area, grill, informal angler location, and addition recreation features | 2 |
| Buck Dam Canoe Portage (Camera 8) | Project Facility | Collect data on visitors utilizing portage and tailrace | 1 |
| Buck Tailrace – Fishing Access (Camera 7) | Non-Project Facility | Collect data on visitors utilizing Buck tailrace area for fishing; camera faces river-right to capture all types of recreation (of specific interest is fishing from Loafer's Rest) | 1 |

# Byllesby VDWR Boat Launch and the Byllesby Canoe Portage (Project Facilities)

- Most frequented by users: Byllesby VDWR Boat Launch and Byllesby Canoe Portage parking lot.
- Provide a range of recreation opportunities including boating, canoeing, fishing, walking, biking, and hiking.
- The Byllesby VWDR Boat Launch has the easiest boat access to the New River within the Study Area. Fishing is also popular along the shoreline.


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# New River Canoe Launch (Project-Facility)

- Used as intended (canoe/kayak put-in), but more frequently used for bank fishing or relaxing along the sandy shore.
- Had a consistent amount of foot traffic, especially during the warmer days.


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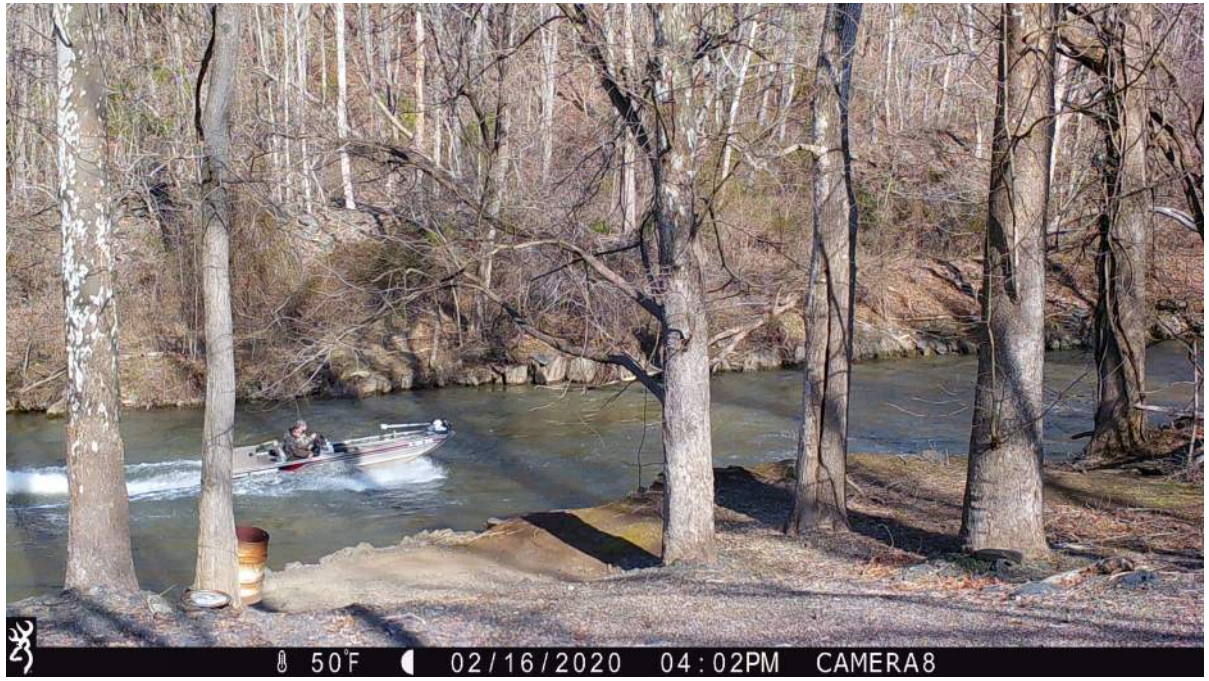
# Buck Dam – Canoe Portage (Project Facility)

- Generally not used and the trail camera did not capture a high use.
- Stakeholders noted during the site visit that users cross the Buck bypass to Mountain Island to gain angler access further downstream.



# Buck Dam – Fishing Access (Non-Project Facility)

- Accessed from VDWR's Loafer's rest facility.
- Only camera that was set to time-lapse.
- Interest to stakeholders during the development of the RSP; however, the camera only recorded approximately two days of use during the survey year.

# New River Trail Picnic Area (Non-Project Facility)

- Upper and lower access provides a wide range of recreational opportunities including picnicking, horseback riding, biking, walking (and dog walking), relaxing, grilling, fishing, observing wildlife and more.
- Accessed directly from the New River Trail, recorded consistent usage throughout the survey window, especially from spring to fall.


# Buck Dam Picnic Area (Non-Project Facility)

- Just downstream of the New River Trail Picnic Area and is also on the New River Trail, so use was similar.
- This area has direct access from the New River Trail and saw consistent usage throughout the survey window especially from spring to fall.

| Recreation Facility | Project or Non-Project Facility | Primary Recreation Activity(s) Observed | Representative Spring Count<br>Sunday, May 10, 2020 | Representative Summer Count<br>Friday, July 24, 2020 | Representative Fall Count<br>Saturday, October 24, 2020 | Additional Notes |
|---|---|---|---|---|---|---|
| Camera 1: Byllesby VWDR Boat Launch | Project Facility | Bank Fishing and Boating. | 14 vehicles | 16 vehicles | 12 vehicles | Highest recreational usage noted at this facility over the trail camera study period. |
| Camera 2: Byllesby Canoe Portage | Project Facility | Parking lot used to walk, bike, or hike. | 9 vehicles | 6 vehicles | 15 vehicles | No canoe portaging from the parking area was observed. |
| Camera 3: New River Canoe Launch | Project Facility | Bank Fishing. | 10 people | 2 people | 4 people | Bank fishing was commonly seen, whereas the portage was seldom used. |
| Camera 4: New River Trail Picnic Area (Upper) | Non-Project Facility | Facilities (picnicking, bike rack, informal walking trail, and hitching post) enjoyed by New River trail users. | 5 people | 13 people | 23 people | Usage Counts was calculated based on individual's using the recreation facilities, not only the New River Trail. |
| Camera 5: New River Trail Picnic Area (Lower) | Non-Project Facility | Bank Fishing and Observing/Relaxing. | 6 people | 7 people[1] | 18 people | Frequently used to appreciate the New River from the New River Trail. |
| Camera 6: Buck Dam Picnic Area | Non-Project Facility | Facilities (picnicking, bike rack and hitching post) enjoyed by New River trail users. | 6 people | 7 people[1] | 22 people | Usage Counts was calculated based on individual's using the recreation facilities, not only the New River Trail. |
| Camera 7: Buck Dam – Fishing Access (informal recreation facility) | Non-Project Facility | Bank Fishing and Canoe/Kayaking. | 0 people | 0 people | 0 people | Two observed uses (fishing and observing) during the study, but overall, no primary recreation noted. High water from the trash gate restricts access to this area often. |
| Camera 8: Buck Dam Canoe Portage (Put-In) | Project Facility | None | 0 people | 0 people | 0 people | Low overall usage of the recreation site. |

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# Capacity

- There were approximately ten to fifteen days during peak weekends (e.g., holidays) or when weekend weather was optimal where the parking lot at the Byllesby VDWR Boat Launch and Byllesby Canoe Portage parking lot appeared to reach capacity.
- On non-peak weekends or a typical recreation day these two facilities did not appear to reach parking capacity.
- Project is sufficient to meet the current demand during a typical peak recreation day.

