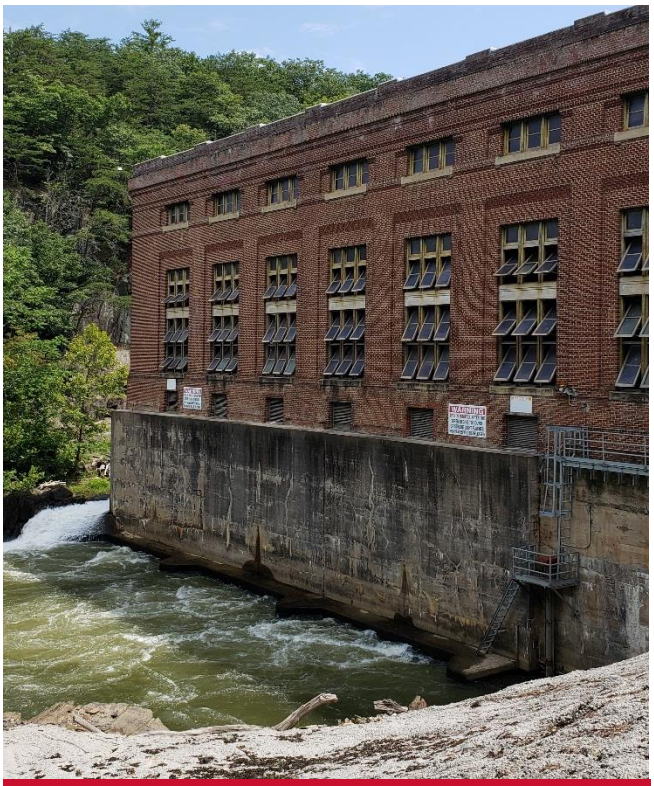

FINAL LICENSE APPLICATION

Volume II of V

Part 2 - Study Reports

Byllesby-Buck Hydroelectric Project
(FERC No. 2514)

February 28, 2022

Prepared by:

Prepared for:

Appalachian Power Company

APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY

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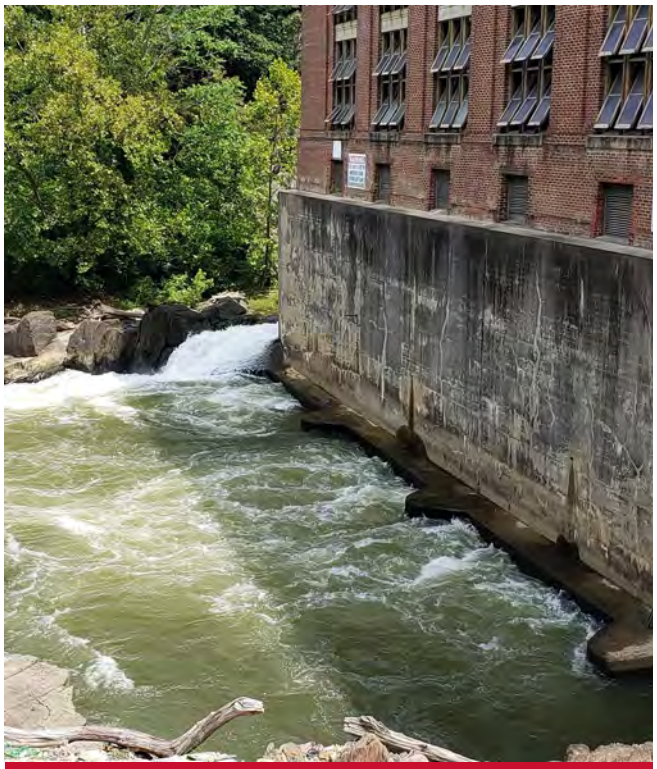

Appendix A - Bypass Reach Flow and Aquatic Habitat Study Report

To be filed by April 14, 2022

Byllesby-Buck Hydroelectric Project (FERC No. 2514)

February 28, 2022

Prepared by:

Prepared for:

Appalachian Power Company

An AEP Company

BOUNDLESS ENERGY

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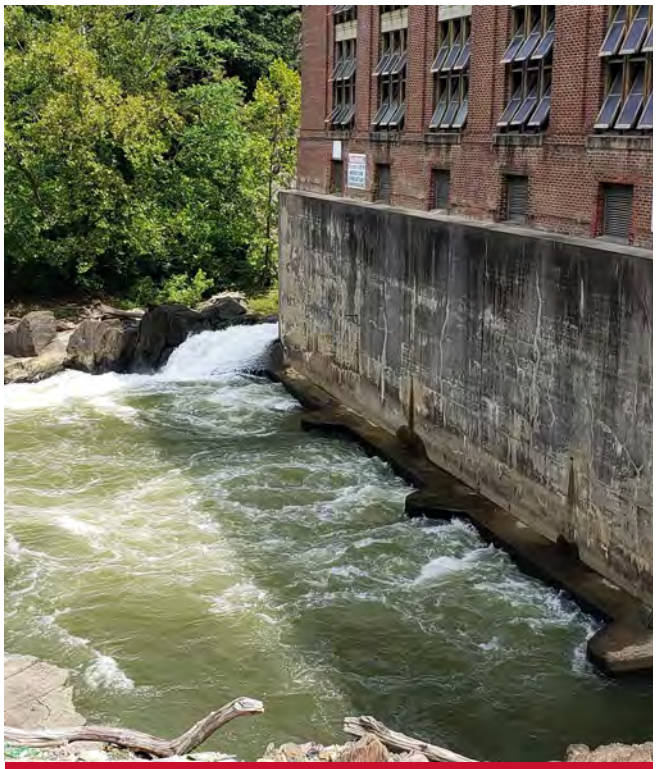

Appendix B - Water Quality Study Report

Byllesby-Buck Hydroelectric Project
(FERC No. 2514)

February 28, 2022

Prepared by:

Prepared for:

Appalachian Power Company

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Acronyms and Abbreviations

°C	degrees Celsius
AEP	American Electric Power
Appalachian or Licensee	Appalachian Power Company
Byllesby	Byllesby Development
Buck	Buck Development
DO	dissolved oxygen
CFR	Code of Federal Regulations
CWA	Clean Water Act
FERC or Commission	Federal Energy Regulatory Commission
ft	feet/foot
mg/l	milligrams per liter
HDR	HDR Engineering, Inc.
Hydrolab	Hach Hydrolab® MS5
ILP	Integrated Licensing Process
ISR	Initial Study Report
mg/m^3	milligrams per cubic meter
NGVD	National Geodetic Vertical Datum of 1929
NTU	Nephelometric turbidity units
PAD	Pre-Application Document
PM&E	protection, mitigation, and enhancement
Project	Byllesby-Buck Hydroelectric Project
RM	river miles
RSP	Revised Study Plan
SPD	Study Plan Determination
USGS	U.S. Geological Survey
USR	Updated Study Report
VAC	Virginia Administrative Code
VDEQ	Virginia Department of Environmental Quality
µS/cm	microsiemens per centimeter

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1 Project Introduction and Background

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 (Byllesby) is located about 9 miles north of the city of Galax, and the Buck Development (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 §5.11 of the Commission's regulations, 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 12, 2019, Appalachian filed a clarification letter on the SPD with the Commission. 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. Stakeholders provided written comments in response the Appalachian's filling of the ISR meeting summary; these comments were addressed in the Updated Study Report (USR), which was filed November 17, 2021. A USR meeting was held on December 1, 2021 and requests from stakeholders made during the meeting are addressed in this revised USR.

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

2 Study Goals and Objectives

Appalachian's study employs standard methodologies that are consistent with the scope and level of effort of water quality monitoring conducted at hydropower projects in the region. This study is intended to provide sufficient information to support an analysis of the potential Project-related effects on water quality. The goals and objectives of this study are to:

- Gather baseline water quality data sufficient to determine consistency of existing Project operations with applicable Virginia state water quality standards and designated uses (Virginia Administrative Code [VAC] 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 [CWA] 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.

3 Study Area

The study area for the Water Quality Study is shown on Figure 3-1 and includes the reservoirs, bypass reaches, and tailraces downstream of Byllesby and Buck dams. Water quality data was collected at all five Buck monitoring locations and one Byllesby monitoring location (tailrace) for approximately two months in 2020, and at all six Byllesby monitoring locations for approximately three and a half months in 2021.

- **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)

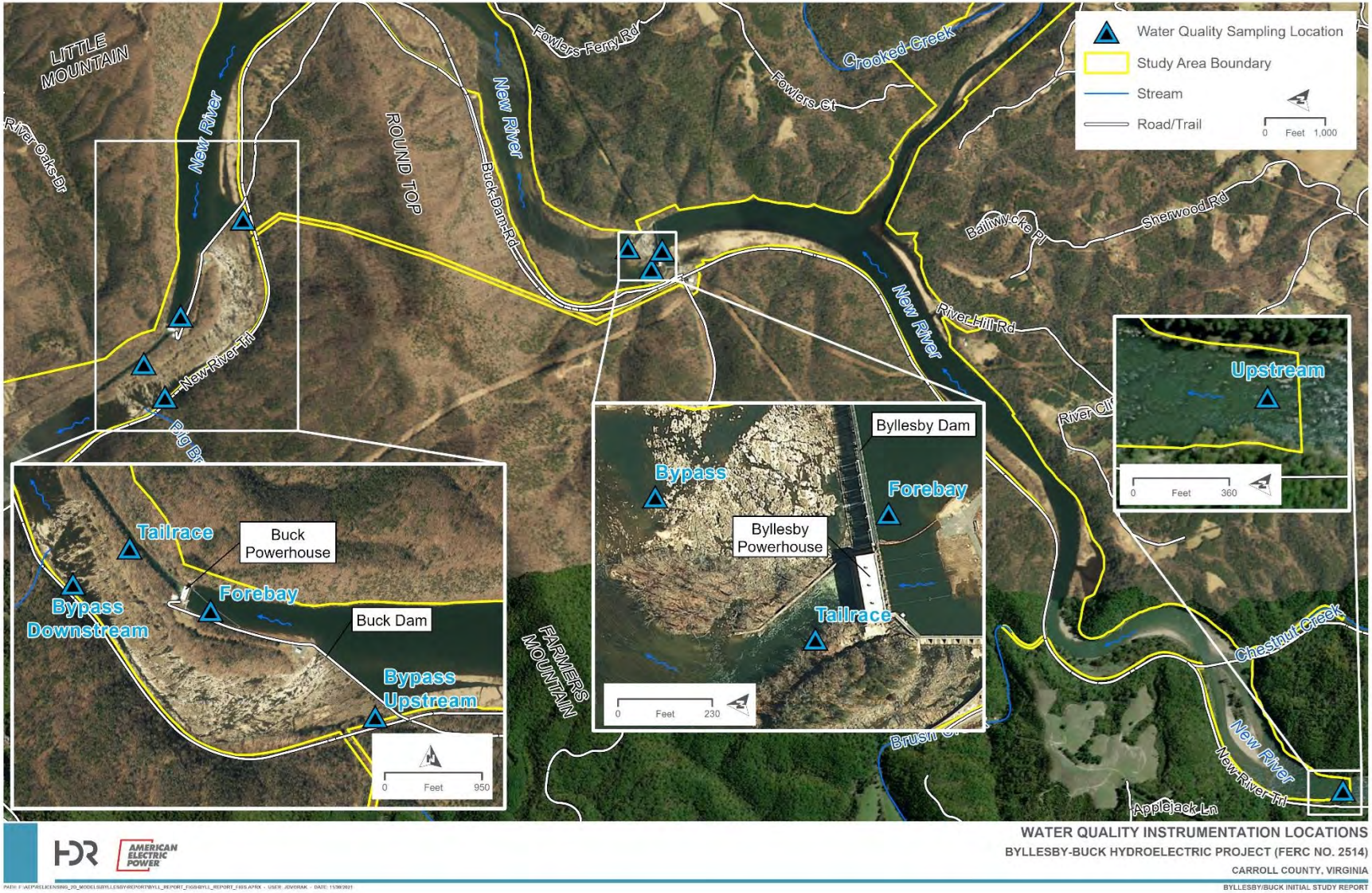

Figure 3-1. Byllesby-Buck Water Quality Study Locations

4 Background and Existing Information

4.1 Applicable Water Standards

Existing relevant and reasonably available information regarding water quality in the Project vicinity was presented in Section 5.3 of the Pre-Application Document (PAD) (Appalachian 2019). The PAD included historical water quality data collected by the U.S. Geological Survey (USGS) and the Virginia Department of Environmental Quality (VDEQ) (discussed in Section 4.2). The data presented in the PAD indicates that temperatures and DO concentrations did not differ between impoundments and tailraces during collection efforts, and no evidence of thermal stratification was observed in either impoundment. Data from the historical studies also demonstrated that the Project waters meet the state water quality standards, including temperature maximums and DO minimums.