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# Recreation Study Summary

- Consistent recreation usage at most of the Project and Non-Project facilities, with usage peaking on the weekends, holidays, and warmer months, as anticipated.
- The New River Trail provides a unique opportunity to access most of the recreation facilities in otherwise remote locations.
- The trail camera and online survey results indicated that fishing and canoe/kayaking were the primary recreation activities.
- The Buck Dam Canoe Portage was the only Project recreation facility that saw very little recreation usage, likely because it is inaccessible except by canoe/kayak.

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# Variances from FERC-approved Study Plan

The Recreation Study was conducted in conformance with the Commission's SPD.

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# 5-minute break

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# Cultural Resources Study

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# Cultural Resources Study

## Study Status

- Initiated the Study in accordance with the schedule and methods described in the RSP and SPD.

## Methods

- Task completed (late summer – November 2020):
  - Consultation for the APE Determination (Task 1),
  - Background Research and Archival Review of the Study Area (Task 2),
  - Phase I Reconnaissance Survey of the Area of Potential Effects (APE) (Task 3).
- Task to be completed in 2021:
  - Inventory of Traditional Cultural Properties (Task 4)
  - Update to the Cultural Resources Management Plan (Task 5)

# Cultural Resources Study

## APE Consultation

On September 1, 2020, Terracon consulted with the SHPO and applicable tribes to request concurrence on the Project's APE.

APE responses were received from:

- The Virginia DHR/SHPO
- The Catawba Indian Nation
- The Pamunkey Indian Tribe
- The Delaware Nation

# Cultural Resources Study

## Background Research

- Terracon reviewed the Virginia Cultural Resource Information System (V-CRIS) to identify previously recorded cultural resources within a 0.5-mile radius of the Study Area.
- On September 10, 2020, Terracon staff traveled to the Virginia Department of Historic Resources (VDHR) office in Richmond, VA to gather additional information.

# Cultural Resources Study: Background Research and On-Site Fieldwork

- Terracon conducted an archaeological assessment of the Project APE (October 2020)
  - Most of the APE is either steeply sloped or deeply buried in historic alluvium.
  - Very little erosion or other Project related effects in any portions of the APE.
- The three above-ground historic resources are eligible for inclusion in the National Register of Historic Places (NRHP) and were revisited during the field work. All three remain eligible for listing in the NRHP.
  - It is Terracon's opinion that no historic properties are currently being affected by continued Project operations.
- None of the resources identified through Terracon's research, either within the APE and those within a 0.5-mile radius, will be affected by the Project.

# Variances from FERC-approved Study Plan

The Preliminary Cultural Resources Study has been and will continue to be conducted in conformance with the Commission's SPD.

| Proposed Scheduling Changes to the 2020-2021 Study Plan Schedule for the Byllesby/Buck Project (FERC No. 2514) | | |
|---|---|---|
| | **Activity** | **Proposed Timeframe for Completion (January 2021 update)** |
| **Cultural Resources Study** | Determination of Area of Potential Effect (APE) | Completed (September 2020) |
| | Background Research and Archival Review | Completed (September 2020) |
| | Phase I Reconnaissance Survey of APE | Completed (October 2020) |
| | Inventory of Traditional Cultural Properties | August 2020 – August 2021 |
| | Review and Updates to the Existing CRMP | November 2021 |
| | Distribute Draft Study Report with the ISR/USR | ISR Completed (January 2021)<br>USR December 2021 |

# ISR Meeting: Stakeholder Participation

- Appalachian will file the Initial Study Report Meeting Summary with FERC by February 12, 2021.
- Meeting summary disagreements, requests for modifications to studies, or requests for new studies should be filed with FERC by March 14, 2021.
  - If requesting modifications to studies, stakeholders must take into account FERC's Criteria for Modification of Approved Studies (18 CFR § 5.15(d)).
  - If requesting new studies, stakeholders must take into account FERC's 7 Criteria for New Study (18 CFR § 5.15(e)).
- Appalachian will file responses to meeting summary disagreements by April 13, 2021.
- FERC will make a determination on any disputes/amendments to the approved study plan by May 13, 2020.
- Stakeholders can contact Appalachian with questions or comments:


**Elizabeth Parcell**
**(540) 985-2441**
**ebparcell@aep.com**

**Jonathan Magalski**
**(614) 716-2240**
**jmmagalski@aep.com**

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# Closing

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FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
March 15, 2021

OFFICE OF ENERGY PROJECTS

Project No. 2514-185 – Virginia
Byllesby-Buck Hydroelectric Project
Appalachian Power Company

VIA Electronic Mail

Ms. Elizabeth Parcell
Process Supervisor
American Electric Power
ebparcell@aep.com

**Reference: Comments on the Initial Study Report and Meeting Summary**

Dear Ms. Parcell,

On January 19, 2021, Appalachian Power Company (Appalachian) filed the Initial Study Report (ISR) for the Byllesby-Buck Hydroelectric Project (Byllesby-Buck Project) describing Appalachian's overall progress in implementing the approved study plans. On January 28, 2021, Appalachian held a virtual meeting to discuss the ISR. On February 12, 2021, Appalachian filed its ISR Meeting Summary (Meeting Summary). We have reviewed the ISR and the Meeting Summary and provide our comments in Appendix A, pursuant to 18 C.F.R. § 5.15(c)(4).

If you have any questions, please contact Allyson Conner at (202) 502-6082, or by email at allyson.conner@ferc.gov.

Sincerely,

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

**APPENDIX A**
**Comments on the Initial Study Report and Meeting Summary**

1. The approved study plan requires that fish lengths be measured;[1] however, no length data were provided in the Preliminary Aquatic Resources Study Report of the Initial Study Report (ISR). Therefore, when filing the Updated Study Report (USR) please provide this raw length data, preferably in Microsoft Excel format. The Excel file should include species and sampling information (i.e., sampling date/location/gear) for each measured individual. Information on the size distribution of fish in the vicinity of the project will aid staff's analysis of the susceptibility of resident fishes to impingement and entrainment.

2. Figure 6-9 of the Preliminary Bypassed Reach Flow and Aquatic Habitat Study Report shows continuously recorded water levels from water level loggers deployed in the Buck bypassed reach in 2020. While total project inflows are plotted on these figures, there is no indication of what portion of the total inflow is being released (spilled) into the bypassed reach and how much flow is being passed through the powerhouse. Adding this information on the flows in the bypassed reach and through the powerhouse would improve the interpretability of the figure and allow Commission staff to more easily discern how water levels in the bypassed reach change under varying amounts of spill, which would in turn aid our analysis of the potential for fish stranding in the bypassed reach following high-flow (spill) events. Therefore, in the USR, we recommend adding bypassed reach and powerhouse flows to figure 6-9 (2020 field season) and any similar figures generated from data collected during the upcoming 2021 field season.

3. The preliminary Water Quality Study Report provides no confirmation as to whether the project was operating normally during the 2020 water quality monitoring period from August 17, 2020 through October 8, 2020. Therefore, in the USR, please indicate for both the previous (2020) and upcoming (2021) monitoring periods, if the project was operating normally and identify any periods during which there were any unit outages, flashboard failures, or station trips that may have increased spill into the bypassed reaches relative to normal project operation. Providing this operational data will assist Commission staff's analysis of the potential effects of project operation on water quality.

[1] *See* section 6.6.1.2 of the Revised Study Plan.

**Appalachian Power Company**
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

Via Electronic Filing

April 13, 2021

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

**Subject: Byllesby Buck Hydroelectric Project (FERC No. 2514-186)**
**Response to Comments on the Initial Study Report**

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Licensee), 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 Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission). The Project underwent relicensing in the early 1990s and the current operating license for the Project expires on February 29, 2024. Accordingly, Appalachian is pursuing a subsequent license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Pursuant to 18 CFR § 5.15(c), Appalachian filed the Initial Study Report (ISR) with the Commission on January 18, 2021. The ISR filing also included notification of the ISR Meeting date, time, and proposed agenda. As required by the ILP schedule, within 15 days of the ISR filing Appalachian held a virtual ISR Meeting via WebEx from 9:30am to 3pm on Thursday, January 28, 2021. The ISR meeting summary was filed with FERC on February 12, 2021. Stakeholders comments on the ISR meeting summary were due by March 14, 2021.

The United States Fish and Wildlife Service (USFWS or the Service) and FERC provided written comments in response to Appalachian's filing of the ISR meeting summary. A letter from the Virginia Department of Wildlife Resources (VDWR) was also received; however, they stated that the meeting summary captured all concerns and needs for clarification on completed and continuing studies for the relicensing and they had no further concerns or comments.

Appalachian is hereby providing responses to stakeholder comments received on the ISR.

## Aquatic Resources Study

*Stakeholder Comment:*

FERC requests that when filing the Updated Study Report (USR), Appalachian provide the raw length data (as approved in the Revised Study Plan [RSP]), preferably in Microsoft Excel format. The file should include species and sampling information (i.e., sampling date/location/gear) for each measured individual. Information on the size distribution of fish in the vicinity of the projects will aid FERC staff's analysis of the susceptibility of resident fishes to impingement and entrainment.

*Appalachian's Response:*

Appalachian will provide the raw catch length data as available in the USR, which will include the date, site, species, and gear type used.

*Stakeholder Comment:*

The USFWS notes that the ISR meeting summary captured all concerns and identified appropriate action items. The Service confirms they are satisfied with the impingement / entrainment study plan; however, they would like to review the intake structure drawings and screen approach velocity calculations when the study results are published.

*Appalachian's Response:*

Appalachian greatly appreciates the Service's participation at the ISR meeting and concurrence on the ISR meeting summary and action items. Appalachian will provide detailed historical intake structure drawings as an appendix or attachment to the final Fish Community Study Report that will be filed with the USR. (Appalachian has done a preliminary review of relevant drawings and believes they can be filed publicly; if the drawings are determined to contain sensitive information that would require filing as CEII, Appalachian will coordinate with the Service to directly provide the requested information.) The intake structure approach velocity calculations were provided in the ISR meeting summary and will also be included in the final Fish Community Study Report.

*Stakeholder Comment:*

The USFWS also notes that the protected status of the Green Floater (*Lasmigona subviridis*) is currently under review, and that should the review lead to federal protection as a listed species, a new mussel survey will be requested.

*Appalachian's Response:*

Appalachian appreciates the Service's comment about the Green Floater and will continue to track the federal listing status of this species.

## Bypass Reach Flow and Aquatic Habitat Study

*Stakeholder Comment:*
The Commission notes that Figure 6-9 of the Preliminary Bypass Reach Flow and Aquatic Habitat Study Report shows continuously recorded water levels from water level loggers deployed in the Buck bypass reach in 2020. While total Project inflows are plotted on these figures, there is no indication of what portion of the total inflow is released (spilled) into the bypass reach and how much flow is being passed through the powerhouse. Adding this information on the flows in the bypass reach and through the powerhouse would improve the interpretability of the figure and allow FERC staff to more easily discern how water levels in the bypass reach change under varying amounts of spill, which would in turn aid the analysis of the potential for fish stranding in the bypass reach following high-flow (spill) events. Therefore, in the USR, FERC recommends adding bypass reach and powerhouse flows to Figure 6-9 (2020 field season) and any similar figures generated from data collected during the upcoming 2021 field season.

*Appalachian's Response:*
Appalachian agrees that adding powerhouse flow and bypass reach flow (in addition to total flow) would be of benefit to more easily discern how water levels in the bypass reach change under varying amounts of spill into the bypass reach. This information will be included in the USR for the figure referenced above (i.e., Figure 6-9 of the Preliminary Bypass Reach Flow and Aquatic Habitat Study Report for the Buck bypass reach) as well as any similar figures generated from the upcoming 2021 field season for the Byllesby bypass reach.

*Stakeholder Comment:*
The USFWS states that they have continued interest in the Bypass Reach Flow and Aquatic Habitat Study (reference pages 7-10 of the ISR meeting summary). The USFWS expects to learn more as Appalachian moves into the 2021 study year as habitat modeling is refined with respect to seasonal hydrology and potential impacts related to fish stranding and to Walleye (*Sander vitreus)* spawning habitat.

*Appalachian's Response:*
Appalachian appreciates the USFWS's continued interest in the Bypass Reach Flow and Aquatic Habitat Study and plans to host a virtual meeting in May or June 2021 with stakeholders to review seasonal hydrology (in particular as it relates to the potential for Walleye spawning in March; the peak month identified by the VDWR during the ISR meeting) and discuss other flow scenarios of interest at the Buck development from a fish habitat modeling perspective.

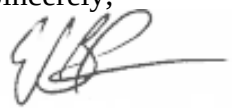
## Water Quality Study

*Stakeholder Comment:*
FERC notes that the preliminary Water Quality Study Report provides no confirmation as to whether the Project was operating normally during the 2020 water quality monitoring period from August 17, 2020 through October 8, 2020. Therefore, in the USR, FERC requests that the License indicate for the previous (2020) and upcoming (2021) monitoring periods whether the Project was operating normally and identify any periods during which there were unit outages, flashboard failures, or station trips that may have increased spill into the bypass reaches relative to normal Project operation. Providing this operational data will assist FERC staff's analysis of the potential effects of Project operation on water quality.

*Appalachian's Response:*
Appalachian will provide information related to Project operations in the USR for the 2020 and 2021 water quality monitoring periods. This information will include identification of any periods during which there were unit outages, flashboard failures, or station trips that may have increased spill into the bypass reaches relative to normal Project operations.

Appalachian sincerely appreciates the detailed comments provided by relicensing stakeholders and has put careful consideration into the proposals and commitments presented in this response. If there are any questions regarding this filing, please do not hesitate to contact me at (540) 985-2441 or via email at ebparcell@aep.com.

Sincerely,



Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

cc: Distribution List
Jonathan Magalski (AEP)

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

**Federal Agencies**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**State Agencies**

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

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

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

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

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

Ms. Emma Williams
Office of the Secretary of the Commonwealth
Virginia Council on Indians
PO Box 2454
Richmond, VA 23218
emma.williams@governor.virginia.gov

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

Ms. Jennifer Wampler
Environmental Programs Planner
Virginia Department of Conservation and Recreation
600 East Main Street, 24th floor
Richmond, VA 23219
jennifer.wampler@dcr.virginia.gov

Ms. Ewing
Virginia Department of Conservation and Recreation
sharon.ewing@dcr.virginia.gov

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

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

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

Mr. Sam Sweeney
New River Trail State Park Manager
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Max Meadows, VA 24360
sam.sweeney@dcr.virginia.gov

Mr. Jimmy Elliott
Virginia Department of Conservation and Recreation - New River Trail
james.elliott@dcr.virginia.gov

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

Mr. Joe Grist
Water Withdrawl Program Manager
Virginia Department of Environmental Quality
PO Box 1106
Richmond, VA 23218
joseph.grist@deq.virginia.gov

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

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

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

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

NEPA Review
Virginia Department of Environmental Quality
eir@deq.virginia.gov

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

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

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

Mr. Jeff Williams
Regional Fisheries Manager
Virginia Department of Wildlife Resources
1796 Highway Sixteen
Marion, VA 24354
jeff.williams@dwr.virginia.gov

Timothy Roberts
Review and Compliance Division
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221
Tim.Roberts@dhr.virginia.gov.