The VDEQ is responsible for carrying out the mandates of the State Water Control Law as well as meeting federal obligations under the CWA (VDEQ 2017). Waters in the New River Basin are classified in 9VAC25-260-540. The New River in the vicinity of the Project is designated as Class IV (Mountainous Zone) (Table 4-1). Numerical criteria for DO, pH, and maximum water temperature for these waters are identified in 9VAC25-260-50 and are summarized in Table 4-2. In accordance with 9VAC25-260-50, these water quality criteria do not apply when flows are below the lowest 7-day average flow expected to occur once every 10 years (i.e., the 7Q10 flow).

Table 4-1. Classification of Project Area Waters – New River

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

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

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

PWS – public water supply.

Table 4-2. Numeric Water Quality Criteria for Class IV Waters

Parameter	Standard
Minimum DO	4.0 milligram per liter (mg/l)
Daily Average DO	5.0 mg/L
pH	6.0 – 9.0
Maximum water temperature	29°C*

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

Multiple segments of the New River are listed as impaired for aquatic life or recreation uses due to *E. coli* concentrations. However, the source of *E. coli* is not associated with the Project and it is expected that continued operation of the Project will have no effect on *E. coli* concentrations in the New River.

4.2 Existing Water Quality Data

Water quality data have been collected approximately 3.0 RM downstream of the Buck Dam at the U.S. Geological Survey (USGS) 03165500 New River at Ivanhoe, VA. Due to the proximity of this monitoring location to the Project, the water quality data is expected to be indicative of the characteristics of Project outflows. Daily mean water temperature and specific conductance data were collected from March 2007 to September 2008; daily mean water temperatures ranged from 0.3°C in to 28.9°C and were below the maximum state criterion. Daily mean specific conductance ranged from 55 microsiemens per centimeter (µS/cm) to 108 µS/cm.

The VDEQ has also collected water quality data approximately 2 RM downstream of Buck Dam at Site 9-NEW127.49. Water temperature, DO, pH, and specific conductivity data were collected at a depth of approximately 0.3 meters from 1992 to 2017. Water temperatures ranged from 0.0 to 28.7°C and were below established state criterion. DO concentrations ranged from 5.3 mg/l to 14.8 mg/l and were well above the minimum state criterion. The pH ranged from 5.9 to 8.9 and were also within the state criteria range, except for a single day in December 1999. Specific conductivity ranged from 20 to 80 µS/cm.

On August 29, 2019, a site visit was conducted by HDR Engineering, Inc. (HDR) on behalf of Appalachian to collect water quality data and evaluate field logistics associated with potential water quality monitoring locations for the Byllesby and Buck developments. During the site visit, a calibrated multiparameter water quality data sonde was used to collect depth profiles in each development's forebay and discrete measurements were taken in each development's tailrace. Streamflow during the site visit was approximately 1,500 cubic feet per second (cfs) measured at USGS gage 03165500, which is typical of average flow conditions in August at this location. During the site visit, the Byllesby forebay elevation[1] was in the normal operating range,[2] however, the Buck forebay elevation was approximately 9 feet (ft) lower than the normal operating range[3] to facilitate construction activities associated with installation of the new Obermeyer gates.

All water quality measurements during the site visit were within applicable Virginia state water quality standards. As Figure 4-1 and Figure 4-2 indicate, the depth profiles in each forebay did not show any significant difference in water quality from top to bottom or laterally. The tailrace measurements were reflective of the water quality in each forebay.

[1] Elevations in this report are referenced to National Geodetic Vertical Datum of 1929 (NGVD)

[2] Normal operating range for the Byllesby impoundment is between 2,078.2 – 2,079.2 ft NGVD.

[3] Normal operating range for the Buck impoundment is between 2,002.4 – 2,003.4 ft NGVD. During the August 29, 2019 water quality sampling site visit, the forebay elevation was approximately 1994 ft NGVD; or approximately 9 ft below the normal operating range.

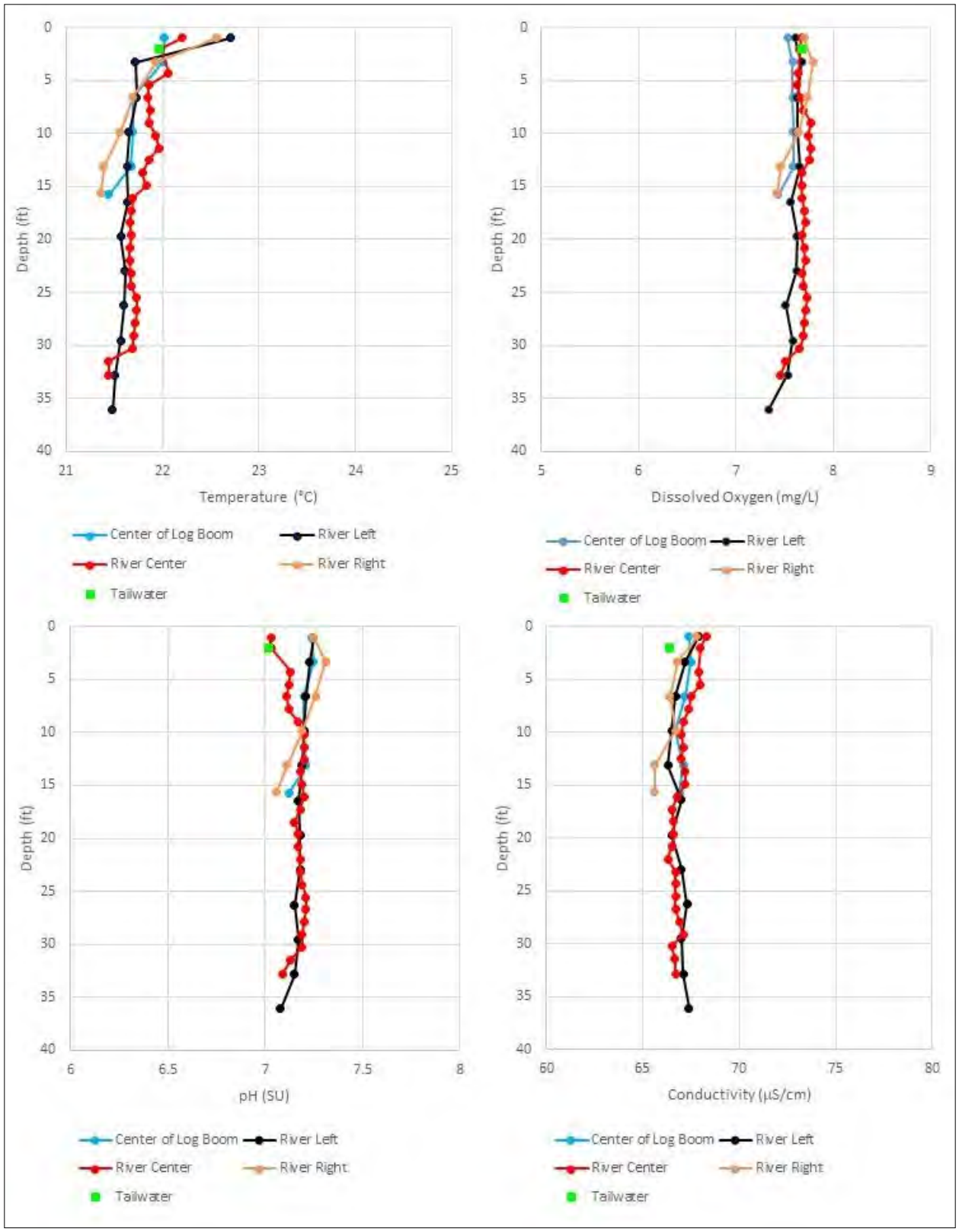

Figure 4-1. Water Quality Parameters for Byllesby (August 29, 2019)

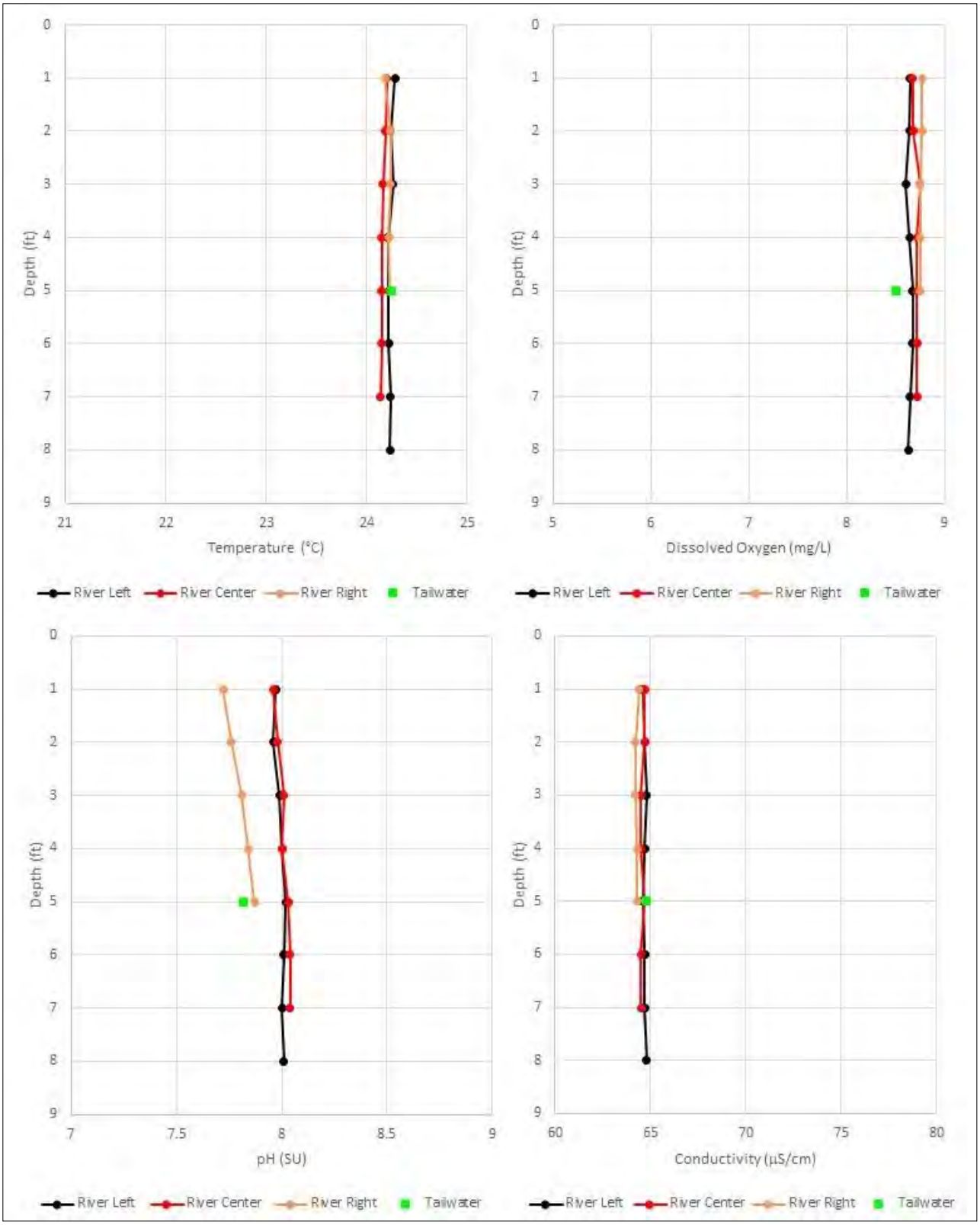

Figure 4-2. Water Quality Parameters for Buck (August 29, 2019)

5 Methodology

5.1 Byllesby Data Collection

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. HDR 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 locations of the water quality instrumentation are shown on Figure 3-1. The equipment recorded data at 15-minute intervals. Data were downloaded from instrumentation at Byllesby approximately every 2 to 3 weeks[4] until September 28, 2021, at which time the data collection instruments were removed.

The depth of the Byllesby forebay water quality monitoring location is approximately 27 ft. The RSP specified a monitoring location near the surface and bottom of the forebay (approximately 3 ft from the surface and bottom, respectively). Appalachian also deployed a water quality data sonde at approximately mid-depth to help determine the extent of any thermal and/or DO stratification in the forebay area.

Field staff downloaded data from sondes at each monitoring location using a data shuttle or directly to a laptop computer. Sondes were regularly cleaned and checked for operation, calibration, and battery life, and adjusted as necessary based on manufacturer's specifications. The cable, housing, and other installation materials were visually inspected for damage and repaired or replaced as necessary.

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 approximately 2.0-ft intervals[5] using the Hydrolab to document temperature and DO stratification at the time of the data sonde downloads.

[4] 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.

[5] 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.

5.2 Buck Data Collection

Water quality instruments (i.e., DO and water temperature sondes) were deployed at Buck at all five planned monitoring locations the week of August 17, 2020. The locations of the water quality instrumentation are shown on Figure 3-1. The equipment recorded data at 15-minute intervals.

Based on the August 29, 2019 site visit described in Section 4.2, the depth of the Buck forebay near the center of the intake channel is approximately 17 ft.[6] As a result, the upper and lower data sondes were placed at approximately 3 ft and 14 ft below the surface, respectively.

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. Field staff downloaded data from sondes at each monitoring location using a data shuttle or directly to a laptop computer. Sondes were regularly cleaned and checked for operation, calibration, and battery life, and adjusted as necessary based on manufacturer's specifications. The cable, housing, and other installation materials were visually inspected for damage and repaired or replaced as necessary.

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 Hydrolab. 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 1.0-ft intervals[7] at the Buck forebay monitoring location using the Hydrolab to document temperature and DO stratification at the time of the data sonde downloads.

5.3 Data Analysis and Processing

Upon completion of the field data collection effort, data was checked for errors and omissions. Data that more closely matched the discrete measurement readings made in the field during download events were preferentially reported and analyzed for each monitoring location.

Real-time flow data (15-minute) was obtained from the USGS New River at Ivanhoe, VA Gage (USGS 03165500), which is approximately 3.0 RM downstream of the Buck powerhouse and includes the combined flows from the powerhouse and bypass reach. Flows have been recorded since January 1996 at the USGS New River at Ivanhoe, VA gage and corresponding stage from August 2020 to present.

[6] During the August 29, 2019 water quality sampling site visit, the Buck pool level was at approximately 1994 ft NGVD; or approximately 9 ft below the normal operating range of 2002.4 – 2003.4 ft NGVD (the impoundment was drawn down to facilitate construction activities at the spillway). At the time of the site visit, the depth measured near the center of the intake channel was approximately 8 ft. Therefore, at normal pool levels, the depth at the same location will be approximately 17 ft (i.e., 8 ft + 9 ft).

[7] 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.

5.4 Equipment Calibration and Quality Assurance

Prior to the first deployment, Onset HOBO® Model U26 DO/Temperature Loggers were initialized with a new DO sensor cap and calibrated. The Hydrolab multi-parameter water quality sonde was lab calibrated by the manufacturer. Prior to each instantaneous sample collection, the Hydrolab was checked against a suite of standards. A Hydrolab® Surveyor 4a is the handheld display that connects to the Hydrolab sonde for attended monitoring applications and was sent to the manufacturer for calibration prior to the field deployment. The water quality sensor specifications as specified by the manufacturer are presented in Table 5-1.

Table 5-1. Water Quality Sensor Specifications

Water Quality Sensor Accuracy		
Sensor	Hydrolab® MS5[2]	Onset HOBO® Model U26[3]
Temperature	+/- 0.1°C	+/- 0.2°C
DO[1]	+/- 0.1 mg/l for 0 – 8 mg/l; +/- 0.2 mg/l for greater than 8 mg/l	+/- 0.2 mg/L for 0 – 8 mg/l; +/- 0.5 mg/L for greater than 8 mg/l
Specific conductivity	+/- 0.5 % of reading; +/- 0.001 millisiemens/centimeter	N/A
pH	+/- 0.2 units	N/A

Note:
[1] = Hach LDO® - Luminescent Dissolved Oxygen sensor or Onset RDO ® - Rugged Dissolved Oxygen. Both use light to optically measure DO.
[2.] Specifications for the Hydrolab® MS5: https://s.campbellsci.com/documents/ca/product-brochures/series_5_br.pdf
[3.] Specifications for the Onset HOBO® Model U26: https://www.onsetcomp.com/products/data-loggers/u26-001/

6 Study Results

6.1 Byllesby Water Quality Results

6.1.1 Water Temperature

Figure 1-1 (Attachment 1) provides continuous and discrete water temperature data at the upstream end of the Byllesby reservoir. The highest water temperatures occurred during the last week of July 2021 and peaked between 29.4–30.0 ºC during the afternoon hours that week. Diurnal temperature variation during the water quality study period ranged from approximately 2–4 ºC. Discrete measurements at all Byllesby water quality monitoring locations are provided in Attachment 3.

Figure 1-2 (Attachment 1) provides continuous and discrete water temperature data at the Byllesby tailrace location in 2020. Water temperatures measured in the 21–26ºC range for the first three weeks of the study. In mid-September 2020, the average temperature decreased over a one-week period by approximately 7ºC. Figure 1-3 (Attachment 1) provides continuous and discrete water temperature data at the forebay and tailrace monitoring locations at Byllesby for 2021. Water temperatures at both of these locations were similar to those recorded at the upstream end of the Byllesby reservoir. As described in Section 5.1, continuous water temperature data was collected at three elevations at the Byllesby forebay monitoring location (near surface, mid-depth, and near bottom). Water temperature differences between the surface and bottom forebay locations typically

varied between 0–2ºC indicating minimal thermal stratification in the forebay, which is reflective of run-of-river operations. Tailrace water temperatures were generally similar to the forebay surface monitoring location, but with less daily fluctuation.

Figure 1-4 (Attachment 1) provides continuous and discrete water temperature data at the Byllesby bypass reach monitoring location. Bypass reach water temperature magnitude and daily fluctuation was very similar to that at the Byllesby upstream reservoir monitoring location.

Air temperature data is also included in Figures 1-1 through 1-4 (Attachment 1) to help put into context the larger daily air temperature fluctuations compared to the daily water temperature fluctuations.

Water temperature vertical profile data for the Byllesby forebay are presented in Figure 5-1 (Attachment 5). While water temperature varied seasonally, there was little (i.e., <2.0ºC) to no thermal stratification at the forebay monitoring location.

6.1.2 Dissolved Oxygen

Figure 1-5 (Attachment 1) provides continuous and discrete DO concentration data at the Byllesby upstream monitoring location. All measurements were greater than the 5.0 mg/l daily average DO standard with daily fluctuations in the 1.0–2.5 mg/l range. DO concentrations were in the 6.0–9.0 mg/l range through the July–August 2021 period and then generally increased through September as water temperatures decreased[8]. Note at the beginning of the water quality study period in 2021, the upstream monitoring location was in a pool with very slow-moving water which resulted in significant biofouling of the DO sensors. The sampling equipment was subsequently relocated during the July 14, 2021 download event to an area just upstream of the original location with slightly higher velocities, which greatly reduced biofouling effects.

Figure 1-6 (Attachment 1) provides continuous and discrete DO concentration data at the Byllesby forebay monitoring locations. All measurements were greater than the 5.0 mg/l daily average DO standard with the exception of several days when DO concentrations measured at the forebay bottom monitoring location dipped below 5.0 mg/l. During these periods, thermal and DO stratification was present in the forebay, therefore, the surface DO concentration was used for comparison to the state water quality standards (all of which were above the 5.0 mg/l daily average DO standard). Differences in DO concentrations between the upper and lower forebay monitoring locations typically ranged from 0–1.0 mg/l indicating minor stratification in the forebay area during the summer months. See data tables in Attachment 3 for discrete sampling results in the Byllesby forebay.

A planned reservoir drawdown occurred from August 6 – 13, 2021 to repair a section of broken flashboards at the Byllesby spillway. During this period, the reservoir was drawn down approximately 8 ft (see Figure 1-6 in Attachment 1) which impacted the results from the forebay middle and bottom monitoring locations as the DO sensors were likely resting on the bottom of the reservoir. Data points were removed from Figure 1-6 during the reservoir drawdown period.

[8] Generally, there is an inverse relationship between DO concentrations and water temperature. Colder water temperatures have a higher capacity for DO concentrations and vice versa.

Figure 1-7 and Figure 1-8 in Attachment 1 provide continuous and discrete DO concentration data at the Byllesby tailrace monitoring location for 2020 and 2021, respectively. All measurements were greater than the 5.0 mg/l daily average DO standard with daily fluctuations in the 0.5–1.5 mg/l range. DO concentrations generally increased over the course of the study period as water temperatures decreased[9].

A data gap between August 8, 2021 and August 25, 2021 resulted from a combination of the planned maintenance drawdown event (August 6 – 13, 2021) which was immediately followed by a large rainfall runoff event as the remnants from Tropical Storm Fred moved through the area (see Figure 1-9 in Attachment 1). These two back-to-back events delayed the routine download trip to August 25, 2021. By this time, the DO sensors had experienced significant biofouling resulting in data that was not usable. Based on water temperature data (which decreased during the rainfall runoff period, see Figure 1-3), it is expected that DO in the tailrace would have remained above the 5.0 mg/l daily average DO standard.

Figure 1-10 in Attachment 1 provides continuous and discrete DO concentration data at the bypass reach monitoring location. All measurements were greater than the 5.0 mg/l daily average DO standard with daily fluctuations ranging from 1.0 mg/l up to 4.0 mg/l as temperatures cooled toward the end of September. Like the Byllesby tailrace monitoring location, the same data gap occurred at the bypass reach monitoring location (for the same reasons described above). Similar to the tailrace monitoring location, it is expected that DO concentrations in the bypass reach would have remained above the 5.0 mg/l daily average DO standard due to cooler water temperatures and higher flows in the bypass reach during the Tropical Storm Fred rainfall runoff event (Figure 1-9, Attachment 1).

DO vertical profile data is presented in Figure 5-1 of Attachment 5 for the Byllesby forebay monitoring location and similar to the water temperature profile data, there was minor indication of stratification of DO concentrations at this location.