**Local Governments**

Mr. Stephen Bear
Wythe County Administrator
340 South Sixth Street
Wytheville, VA 24382
sdbear@wytheco.org

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

Mr. Rex Hill
Carroll Board of Supervisor
Carroll County
rex.hill@carrollcountyva.gov

Mr. Mike Watson
Carroll County Administrator
Carroll County
605-1 Pine Street
Hillsville, VA 24343
michael.watson@carrollcountyva.gov

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

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

Dr. Beth Taylor
Mayor
Town of Wytheville
beth.taylor@wytheville.org

**Tribes**

Caitlin Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Road
Rock Hill, SC 29730
Caitlin.Rogers@catawba.com

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

Erin Paden
Director of Historic Preservation
Delaware Nation
31064 State Highway 281
Anadarko, OK 73005
epaden@delawarenation-nsn.gov

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

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

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

Terry Clouthier
Tribal Historic Preservation Officer
Pamunkey Indian Tribe
1054 Pocahontas Trail
King William, VA 23086
terry.clouthier@pamunkey.org.

Whitney Warrior
Natural Resources & Cultural Preservation Director
United Keetoowah Band of Cherokee Indians
PO Box 746
Tahlequah, OK 74465
wwarrior@ukb-nsn.org

**Non-Governmental**

Mr. Bill Tanger
Friends of the Rivers of Virginia
PO Box 1750
Roanoke, VA 24008
Bill.tanger@verizon.net

Ms. Angie Grooms
angie.grooms750@gmail.com

Mr. David Taylor
jklfloat@embarqmail.com
American Canoe Association
503 Sophia Street, Suite 100
Fredericksburg, VA 22401

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

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

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

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

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

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

Ms. Andrea Langston
New River Land Trust
PO Box K
Blacksburg, VA 24063-1025

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

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

Mr. Zachary R. Slate
New River Regional Water Authority
newriverwater@gmail.com

Mr. Richard Roth
Friends of the Rivers of Virginia
rroth@radford.edu

**Appalachian Power Company**
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

April 30, 2021

***VIA ELECTRONIC FILING***

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

**Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514-186)**
**Third Quarterly Study Progress Report – Spring 2021**

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Applicant), a unit of American Electric Power (AEP) is the Licensee, owner, and operator of the 30.1 megawatt (MW) Byllesby-Buck Hydroelectric Project (Project No. 2514 (Project or Byllesby-Buck Project), located on the New River in Carroll County, Virginia. The two-development Project comprises the upstream Byllesby development and the downstream Buck development. The Project is currently undergoing relicensing following the Federal Energy Regulatory Commission's (FERC or Commission) Integrated Licensing Process (ILP).

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Appalachian filed the Initial Study Report (ISR) with the Commission on January 18, 2021, which summarized study activities performed in 2020, as well as ILP activities expected to be completed in 2021.

This Third Quarterly Study Progress Report describes the activities performed since the ISR was filed, including activities that occurred in quarter 1 (Q1) of 2021 and activities expected to be conducted in quarter 2 (Q2) of 2021. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD), as subsequently modified by Order on Rehearing dated February 20, 2020, and the ISR study schedule.

## General Updates – ILP Process and Milestones

- As required by the ILP schedule, within 15 days of the ISR filing, Appalachian held a virtual ISR meeting via WebEx on Thursday, January 28, 2021 which included participation by agencies and stakeholders with interest in the Project.
- The ISR meeting summary was filed with FERC on February 12, 2021. Stakeholders comments on the ISR meeting summary were due by March 14, 2021. Appalachian's responses to the stakeholder meeting comments were filed on April 13, 2021.

## Bypass Reach Flow and Aquatic Habitat Study

### ***Buck Bypass Reach***

- Field data collection for the Buck Bypass Reach Flow and Aquatic Habitat Study was completed in 2020 and summarized in the ISR. Appalachian plans to host a virtual meeting (via WebEx) in May or June 2021 with interested stakeholders to review seasonal hydrology (in particular as it relates to the potential for Walleye spawning in March; the peak month identified by the Virginia Department of Wildlife Resources [VDWR] during the ISR meeting) and discuss other flow scenarios of interest at the Buck development from a fish habitat modeling perspective.
- Additional aquatic habitat modeling, based on stakeholder consultation, will be performed in 2021 and the results, summary, and recommendations will be provided in the Updated Study Report (USR).

### ***Byllesby Bypass Reach***

- The GIS-based desktop aquatic habitat assessment and Habitat Suitability Index curves for the aquatic species that will be modeled in the Byllesby bypass reach, as well as the proposed test flow scenarios that will be used to support model calibration and validation activities, were summarized in the Bypass Reach Flow and Aquatic Habitat Study provided in the ISR submitted on January 18, 2021.
- Field data collection is planned for the 2021 field season (likely in quarter 3 [Q3]) to allow time for spillway flashboard repairs once higher inflows, which typically occur over the winter and early spring months, recede. Once the field data has been collected, a two-dimensional (2D) aquatic habitat model will be developed. Appalachian plans to host a virtual meeting (via WebEx) with agency representatives after the model has been developed to discuss flow scenarios of interest. Modeling results, conclusions, and recommendations will be provided in the USR in the fourth quarter (Q4) of 2021.

## Water Quality Study

***Buck Development***

- Field data collection for the Buck development was completed in 2020 and summarized in the ISR.
- Based on stakeholder comments on the ISR, Appalachian will provide additional information related to Project operations in the USR for the 2021 water quality monitoring periods. This information will include identification of any periods during which there were unit outages, flashboard failures, or station trips that may have increased spill into the bypass reaches relative to normal Project operations.

***Byllesby Development***

- Due to high baseflow conditions and continuous flow releases at the dam through the damaged flashboard section throughout Q3 and Q4 2020, water quality instrumentation was deployed solely at the Byllesby tailrace location during the 2020 water quality monitoring period. This data was summarized in the ISR.
- As proposed in the ISR and Appalachian's subsequent response to comments filed by stakeholders on the ISR meeting summary, water quality data collection efforts will be repeated at Byllesby in 2021 with the full deployment of data sondes as proposed in the RSP (including the tailrace monitoring location which was sampled during the 2020 study period). The deployment is planned for July through September 2021 to capture the warmer, typically lower flow, summer months.

***Byllesby and Buck Developments***

- The RSP included the collection of chlorophyll a grab samples in the forebay of each development during the monthly discrete water quality sampling events. Since forebay water quality monitoring was not conducted at the Byllesby development in 2020, chlorophyll a sampling in the Buck forebay was also delayed so that samples from both forebay monitoring locations would be collected during the same year. As proposed in the ISR and Appalachian's subsequent response to comments filed by stakeholders on the ISR meeting summary, monthly chlorophyll a grab samples will be collected during the monthly discrete water quality sampling events as described in the RSP at both the Buck forebay and Byllesby forebay monitoring locations during the same months (i.e., July, August, and September) in 2021.
- Due to higher than normal Project inflows from the New River in Q3 2020, the turbidity study was also rescheduled for Q3 2021 at the Byllesby and Buck developments, which

will allow data collection efforts to target conditions that are more representative of typical station operations during lower flows.

## Aquatic Resources Study

### ***Fish Community Study***

- Field data collection for the fall season of the general fish community study was completed in 2020 and summarized in the ISR.
- Additional spring 2021 fish community sampling was performed April 1926, 2021. Electrofishing samples were completed at all sites for Byllesby and for two of ten sample sites located upstream and downstream of Buck Dam. Sampling had to be halted due to an issue with the electrofishing boat motor. An additional field deployment is planned for early May 2021 to complete the remaining sampling sites for Buck Dam. Results of the 2020 and 2021 sampling efforts will be used to support completion of the Fish Impingement and Entrainment Study and will be summarized in the USR.

### ***Impingement, Entrainment, and Bladestrike Analysis Study***

- Data compilation is underway for the desktop impingement and entrainment evaluation.
- Appalachian will initiate the Turbine Blade Strike Evaluation for Buck and Byllesby using the most recent version of the USFWS Turbine Blade Strike Analysis Model[1] and will also incorporate available historical information. A tentative list of fish species collected at the site to be used in the analysis was presented in the ISR. The analysis and reporting will be performed in Q2 2021 and results will be included in the USR.