6.1.3 pH

Vertical pH profile data are presented on Figure 5-2 of Attachment 5 for the Byllesby forebay monitoring location. While there was some variability between sampling events, the overall pH range was between 6.8 and 8.9. Four of the sampling events indicated little to no stratification between the reservoir surface and bottom measurements; all closely grouped around a pH of 7.0. The other three sampling events indicated a higher pH range with some degree of stratification.

Discrete pH measurements at each monitoring location during the initial instrument deployment and subsequent download events were between 6.9 and 8.9; these values meet state water quality standards for Class IV waters (see Table 4-2). The only pH value outside this range was a discrete measurement of 9.2 at the upstream monitoring location during the last download event on September 28, 2021 (see data tables in Attachment 3 for discrete sampling results).

[9] Generally, there is an inverse relationship between DO concentrations and water temperature. Colder water temperatures have a higher capacity for DO concentrations and vice versa.

6.1.4 Specific Conductivity

Specific conductivity vertical profile data is presented in Figure 5-3 of Attachment 5 for the Byllesby forebay monitoring location. Specific conductivity at this monitoring location varied each sampling event, but concentrations were typically the same from reservoir surface to bottom and ranged from 58–69 µS/cm over seven sampling events during the study period. Discrete measurements of specific conductivity for all monitoring locations ranged from 55–69 µS/cm (see data tables in Attachment 3 for discrete sampling results). These results are consistent with specific conductivity measurements during the August 29, 2019 site visit, the 2020 water quality monitoring results at Buck (see Section 6.2.4), and the results of other nearby historic studies and data collection efforts (NWQMC 2020; Stantec 2016) indicating a long-term, relatively consistent range of conductivity in the Project area.

6.1.5 Chlorophyl A

Chlorophyll a grab samples were collected at the Byllesby and Buck forebay surface monitoring locations on July 14, September 9[10], and September 29, 2021 and analyzed at the certified laboratory Pace Analytical Services in Ormond Beach, Florida. All sample results were “non-detect” indicating chlorophyll a concentrations in the samples were less than 5.0 milligrams per cubic meter (mg/m^3).

6.1.6 Turbidity

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. Turbidity concentrations were 16.9, 6.1, and 1.0 Nephelometric turbidity units (NTU) on these three sampling dates, respectively.

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[11]. 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 each of the locations listed below (which coincide with the continuous monitoring locations shown on Figure 3-1).

- One location in the upstream extent of the Byllesby reservoir (to characterize background turbidity levels)
- One location in the Byllesby forebay (approximate mid-depth)
- One location in the Byllesby tailrace below the powerhouse
- One location in the Buck forebay (approximate mid-depth)

[10] A chlorophyll a sampling event was conducted on August 25, 2021. However, due to a delay in shipping, the grab sample arrived at the off-site laboratory after the maximum allowable hold period and as a result, was not analyzed. A second grab sample was subsequently collected on September 9, 2021 which resulted in two chlorophyll a sampling events in September 2021.

[11] For the continuous turbidity monitoring study, HDR rented MS5 data sondes from OTT HydroMet. The turbidity sensors installed in the MS5 data sondes were provided by Turner Designs.

- One location in the Buck tailrace below the powerhouse

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 Figure 8-1 (Attachment 8). 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 within hours of their deployment.

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[12].

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[13] 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. Figure 8-2 (Attachment 8) 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.

6.2 Buck Water Quality Results

6.2.1 Water Temperature

Figure 2-1 in Attachment 2 provides continuous and discrete water temperature data at the forebay and tailrace locations at Buck. Water temperatures at both of these locations were similar to those recorded at the Byllesby tailrace. The Buck forebay and tailrace monitoring locations were within 0.5ºC of each other for most of the study period, which is reflective of run-of-river operations. Discrete measurements at all Buck water quality monitoring locations are provided in Attachment 4.

[12] The turbidity sensors use infrared wavelength to measure turbidity concentrations in the water column. The daily NTU cycling effect shown on Figure 8-1 (Attachment 8) at the Byllesby upstream and Buck tailrace monitoring locations is likely due to sunlight interference with the turbidity sensors (which is inherent in continuous in-situ sampling). Baseline turbidity concentrations would be during nighttime hours when sunlight interference is minimized.

[13] 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.

Figure 2-2 in (Attachment 2) provides continuous and discrete water temperature data at the Buck bypass reach monitoring locations. Daily temperature fluctuations at the downstream monitoring location were approximately twice that observed at the upstream monitoring location. While both monitoring locations are in relatively small pools, the upstream location is shaded more hours of the day compared to the downstream location, thus daily temperature cycles at the upper location are lower in magnitude.

Air temperature data is also included on Figures 2-1 and 2-2 (Attachment 2) to help put into context the larger daily air temperature fluctuations compared to the daily water temperature fluctuations.

Water temperature vertical profile data for the Buck forebay is presented on Figure 6-1 in Attachment 6. While water temperature varied seasonally, there was little (i.e., <0.7ºC) to no thermal stratification at the forebay monitoring location.

6.2.2 Dissolved Oxygen

Figure 2-3 (Attachment 2) provides continuous and discrete DO concentration data at the Buck forebay and tailrace monitoring locations. All measurements were greater than the 5.0 mg/l daily average DO standard. Daily fluctuations in DO concentrations were less than 1.0 mg/l during the study except for September 4–11 when the daily fluctuation increased to the 1.0–2.0 mg/l range at the forebay monitoring locations[14]. Similar to water temperature, there is little (i.e., typically < 1.0 mg/l) to no difference in DO concentrations between the forebay surface and bottom locations; indicating little to no stratification of DO concentrations throughout the forebay water column. DO concentrations in the tailrace were generally higher (by up to 1.0 mg/l) compared to the forebay monitoring locations. This suggests that unit generation and the trash sluice gate operation increase aeration into the tailrace. Tailrace concentrations typically fluctuated approximately 0.25 mg/l between day and night. Discrete measurements at all Buck water quality monitoring locations are provided in Attachment 3.

Figure 2-4 in Attachment 2 provides continuous and discrete DO concentration data at the bypass reach upstream and downstream monitoring locations. The overall trend in DO concentrations was similar between the two bypass reach monitoring locations. All measurements were greater than the 5.0 mg/l daily average DO standard with daily fluctuations of up to 1.0 mg/l for the upstream location and up to 3.0 mg/l at the downstream location. DO concentrations are influenced by water temperatures and as described in Section 6.1, the upstream monitoring location is shaded more hours of the day (compared to the downstream monitoring location), thus the daily fluctuation in DO concentrations is reduced at the upstream location relative to the downstream location.

DO vertical profile data is presented in Figure 6-1 of Attachment 6 for the Buck forebay monitoring location and similar to the water temperature profile data, there was no stratification of DO concentrations at this location.

[14] Flows recorded at the Ivanhoe USGS flow gaging station from September 4 – 11, 2020 were relatively low and stable (compared to the weeks preceding and following) which likely contributed to slightly increased fluctuations in DO concentrations during this period. Flows recorded at the Ivanhoe USGS flow gaging station are shown on Figure 7-1 and 7-2 of Attachment 7.

6.2.3 pH

Vertical pH profile data are presented on Figure 6-2 of Attachment 6 for the Buck forebay monitoring location. The variation in pH was very small (between 7.3 and 7.7) and there was little to no stratification between the reservoir surface and bottom measurements. Discrete pH measurements at each monitoring location during the initial instrument deployment and two download events were between 7.2 and 8.9; these values meet state water quality standards for Class IV waters (see Table 4-2). Eleven of the fifteen readings were within the vertical profile range (7.3 and 7.7).

6.2.4 Specific Conductivity

Specific conductivity vertical profile data is presented in Figure 6-3 of Attachment 6 for the Buck forebay monitoring location. Specific conductivity at this monitoring location varied each sampling event, but concentrations were typically the same from reservoir surface to bottom and ranged from 53 – 61 µS/cm over three sampling events during the study period (see Figure 3-3). Discrete measurements of specific conductivity for all monitoring locations ranged from 52 – 62 µS/cm (see Table 2-1 of Attachment 2 for discrete sampling results). These results are consistent with specific conductivity measurements during the August 29, 2019 site visit and the results of other nearby historic studies and data collection efforts (NWQMC 2020; Stantec 2016) indicating a long-term, relatively consistent range of conductivity in the Project area.

6.2.5 Chlorophyl A

Chlorophyll a grab samples were collected at the Buck forebay surface monitoring location on July 14, September 9[15] and September 29, 2021 and analyzed at Pace Analytical Services. All sample results were “non-detect”, indicating the chlorophyll a concentrations were less than 5.0 mg/m^3.

6.2.6 Turbidity

Turbidity grab samples were collected at the Buck forebay surface monitoring location on July 14, August 25 and September 29, 2021 and analyzed at Pace Analytical Services. Turbidity concentrations were 8.0, 4.3, and 1.5 NTU on these three sampling dates, respectively. Please refer to 6.1.6 for a detailed description of the turbidity study and methods.

7 Summary and Discussion

7.1 Effects of Station Operations on Water Quality

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.

[15] A chlorophyll a sampling event was conducted on August 25, 2021. However, due to a delay in shipping, the grab sample arrived at the off-site laboratory after the maximum allowable hold period and as a result, was not analyzed. A second grab sample was subsequently collected on September 9, 2021 which resulted in two chlorophyll a sampling events in September 2021.

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 at the Byllesby development that would have impacted the water quality results.

Project inflows and precipitation data during the 2020 and 2021 water quality study periods are provided in Figures 7-1 and 7-2 (Attachment 7).

7.2 Consistency with Applicable Virginia State Water Quality Standards

Continuous and discrete water quality data collected during the 2020 study period met Virginia Class IV (New River) water quality standards for temperature (<29ºC), DO (>4.0 mg/l instantaneous minimum; >5.0 mg/l daily average), and pH (range 6.0 – 9.0) at all monitoring locations during the study period.

Continuous and discrete water quality data collected during the 2021 study period met the Virginia Class IV standards described above with the exception of water temperature. New River water temperature flowing into the Byllesby reservoir exceeded 29ºC on an instantaneous basis approximately 13 days between late-July and late-August. Similarly, instantaneous water temperature exceeded 29ºC at the forebay surface monitoring location and bypass reach monitoring location on approximately 9 days each during the study period, respectively. During each of these events, the maximum instantaneous water temperature recorded was less than 30ºC and the daily average water temperature was less than 29ºC. Water temperatures recorded in the Byllesby tailrace were all less than 29ºC.

7.3 Temperature and Dissolved Oxygen Stratification in the Byllesby-Buck Impoundments

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[16].

[16] Figure 7-3 of Attachment 7 provides a comparison of air temperature data at Fries and Ivanhoe, Virginia beginning approximately one month prior to (i.e., mid-July 2020) the water quality data sonde installation in mid-August 2020. Meteorological conditions in mid-August 2020 were similar to the prior month supporting the conclusion that water temperature and DO concentrations were typical of warmer summer conditions.

Note that daily water temperature and DO data (minimum, average, and maximum) for both years of the study are presented in tables in Attachment 9.

7.4 Need for Protection, Mitigation, and Enhancement Measures to Protect Water Quality

Water quality data collected during 2019–2021 at the Byllesby and Buck forebay areas, tailraces, and bypass reaches 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 as described in Section 7.1. And, while Byllesby forebay surface 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).

Chlorophyll a grab samples collected at the Byllesby and Buck forebay monitoring locations all resulted in “non detect” readings indicating the chlorophyll a concentrations were less than 5.0 mg/m^3.

Maximum turbidity concentrations based on the grab sample data were 16.9 NTU and 8.0 NTU at the Byllesby and Buck forebay monitoring locations, respectively. The continuous turbidity monitoring study also yielded relatively low overall turbidity concentrations (typically < 12.0 NTU) and there were no discernible effects (i.e., increases in turbidity) resulting from station operations and maintenance activities such as routine intake structure drag rake operations.

Based on the results of this water quality study, and in consideration of results of other historic studies and data collection efforts, during the new license term Appalachian proposes to continue the existing run-of-river operating mode for the Project for the protection of water quality and other resources, and there is no need for additional PM&E measures to protect water quality at the Project.

7.5 Additional Future Water Quality Data Needs

Water quality data collected during 2019 – 2021 were consistent between years and with Virginia Class IV surface water criteria for water temperature, DO concentrations, and pH with the exception of infrequent instantaneous surface water temperatures as described in Section 7.1. As a result, additional future water quality data collection is not warranted based on a nexus to Project operations.

8 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.

The Water Quality Study was otherwise conducted in accordance with the RSP, with approved schedule modifications as previously communicated to FERC and relicensing stakeholders and minor gaps in data collection due to field conditions or equipment malfunction beyond the control of Appalachian or HDR and typical for a data collection effort of this scale in a large river environment.

9 Germane Correspondence and Consultation

As required by the RSP, on September 22, 2021, Appalachian sent an email to state and federal agencies (VDEQ, Virginia Department of Wildlife Resources, and U.S. Fish and Wildlife Service) describing the one-week turbidity study planned to assess potential impacts that Project operations, in particular drake rake operations, have on turbidity concentration in the tailrace of the Project. A copy of this communication was included in the consultation documentation filed as part of the Draft License Application on October 1, 2021.

10 References

Appalachian Power Company (Appalachian). 2019. Pre-Application Document. Byllesby-Buck Hydroelectric Project. January 2019.

National Water Quality Monitoring Council (NWQMC). 2020. Water Quality Portal. Accessed January 2021. [URL]: https://www.waterqualitydata.us/portal/#countrycode=US&statecode=US%3A51&countycode=US%3A51%3A035&siteid=21VASWCB-9-NEW128.97&mimeType=csv.

Stantec Consulting Services Inc. (Stantec). 2016. Final Report: Claytor Hydroelectric Project FERC No. 739 Mussel Survey. Prepared for Appalachian Power Company. June 17, 2016.

U.S. Environmental Protection Agency (USEPA). 2020. National Rivers and Streams Assessment 2013-2014: A Collaborative Survey. December 2020. EPA 841-R-19-001. Washington, DC. Accessed January 2021. [URL]: https://www.epa.gov/national-aquatic-resource-surveys/nrsa.

Virginia Department of Environmental Quality (VDEQ). 2017. Water Program. Accessed September 2017. [URL]: https://www.deq.virginia.gov/water/water-quality/-fsiteid-1.

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Attachment 1

Attachment 1 – Byllesby Continuous Temperature and Dissolved Oxygen Plots

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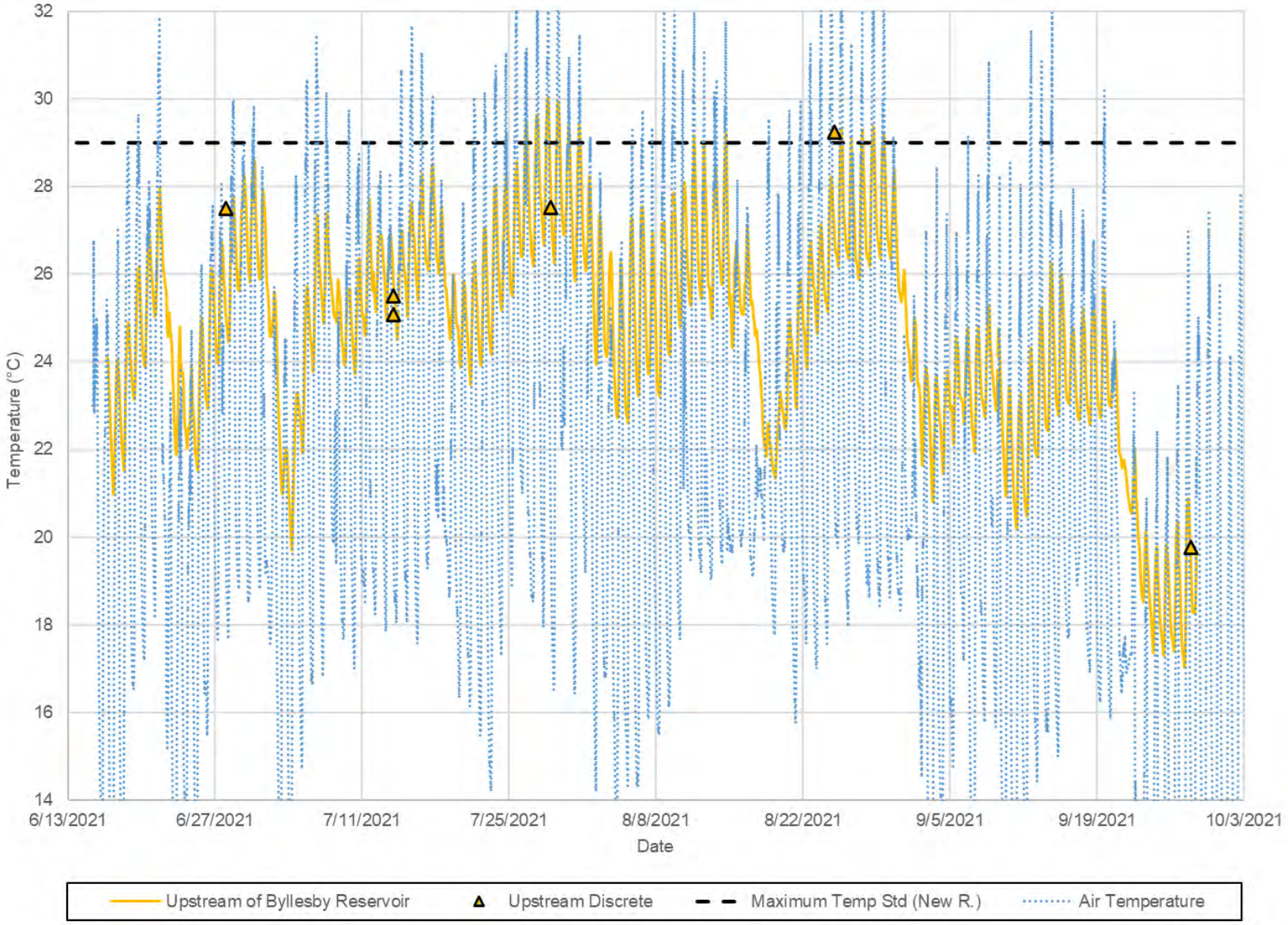


Figure 1-1. Temperature Upstream of Byllesby Reservoir (2021)

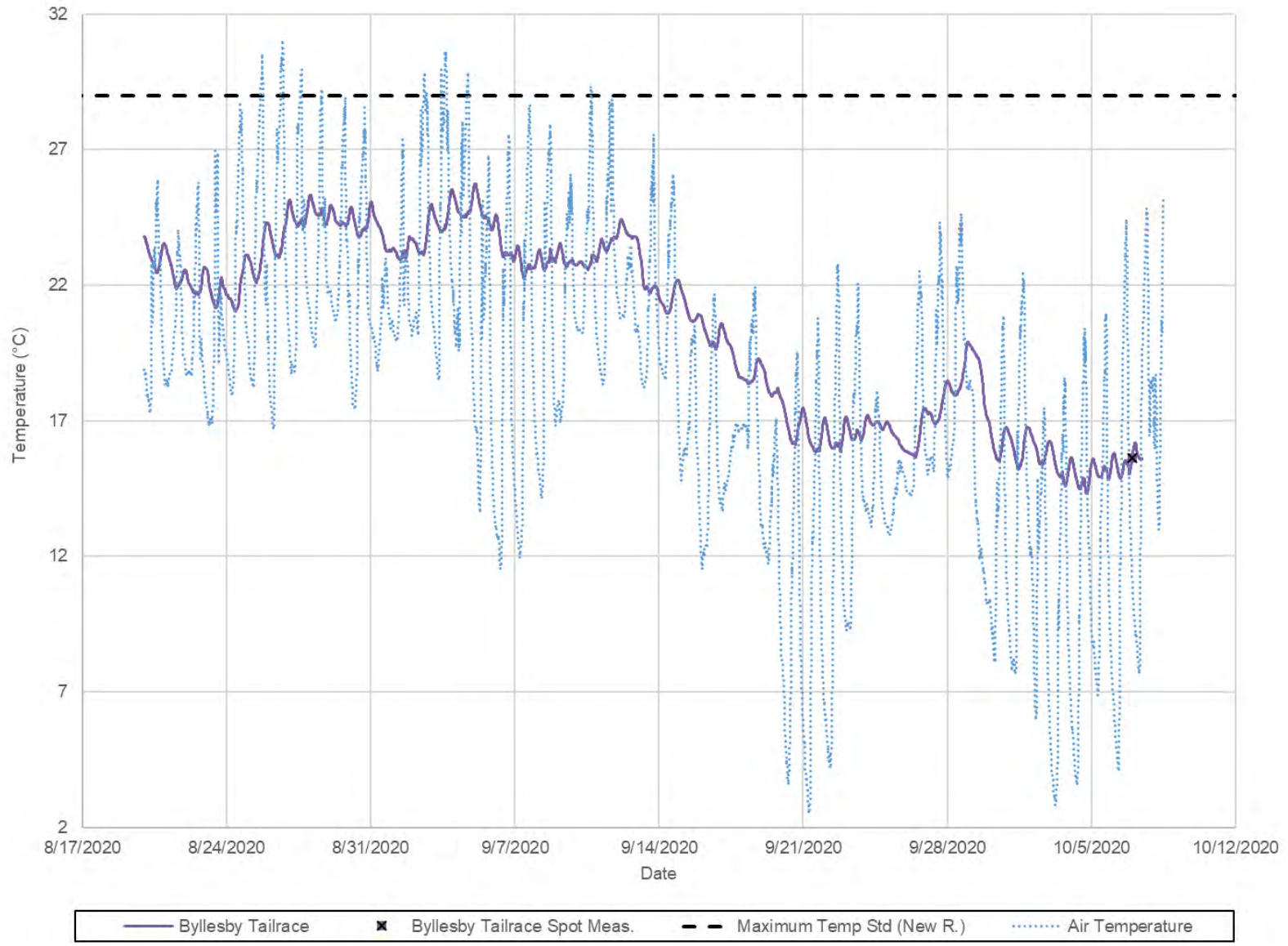


Figure 1-2. Continuous and Discrete Temperature Measurements in the Byllesby Tailrace (2020)