### ***Macroinvertebrate and Crayfish Community Study***

- The ISR did not include results of the 2020 macroinvertebrate field data collection efforts because laboratory identification had not been completed yet. Laboratory identification to the lowest practicable taxonomic level was completed in Q1 2021. Detailed results and data analyses will be presented in the USR. Preliminary results are summarized below:
    - Crayfish
        i. Two specimens of Cambaridae in the genus *Faxonius* were collected at Site BFQT7. Additional crayfish observation data were recorded in the field and previously summarized in the ISR.

[1] U.S. Fish and Wildlife Service (USFWS). 2020. TBSA Model: A Desktop Tool for Estimating Mortality of Fish Entrained in Hydroelectric Turbines. Excel file dated December 9, 2020.

- Macroinvertebrates
    i. The total number of taxa collected at study sites was between 8 and 28, with an average of 18 total taxa per sample site.
    ii. The diversity of the EPTs (Ephemeroptera, Plecoptera, Trichoptera) varied between 3 and 17 species, depending on sampling methodology (quantitative versus qualitative) and habitat sampled. The largest diversity of EPT taxa occurred at riffle sites (BFQT7 and BFQT8) just downstream of Byllesby Dam. The density of EPT organisms per site varied between 3 and 94, with an average of 43 organisms per sample site.
    iii. Specimens from five families of gastropods and two families of clams (Asian and Fingernail clams) were collected in low numbers across the study area.

- Additional spring 2021 macroinvertebrate community sampling was completed April 19-26. Results of the field efforts and taxonomic identification will be presented in the USR.

**Recreation Study**

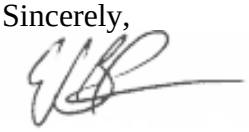
- Field data collection for the Recreation Study was completed in 2020 and summarized in the ISR submitted on January 18, 2021.
- Appalachian, HDR, Land Planning Design & Associates (HDR's sub-consultant), and the VDWR met at the Loafer's Rest recreation facility for a site visit on March 24, 2021 to evaluate and discuss applicable stakeholder comments at the ISR meeting.
- Appalachian is presently evaluating recreation facility enhancements to be included in Appalachian's licensing proposal and plans to conduct additional agency consultation related to potential enhancements in Q3 2021.

**Cultural Resources Study**

- Data collection for the Cultural Resources Study was completed in 2020 and summarized in the ISR. Appalachian completed the final additional day in the field for the geomorphology survey during the week of April 19th, 2021, which was interrupted last year due to high flows and weather. Complete results of the Cultural Resources Study will be filed with the USR.

If there are any questions regarding this progress report, please do not hesitate to contact me at (540) 985-2441 or via email at ebparcell@aep.com.

Sincerely,



Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

**Appalachian Power Company**
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

July 22, 2021

***VIA ELECTRONIC FILING***

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

**Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514-186)**
**Fourth Quarterly Study Progress Report – Summer 2021**

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Applicant), a unit of American Electric Power (AEP) is the Licensee, owner, and operator of the 30.1 megawatt (MW) Byllesby-Buck Hydroelectric Project (Project No. 2514 (Project or Byllesby-Buck Project), located on the New River in Carroll County, Virginia. The two-development Project comprises the upstream Byllesby development and the downstream Buck development. The Project is currently undergoing relicensing following the Federal Energy Regulatory Commission's (FERC or Commission) Integrated Licensing Process (ILP).

This Fourth Quarterly Study Progress Report describes the activities performed since the Third Quarterly Study Progress Report which was filed on April 30, 2021 and includes activities expected to be conducted in quarter 3 (Q3) of 2021. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD), as subsequently modified by Order on Rehearing dated February 20, 2020, and the ISR study schedule.

## Bypass Reach Flow and Aquatic Habitat Study

### ***Buck Bypass Reach***

- Appalachian plans to host a virtual meeting (via WebEx) later this summer with interested stakeholders to review seasonal hydrology (in particular as it relates to the potential for Walleye spawning in March; the peak month identified by the Virginia Department of Wildlife Resources [VDWR] during the ISR meeting) and discuss other flow scenarios of interest at the Buck development from a fish habitat modeling perspective.

- Additional aquatic habitat modeling, based on stakeholder consultation, will be performed in the fall of 2021 and the results, summary, and recommendations will be provided in the Updated Study Report (USR).

***Byllesby Bypass Reach***

- Field data collection is presently scheduled for August, subject to project operating and inflow and other conditions. Habitat mapping and data collection under leakage flow will not be feasible until the damaged flashboard bay is repaired. Appalachian is presently working to schedule a brief reservoir drawdown to allow for this maintenance in early August.
- Once all field data has been collected, a two-dimensional (2D) aquatic habitat model will be developed. Appalachian plans to host a virtual meeting (via WebEx) with agency representatives after the model has been developed to discuss flow scenarios of interest. Modeling results, conclusions, and recommendations will be provided in the USR.

**Water Quality Study**

***Buck Development***

- As noted in the previous progress report, Appalachian will provide additional information related to Project operations in the USR for the 2020 water quality monitoring periods at the Buck Development. This information will include identification of any periods during which there were unit outages, flashboard failures, or station trips that may have increased spill into the bypass reach relative to normal Project operations.

***Byllesby Development***

- As discussed in the previous progress report, water quality data collection efforts are being repeated at Byllesby in 2021 with the full deployment of data sondes as proposed in the RSP (including the tailrace monitoring location which was sampled during the 2020 study period). Water quality equipment was successfully installed at these four locations on June 15 and 16, 2021 and were downloaded on June 28 and July 14. The data will continue to be downloaded through September to capture warmer, typically lower flow, summer months.

***Byllesby and Buck Developments***

- Monthly chlorophyll a and turbidity grab samples will be collected during the monthly discrete water quality sampling events as described in the RSP at both the Buck forebay and Byllesby forebay monitoring locations during the same months (i.e., July, August, and September) in 2021. The first monthly grab sample was completed on July 14.

- The turbidity Water Quality Study task could not be completed in 2020 due to higher than normal Project inflows from the New River. This task is presently rescheduled for the fall of 2021 at the Byllesby and Buck developments, which will allow data collection efforts to target conditions that are more representative of typical station operations during lower flows, and is also intended to accommodate scheduled repairs to the Byllesby trashracks and return to normal operation of the trashrake at the Byllesby Development.

## Aquatic Resources Study

### ***Fish Community Study***

- Additional spring 2021 fish community sampling was performed April 19-26, 2021 and completed on May 27, 2021. Electrofishing samples were completed at all sites for Byllesby and for the ten sample sites located upstream and downstream of Buck Dam. Results of the 2020 and 2021 sampling efforts will be used to support completion of the Fish Impingement and Entrainment Study and will be summarized in the USR.

### ***Impingement, Entrainment, and Bladestrike Analysis Study***

- Data compilation is underway for the desktop impingement and entrainment evaluation.
- Appalachian will initiate the Turbine Blade Strike Evaluation for Buck and Byllesby using the most recent version of the USFWS Turbine Blade Strike Analysis Model[1] and will also incorporate available historical information. A tentative list of fish species collected at the site to be used in the analysis was presented in the ISR. The analysis and reporting will be continued to be performed in Q3 2021 and results will be included in the USR.
- Appalachian is evaluating the potential for turbine upgrades to extend the Project's operating life. If turbine upgrades, which would result in a significant increase in hydraulic capacities' of the units, are proposed by Appalachian in the draft or final license application, the Turbine Blade Strike Evaluation will be further run to account for potential proposed changes to the turbines.