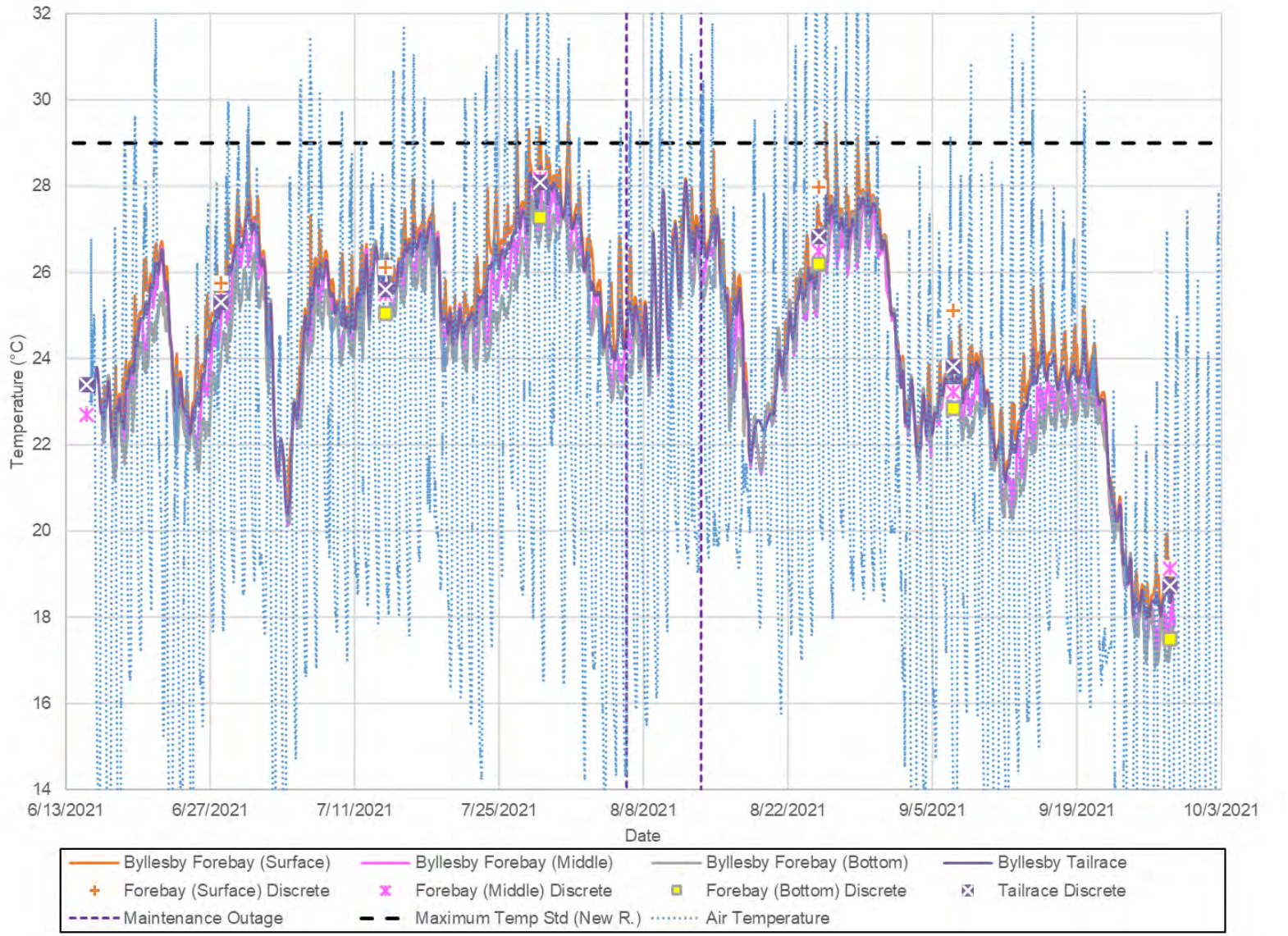


Figure 1-3. Temperature in the Byllesby Forebay and Tailrace (2021)

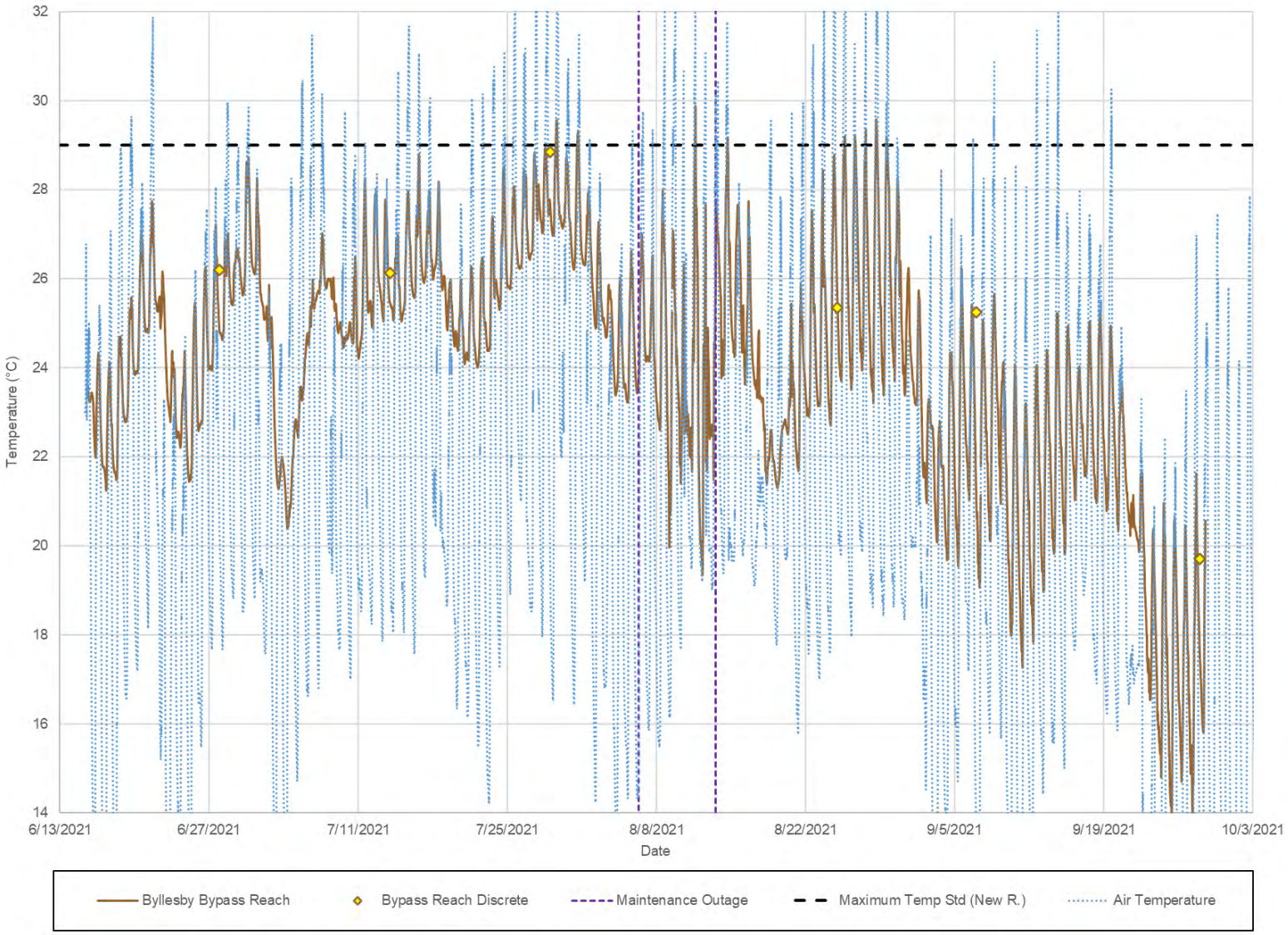
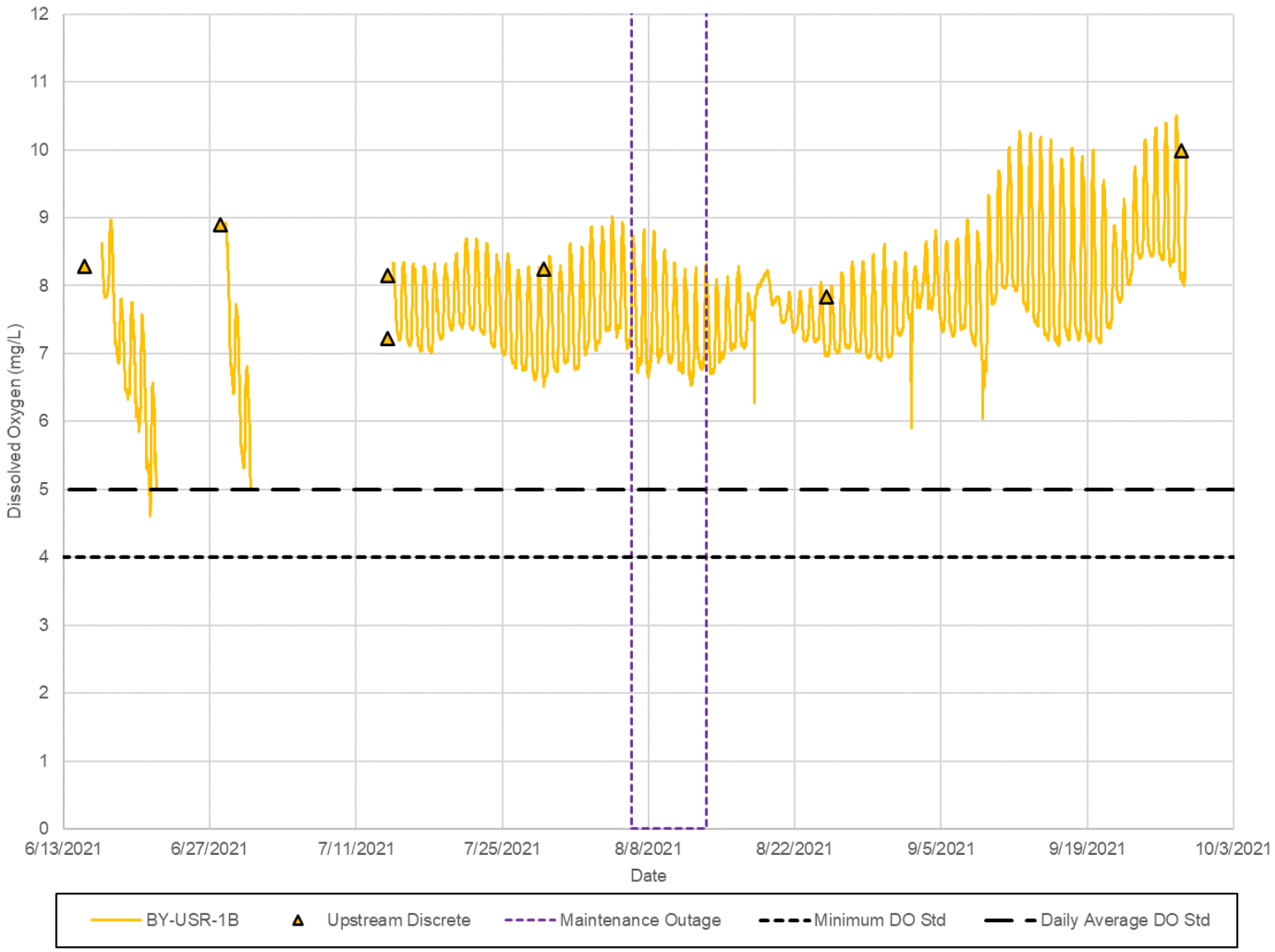


Figure 1-4. Temperature in the Byllesby Bypass Reach (2021)


Dissolved Oxygen (mg/L)
12
11
10
9
8
7
6
5
4
3
2
1
0
6/13/2021
6/27/2021
7/11/2021
7/25/2021
8/8/2021
8/22/2021
9/5/2021
9/19/2021
10/3/2021
Date
BY-USR-1B
Upstream Discrete
Maintenance Outage
Minimum DO Std
Daily Average DO Std

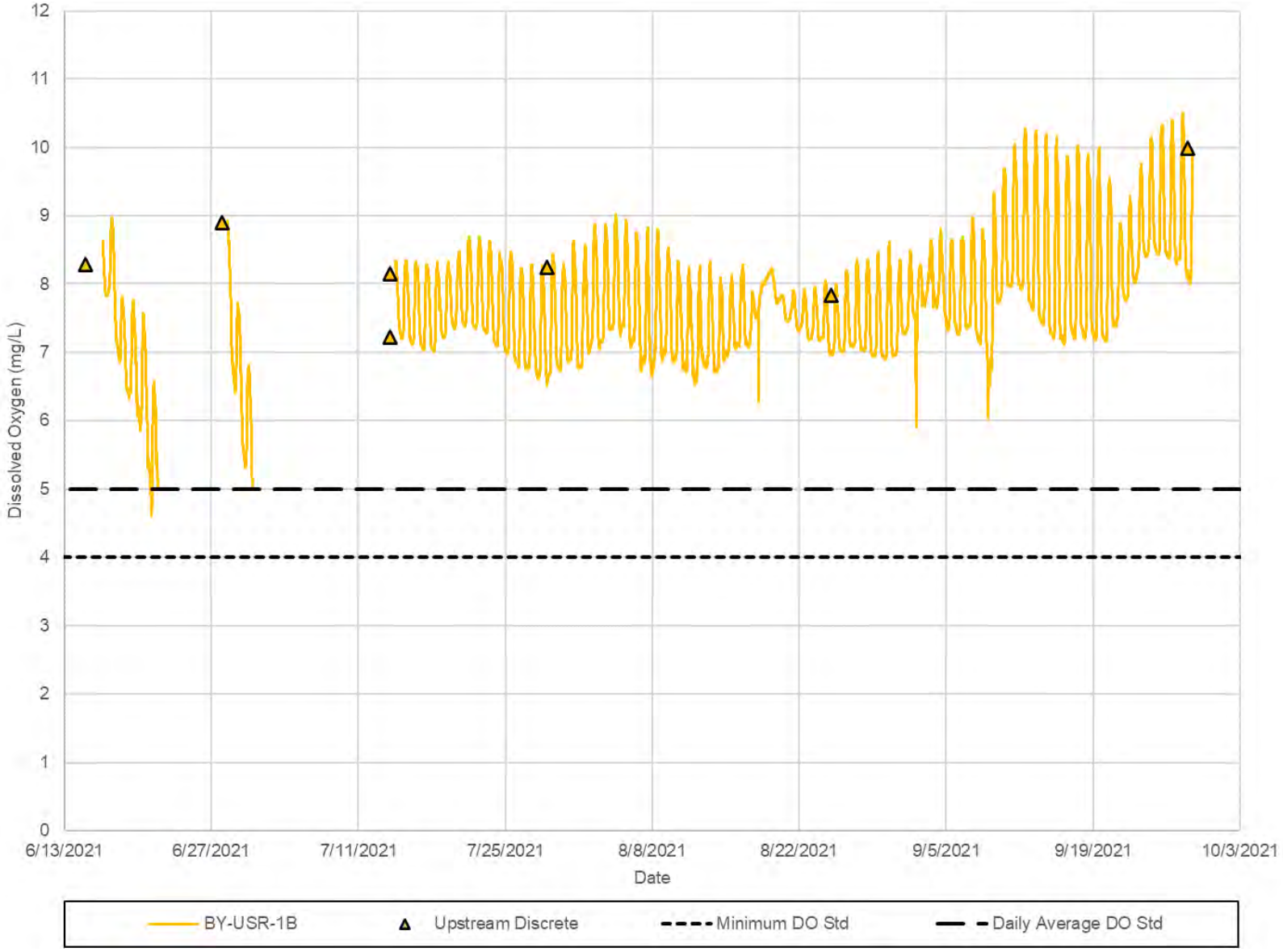


Figure 1-5. Dissolved Oxygen in the Byllesby Upstream Reach (2021)

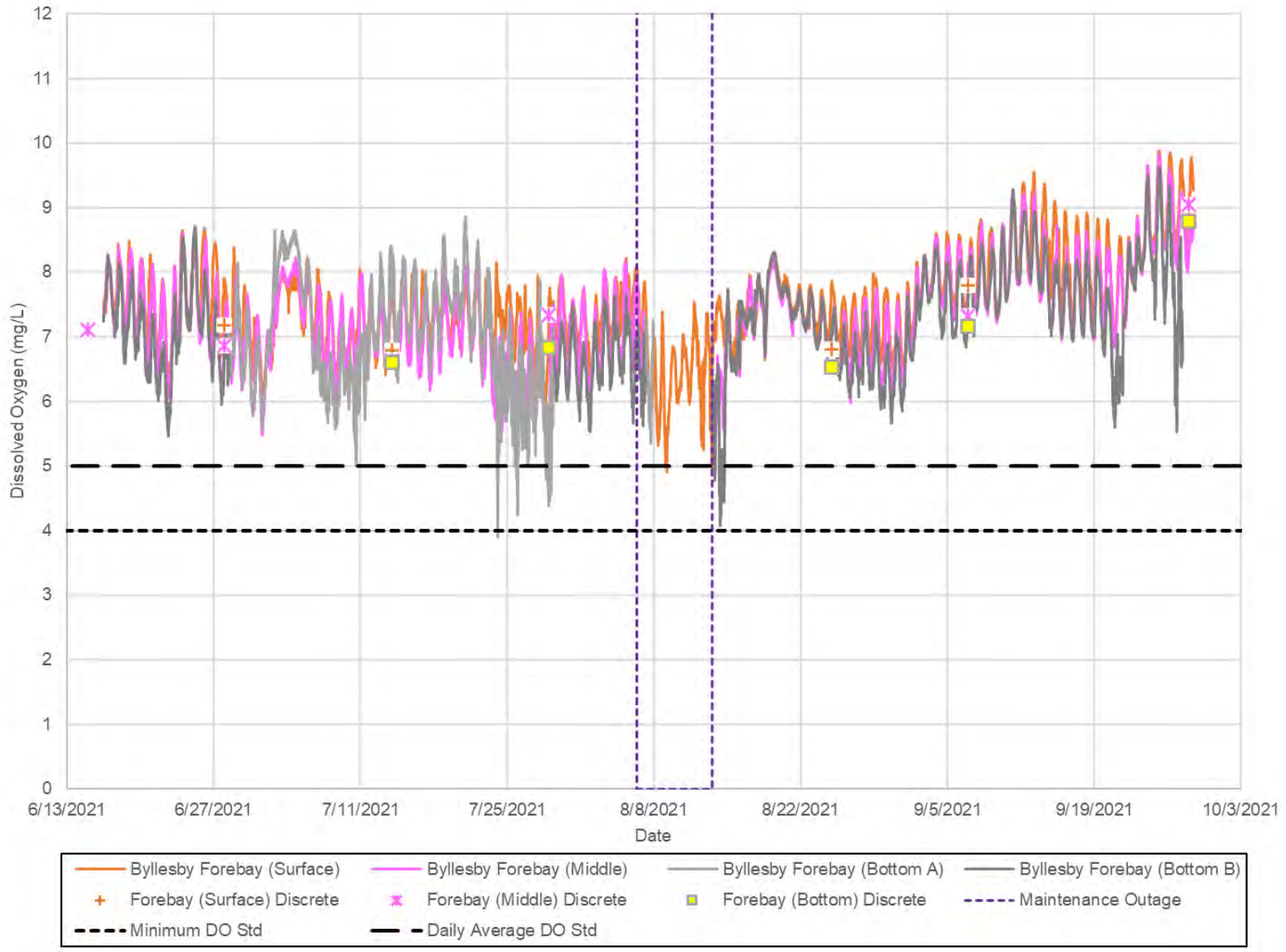


Figure 1-6. Dissolved Oxygen in the Byllesby Forebay (2021)

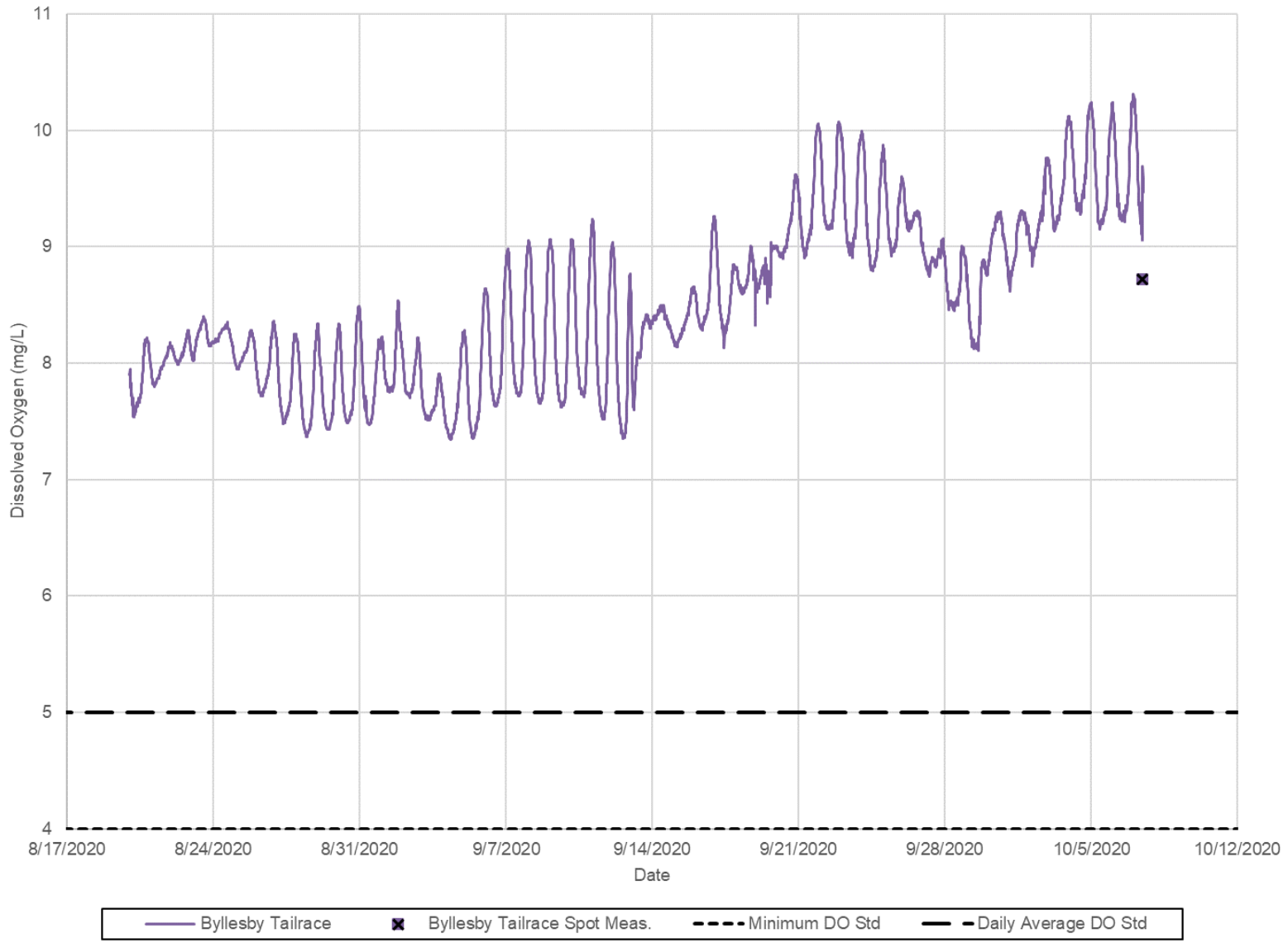


Figure 1-7. Continuous and Discrete Dissolved Oxygen Concentrations in the Byllesby Tailrace (2020)