## Recreation Study

- Appalachian, HDR, Land Planning Design & Associates (HDR's sub-consultant), and the VDWR participated in a conference call on June 29, 2021 to discuss potential Project and

[1] U.S. Fish and Wildlife Service (USFWS). 2020. TBSA Model: A Desktop Tool for Estimating Mortality of Fish Entrained in Hydroelectric Turbines. Excel file dated December 9, 2020.

Non-Project improvements. Appalachian plans on further consulting with the larger recreation stakeholder group in advance of the filing of the Draft License Application.

- Appalachian continues to evaluate recreation facility enhancements to be included in Appalachian's licensing proposal.

**Terrestrial Resources Study**

- The field work in support of the Terrestrial Resources Study was completed on May 26-27, 2021 and results will be provided in the USR.

**Wetlands, Riparian, and Littoral Habitat Characterization Study and Shoreline Stability Assessment**

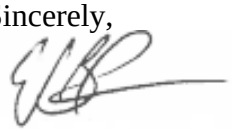
- The field work in support of the Wetlands, Riparian, and Littoral Habitat Characterization Study and the Shoreline Stability Assessment is scheduled to be completed during the week of July 19th and results will be provided in the USR.

**Cultural Resources Study**

- All field investigations for this study have been completed. Final results of the Cultural Resources Study will be filed with the USR.

If there are any questions regarding this progress report, please do not hesitate to contact me at (540) 985-2441 or via email at ebparcell@aep.com.

Sincerely,



Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY

Appalachian Power Company
P.O. Box 2021
Roanoke, VA 24022-2121
aep.com



September 8, 2021

To: Attached Section 106 Consultation Distribution List

Subject: **Byllesby-Buck Hydroelectric Project (FERC No. 2514)**
**Cultural Resource Study Report**
**Consultation Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended**

Dear Consulting Parties:

This letter represents consultation with the Virginia State Historic Preservation Officer (SHPO) and federally recognized Indian tribes (collectively "Consulting Parties") regarding the enclosed cultural resource study report. The report has been prepared in support of the ongoing Federal Energy Regulatory Commission (FERC or Commission) relicensing of the Byllesby-Buck Hydroelectric Project (FERC No. 2514) located in Carroll County, Virginia.

Appalachian Power Company (Appalachian or Applicant), a unit of American Electric Power (AEP), is the Licensee, owner, and operator of the 30.1-megawatt (MW) Byllesby-Buck Hydroelectric Project (Project No. 2514) (Project or Byllesby-Buck Project), located on the New River in Carroll County, Virginia. The Byllesby development is located about nine miles north of the City of Galax, and the Buck development is located approximately three river miles (RM) downstream of Byllesby and 43.5 RM upstream of Claytor Dam.

The existing license for the Project was issued by the Federal Energy Regulatory Commission (FERC or Commission) for a 30-year term, with an effective date of March 28, 1994, and expires February 29, 2024. Accordingly, Appalachian is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. Section 106 of the National Historic Preservation Act (Section 106) requires the Commission to take into account the effects of issuing a new license for the continued operation of the Project on historic properties and to afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment[1]. This consultation, including the enclosed cultural resources study report, represents part of Appalachian's ongoing Section 106 consultation efforts for the Project.

## BACKGROUND

Pursuant to the regulations implementing Section 106[2], the Commission has determined that issuing a new license for the Byllesby-Buck Project is considered an undertaking with the

[1] 54 United States Code § 306108
[2] 36 C.F.R. Part 800

potential to effect historic properties listed in or eligible for inclusion in the National Register of Historic Places.

Appalachian filed a Pre-Application Document (PAD) and associated Notice of Intent (NOI) with the Commission on January 7, 2019, to initiate the ILP. The Commission issued Scoping Document 1 (SD1) for the Project on March 8, 2019. SD1 was intended to advise resource agencies, Indian tribes, non-governmental organizations, and other stakeholders as to the proposed scope of FERC's Environmental Assessment (EA) for the Project and to seek additional information pertinent to the Commission's analysis.

On April 10 and 11, 2019, the Commission held public scoping meetings in Galax, Virginia. During these meetings, FERC staff presented information regarding the ILP and details regarding the study scoping process and how to request a relicensing study, including the Commission's study criteria. In addition, FERC staff solicited comments regarding the scope of issues and analyses for the EA. Pursuant to 18 CFR §5.8(d), a public site visit of the Project was conducted on April 10, 2019.

Concurrent with the January 7, 2019, PAD and NOI required by the ILP, Appalachian requested designation as the Commission's non-federal representative for carrying out informal consultation pursuant to Section 106. The Commission granted Appalachian's request by notice dated March 8, 2019. While Appalachian is authorized to consult in an informal capacity, the Commission remains legally responsible for all agency findings and determinations under Section 106.

On October 18, 2019, Appalachian filed a Revised Study Plan (RSP) with the Commission describing the studies that the Licensee is proposing to conduct in support of relicensing the Project, including a Cultural Resources Study. As described in the RSP, Appalachian preliminarily proposed to define the Study Area/Area of Potential Effects (APE) to include lands within the FERC-approved Project boundary, and lands outside of the Project boundary where Project operations, Project-related recreation activities or other enhancements, and routine maintenance activities associated with implementation of the license by the Commission could cause changes in the character or use of historic properties, if any such properties exist.

On September 1, 2020, Appalachian submitted a letter to the Virginia SHPO, federally recognized Indian Tribes, the Advisory Council on Historic Preservation (ACHP), and other interested parties requesting concurrence on the definition of the APE and to ascertain whether properties of cultural significance (e.g., Traditional Cultural Properties [TCPs]) might exist within the APE. If no response was received from Indian Tribes, follow-up emails were sent in September and October 2021. Responses were received from the Virginia Department of Historic Resources (Virginia SHPO), Catawba Indian Nation, Delaware Nation, and Pamunkey Indian Tribe. There was no response from the National Park Service, Bureau of Indian Affairs,

Cherokee Nation, Eastern Band of Cherokee Indians, or the Archaeological Society of Virginia. As a result of the consultation, no TCPs were indicated as being within the APE.

## ARCHAEOLOGICAL AND GEOMORPHOLOGICAL INVESTIGATIONS

Archaeological fieldwork was conducted from October 19–22, 2020, by Terracon Consultants, Inc (Terracon). Nine different portions of the Project area considered to have the highest potential for containing archaeological resources were examined using shovel testing. In addition, Terracon attempted to relocate three previously recorded sites that were reported to be within the APE, 44CA3, 44CA33, and 44CA121. Sites 44CA3 and 44CA121 are late nineteenth century Army Corps of Engineers sluices, whereas site 44CA33 is a temporally non-diagnostic lithic scatter. Site 44CA33 was relocated and is recommended as being ineligible for inclusion in the National Register of Historic Places (NRHP). Sites 44CA3 and 44CA121 could not be relocated, possibly because the water level was too high. In addition to the archaeological investigations, geomorphological investigations were conducted by Seramur & Associates from October 26–28, 2020, and again on April 20, 2021. Twenty hand auger borings were placed in the same nine areas where archaeological investigations took place. Based on the geomorphological analysis, only the area near site 44CA33 had the potential to contain buried archaeological deposits. Currently, this area is not being affected by Project operations, including erosion. The other eight areas did not have suitable landforms for containing undisturbed archaeological resources. Based on these results, Terracon recommended the Project would have no effect on historic properties and that no additional cultural resource investigations were warranted for the proposed undertaking.

Although no significant archaeological resources are being affected by the Project, the investigations did identify one area within the APE that has the potential for containing intact archaeological sites. This approximately 47.5-acre area includes a terrace located on the east bank of the river at the north end of the Project where archaeological site 44CA33 was found. Based on the archaeological and geomorphological studies, this is the only area within the Project that has the potential to contain intact archaeological resources. Although the area is not currently being affected by the Project, nor will continued operations of the Project affect the area through erosion or other mechanisms, Terracon recommended that a Phase I intensive archaeological survey take place if any ground disturbing activities were to occur in this area. Terracon also recommended updating the existing Cultural Resources Management Plan (CRMP) for the Project (Berger 1995) to include the results and recommendations contained in their report.

## ARCHITECTURAL SURVEY

There are three previously recorded aboveground historic-age resources identified within the Project boundary—the Buck Hydroelectric Facility (017-0022); the Byllesby Dam (017-5154); and the Norfolk and Western Railway Cripple Creek Extension (077-5068). The Byllesby and

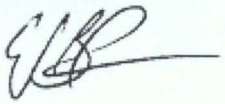
Buck facilities were determined to be eligible for the NRHP (Berger 1990), as was the Norfolk and Western Railway. None of these historic resources are currently being affected by Project operations.

**REQUEST FOR CONCURRENCE**

At this time, Appalachian is seeking concurrence from the Consulting Parties on the recommendations contained in the enclosed cultural resources study report, including the recommendation to prepare a revised Historic Properties Management Plan.

Appalachian respectfully requests that the consulting parties provide written concurrence within 30 days of the date of this letter (e.g., on or before October 8, 2021). If there are any questions regarding the enclosed study or the relicensing process, please do not hesitate to contact me at (540) 985-2241 or via email at ebparcell@aep.com.

Sincerely,



Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

Attachment: Byllesby-Buck Hydroelectric Project Section 106 Consultation Distribution List

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

**Federal Agencies**

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

**State Agencies**

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

**Tribes**

Wenonah Haire
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Rd.
Rock Hill, SC 29730

Erin Paden
Director of Historic Preservation
Delaware Nation
PO Box 825
Anadarko, OK 73005

Terry Clouthier
Cultural Resources Director
Pamunkey Indian Tribe
1054 Pocahontas Trail
King William, VA 23086

**Appalachian Power Company**
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

Via Electronic Filing

October 1, 2021

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

**Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514-186)**
**Filing of Draft License Application**

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Licensee), a unit of American Electric Power (AEP), is the Licensee, owner, and operator of the 30.1-megawatt, two-development Byllesby-Buck Hydroelectric Project (Project) (Project No. 2514), located on the upper New River in Carroll County, Virginia.

The Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission). The Project underwent relicensing in the early 1990s, and the current operating license for the Project expires on February 29, 2024. Accordingly, Appalachian is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. In accordance with 18 CFR § 5.16(a), Appalachian is hereby filing the Draft License Application (DLA) for the Project.

As described in the DLA, Appalachian is proposing to continue the existing run-of-river mode of operation of the Project and proposes to modernize the Project in the new license term to include replacement of three of four turbine-generator units at the Byllesby Development and replacement of two of three turbine-generator units at the Buck Development. The upgrades will not result in a significant increase in the Project's authorized installed capacity or the maximum hydraulic capacities of the powerhouses, but due to efficiencies of the replacement units and modern components, the upgrades are expected to increase average annual generation at the Project by approximately 25,927 MWh.

The DLA also includes proposals for some preliminary protection, mitigation, and enhancement (PM&E) measures related to operations and resources associated with the Project. The proposed PM&E measures described in the DLA reflect careful consideration of available information, preliminary results of studies conducted or in-process, and issues specific to the Project. Appalachian notes that these proposals are preliminary and expects them to be refined within the Final License Application (to be filed with FERC by February 28, 2022), based on the completion of ongoing relicensing studies and study reporting, interests of Project stakeholders, and further evaluation of Project power and non-Power values.

The DLA is composed of five volumes, as described below:

**Volume I of V (Public)**

Volume I contains Public information and exhibits as listed below.

- Table of Contents
- Initial Statement and Additional Information Required by 18 CFR §5.18(a)
- Exhibit A – Project Description
- Exhibit B – Project Operations and Resource Utilization
- Exhibit C – Construction History and Proposed Construction Schedule
- Exhibit D – Costs and Financing

**Volume II of V (Public)**

Volume II contains Exhibit E – Environmental Report and Appendices (including consultation). Final Study Reports are not included as they are still under preparation and will be filed under with the Updated Study Report (to be filed with FERC by November 17, 2021).

**Volume III of V (Public)**

Volume III contains Public information and exhibits as listed below.

- Exhibit F – List of General Design Drawings
- Exhibit G – Project Boundary Maps
- Exhibit H – Ability to Operate

**Volume IV of V (CRITICAL ENERGY/ELECTRIC INFRASTRUCTURE INFORMATION [CUI//CEII])**

Volume IV contains CUI/CEII materials not intended for public release, and includes the following:

- Exhibit F – General Design Drawings
- Exhibit H – Single Line Diagrams of the Transmission Systems

**Volume V of V (PRIVILEGED [CUI//PRIV])**

Volume V contains CUI/PRIV materials not intended for public release, and includes the following:

- Cultural Resources Study Report

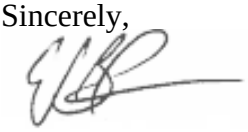
Appalachian is filing the DLA with the Commission electronically and is distributing this letter electronically to the parties listed on the attached distribution list. All parties interested in the relicensing process may obtain a copy of the DLA electronically through FERC's eLibrary system at https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2514-186, or on Appalachian's website at http://www.aephydro.com/HydroPlant/ByllesbyBuck.

**In accordance with 18 CFR § 5.16(e), interested parties may file comments regarding the DLA within 90 days of the date of this letter, by December 30, 2021.** All comments must be filed with FERC electronically or via the following address:

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

If there are any questions regarding this filing, please do not hesitate to contact me at (540) 985-2441 or via email at ebparcell@aep.com.

Sincerely,



Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

cc: Distribution List
Jonathan Magalski (AEP)

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

**Federal Agencies**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**State Agencies**

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

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

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

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

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

Ms. Emma Williams
Office of the Secretary of the Commonwealth
Virginia Council on Indians
PO Box 2454
Richmond, VA 23218
emma.williams@governor.virginia.gov

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

Ms. Ewing
Virginia Department of Conservation and Recreation
sharon.ewing@dcr.virginia.gov

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

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

Mr. Sam Sweeney
New River Trail State Park Manager
Virginia Department of Conservation and Recreation
600 East Main Street, 24th Floor
Max Meadows, VA 24360
sam.sweeney@dcr.virginia.gov

Ms. Jennifer Wampler
Environmental Programs Planner
Virginia Department of Conservation and Recreation
600 East Main Street, 24th floor
Richmond, VA 23219
jennifer.wampler@dcr.virginia.gov

Mr. Jimmy Elliott
Virginia Department of Conservation and Recreation - New River Trail
james.elliott@dcr.virginia.gov

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

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

Mr. Joe Grist
Water Withdrawl Program Manager
Virginia Department of Environmental Quality
PO Box 1106
Richmond, VA 23218
joseph.grist@deq.virginia.gov

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

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

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

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

NEPA Review
Virginia Department of Environmental Quality
eir@deq.virginia.gov

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

Timothy Roberts
Review and Compliance Division
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221
Tim.Roberts@dhr.virginia.gov.

Mr. John Copeland
Fisheries Biologist
Virginia Department of Wildlife Resources
2206 South Main Street, Suite C
Blacksburg, VA 24060
John.Copeland@dwr.virginia.gov

Mr. Jeff Williams
Manager, Marion Office - Region 3 Office
Virginia Department of Wildlife Resources
1796 Highway Sixteen
Marion, VA 24354
jeff.williams@dwr.virginia.gov

**Local Governments**

Mr. Stephen Bear
Wythe County Administrator
340 South Sixth Street
Wytheville, VA 24382
sdbear@wytheco.org

Mr. Rex Hill
Carroll Board of Supervisor
Carroll County
rex.hill@carrollcountyva.gov

Mr. Mike Watson
Carroll County Administrator
Carroll County
605-1 Pine Street
Hillsville, VA 24343
michael.watson@carrollcountyva.gov

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

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

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

Dr. Beth Taylor
Mayor
Town of Wytheville
beth.taylor@wytheville.org

**Tribes**

Caitlin Rogers
Tribal Historic Preservation Officer
Catawba Indian Nation
1536 Tom Steven Road
Rock Hill, SC 29730
Caitlin.Rogers@catawba.com

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

Erin Paden
Director of Historic Preservation
Delaware Nation
31064 State Highway 281
Anadarko, OK 73005
epaden@delawarenation-nsn.gov

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

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

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

Terry Clouthier
Tribal Historic Preservation Officer
Pamunkey Indian Tribe
1054 Pocahontas Trail
King William, VA 23086
terry.clouthier@pamunkey.org

Whitney Warrior
Natural Resources & Cultural Preservation Director
United Keetoowah Band of Cherokee Indians
PO Box 746
Tahlequah, OK 74465
wwarrior@ukb-nsn.org

**Non-governmental Organizations**

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

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

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

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

Mr. Richard Roth
Friends of the Rivers of Virginia
rroth@radford.edu

Mr. Bill Tanger
Friends of the Rivers of Virginia
PO Box 1750
Roanoke, VA 24008
Bill.tanger@verizon.net

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

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

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

Ms. Andrea Langston
New River Land Trust
PO Box K
Blacksburg, VA 24063-1025

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

Mr. Zachary R. Slate
New River Regional Water Authority
newriverwater@gmail.com

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

Ms. Angie Grooms
angie.grooms750@gmail.com

Mr. David Taylor
jklfloat@embarqmail.com

Appalachian Power Company
P. O. Box 2021
Roanoke, VA 24022-2121
aep.com

November 2, 2021

*VIA ELECTRONIC FILING*

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

**Subject: Byllesby-Buck Hydroelectric Project (FERC No. 2514-186)**
**Fifth Quarterly (Final) Study Progress Report – Fall 2021**

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Applicant), a unit of American Electric Power (AEP) is the Licensee, owner, and operator of the 30.1-megawatt (MW) Byllesby-Buck Hydroelectric Project (Project No. 2514 (Project or Byllesby-Buck Project), located on the New River in Carroll County, Virginia. The two-Development Project comprises the upstream Byllesby Development and the downstream Buck Development. The Project is currently undergoing relicensing following the Federal Energy Regulatory Commission's (FERC or Commission) Integrated Licensing Process (ILP).

This Fifth Quarterly Study Progress Report describes the activities performed since the Fourth Quarterly Study Progress Report which was filed on July 22, 2021 and includes the final study plan activities expected to be conducted in quarter 4 (Q4) of 2021. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD), as subsequently modified by Order on Rehearing dated February 20, 2020, and the ISR study schedule.

**Bypass Reach Flow and Aquatic Habitat Study**

- Field data collection was completed at the Byllesby Development from July 27, 2021 – September 9, 2021 in accordance with the methods proposed in the RSP.
- Appalachian's consultant was unable to complete the field data collection and model development activities early enough to allow for a meeting with stakeholders in advance of the USR. As such, Appalachian plans to review seasonal hydrology [in particular as it relates to the potential for Walleye spawning in March, the peak month identified by the Virginia Department of Wildlife Resources (VDWR) during the ISR meeting] and discuss other flow scenarios of interest at the Buck and Byllesby Developments from a fish habitat

modeling perspective during the presentation at the USR meeting. Appalachian will consult with stakeholders at that time to determine if a follow-up call is needed in advance of the filing of the Final License Application.

- HDR is developing a two-dimensional (2D) aquatic habitat model for the Byllesby bypass reach. Modeling results, conclusions, and recommendations will be provided in the USR.

**Water Quality Study**

- As noted in the previous progress reports, Appalachian will provide additional information related to Project operations in the USR for the 2020 and 2021 water quality monitoring periods at the Buck Development. This information will include identification of any periods during which there were unit outages, flashboard failures, or station trips that may have increased spill into the bypass reach relative to normal Project operations.
- Also as previously reported, the water quality data collection effort was repeated at Byllesby in 2021 with the full deployment of data sondes as proposed in the RSP (including the tailrace monitoring location which was sampled during the 2020 study period). Water quality equipment was successfully installed at these four locations on June 15 and 16, 2021; were downloaded on June 28, July 14, July 27-29, August 25, September 7-9, September 15, and September 28; and were removed on October 5.
- Monthly chlorophyll a and turbidity grab samples were collected during the monthly discrete water quality sampling events as described in the RSP at both the Buck forebay and Byllesby forebay monitoring locations during the same months (i.e., July, August, and September) in 2021. Monthly grab samples were completed on July 14, August 25 (turbidity only), September 10 (chlorophyll a only), and September 29 (both turbidity and chlorophyll a).
    - The chlorophyll a grab samples were shipped to an off-site laboratory for analysis. The shipping provider utilized for the August samples did not deliver them to the laboratory within the required sample hold period, therefore, the samples were not analyzed. As a result, HDR collected additional chlorophyll a grab samples in early September to substitute the August samples.
- As previously reported, the Water Quality Study turbidity task could not be completed in 2020 due to higher than normal Project inflows from the New River. This task was shifted to a low inflow period in 2021 and was conducted from September 28 – October 5 with a one-day follow-up data collection event on October 14. During the initial continuous turbidity data sonde deployment from September 28 – October 5, several data sondes failed on the first day of deployment. During the follow-up data collection event on October 14, additional turbidity measurements were focused on the Buck Development as the Byllesby

Development was in an outage condition for scheduled intake screen repair. Observations from and results of this data collection will be reported in the USR.

**Aquatic Resources Studies**

- All field data collection activities were completed by the end of May 2021 and results will be provided in the USR.
- An evaluation of fish passage and turbine blade strike mortality for Byllesby and Buck was completed in October 2021 using the current version of the USFWS Turbine Blade Strike Analysis Model. The results will be reported in the USR.

**Recreation Study**

- Appalachian is in the process of preparing a draft Recreation Management Plan for stakeholder review.

**Terrestrial Resources; Wetlands, Riparian, and Littoral Habitat Characterization; and Shoreline Stability Assessment Studies**

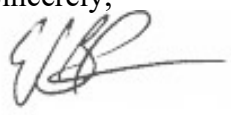
- All field data and desktop mapping activities for these studies were completed as of the end of July 2021. Results will be reported in the USR.

**Cultural Resources Study**

- As noted in the Draft License Application, the Cultural Resources Study was completed by Terracon in 2020-2021. The final study report was distributed to SHPO and Tribes on September 8, 2021 for a 30-day review period. No reply comments have yet been received. The study report was also filed with FERC as a CUI/Privileged volume of the Draft License Application.

If there are any questions regarding this progress report, please do not hesitate to contact me at (540) 985-2441 or via email at ebparcell@aep.com.

Sincerely,



Elizabeth Parcell
Process Supervisor
American Electric Power Services Corporation

# Appendix A

## Appendix A –Bypass Reach Flow and Aquatic Habitat Study Report

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# Appendix B

## Appendix B – Water Quality Study Report

*(Included under separate cover)*

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# Appendix C

## Appendix C – Aquatic Resources Study Report

*(Included under separate cover)*

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# Appendix D

## Appendix D – Wetlands, Riparian, and Littoral Habitat Study Report

*(Included under separate cover)*

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# Appendix E

## Appendix E – Terrestrial Resources

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# Appendix F

## Appendix F – Shoreline Stability Assessment

*(Included under separate cover)*

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# Appendix G

## Appendix G – Recreation Study

*(Included under separate cover)*