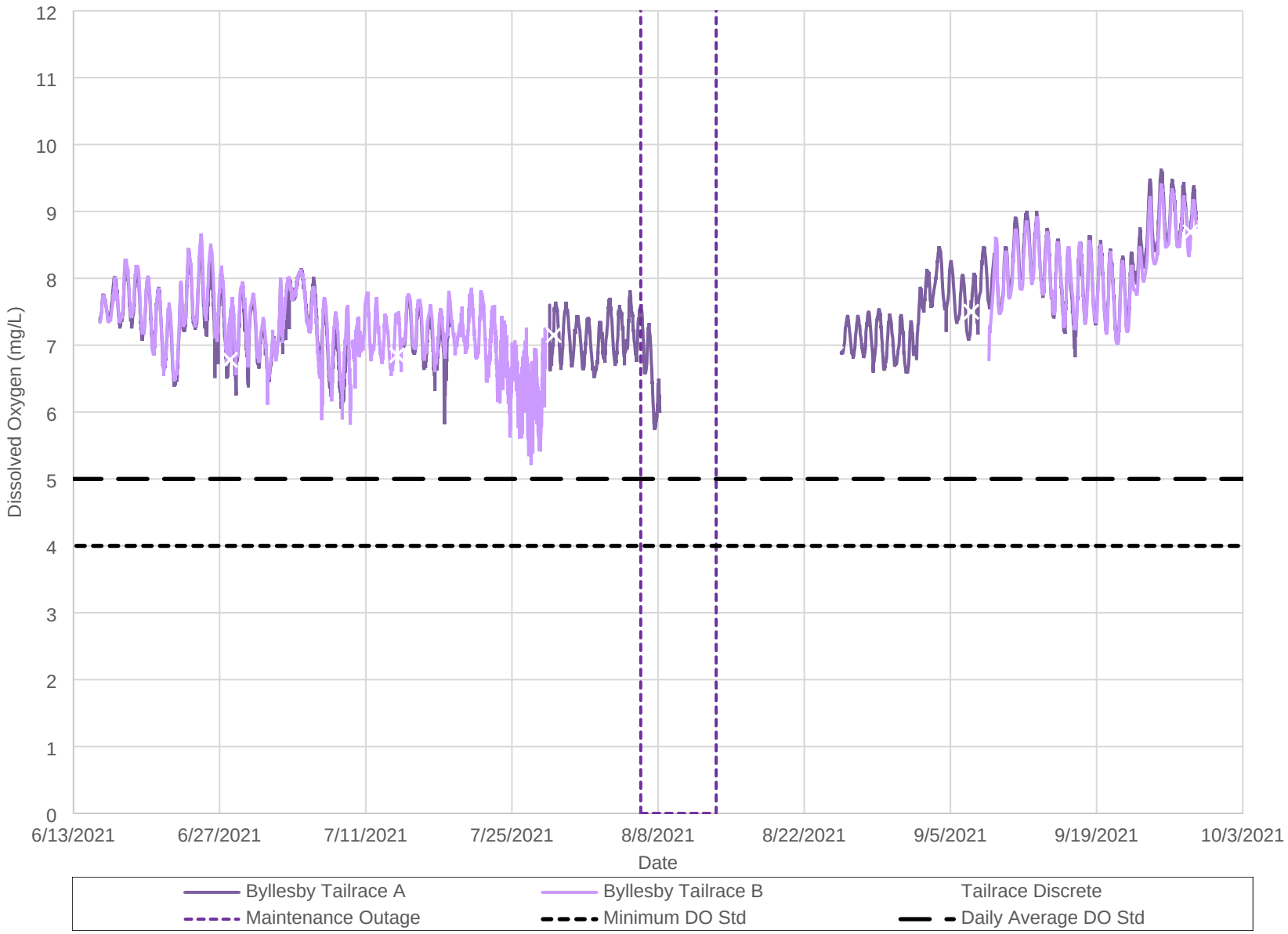


Figure 1-8. Dissolved Oxygen in the Byllesby Tailrace (2021)

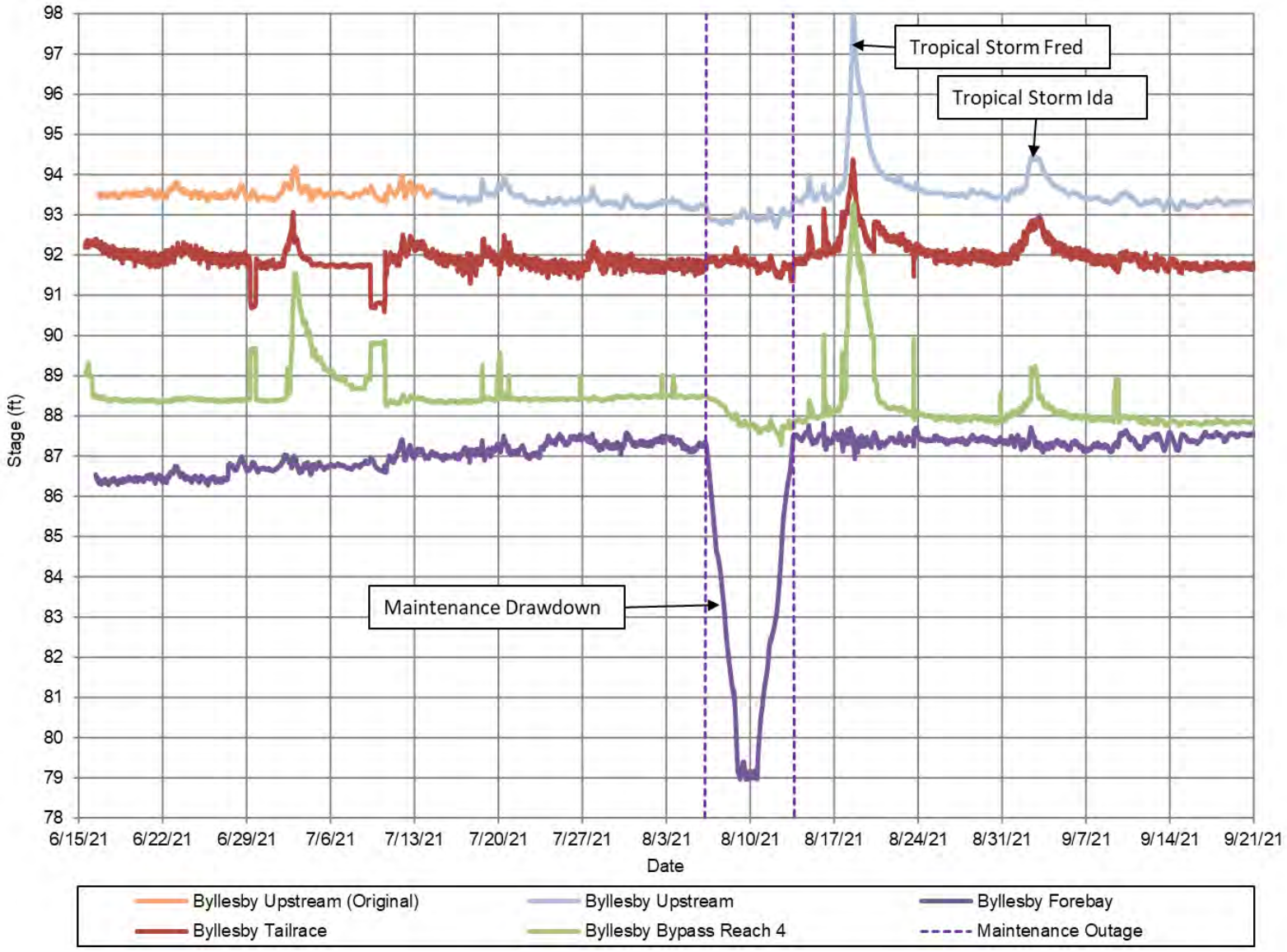


Figure 1-9. Water Level Elevations (Level Logger Data) (2021)

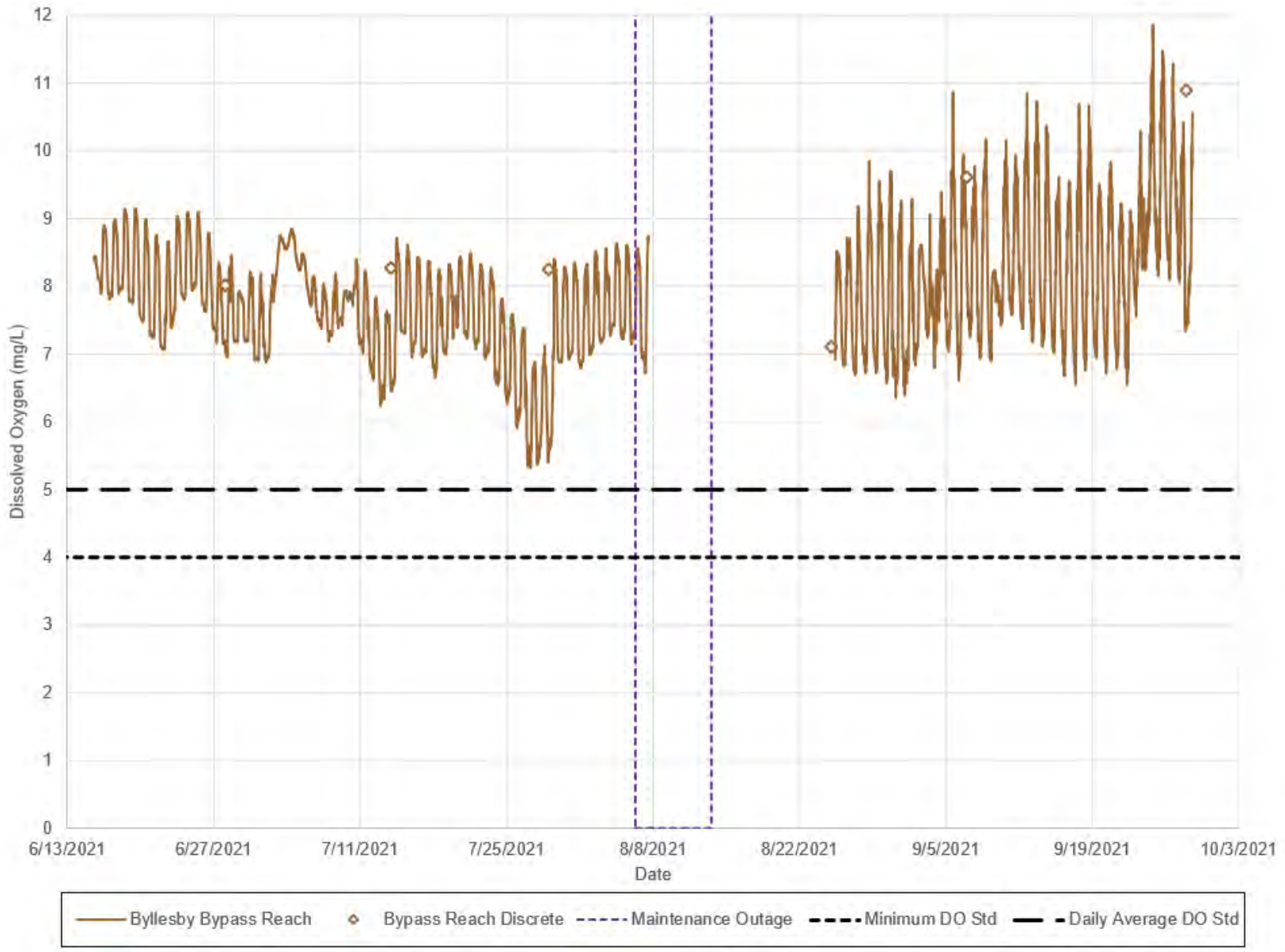


Figure 1-9. Dissolved Oxygen in the Byllesby Bypass Reach (2021)

Attachment 2

Attachment 2 – Buck Continuous Temperature and Dissolved Oxygen Plots

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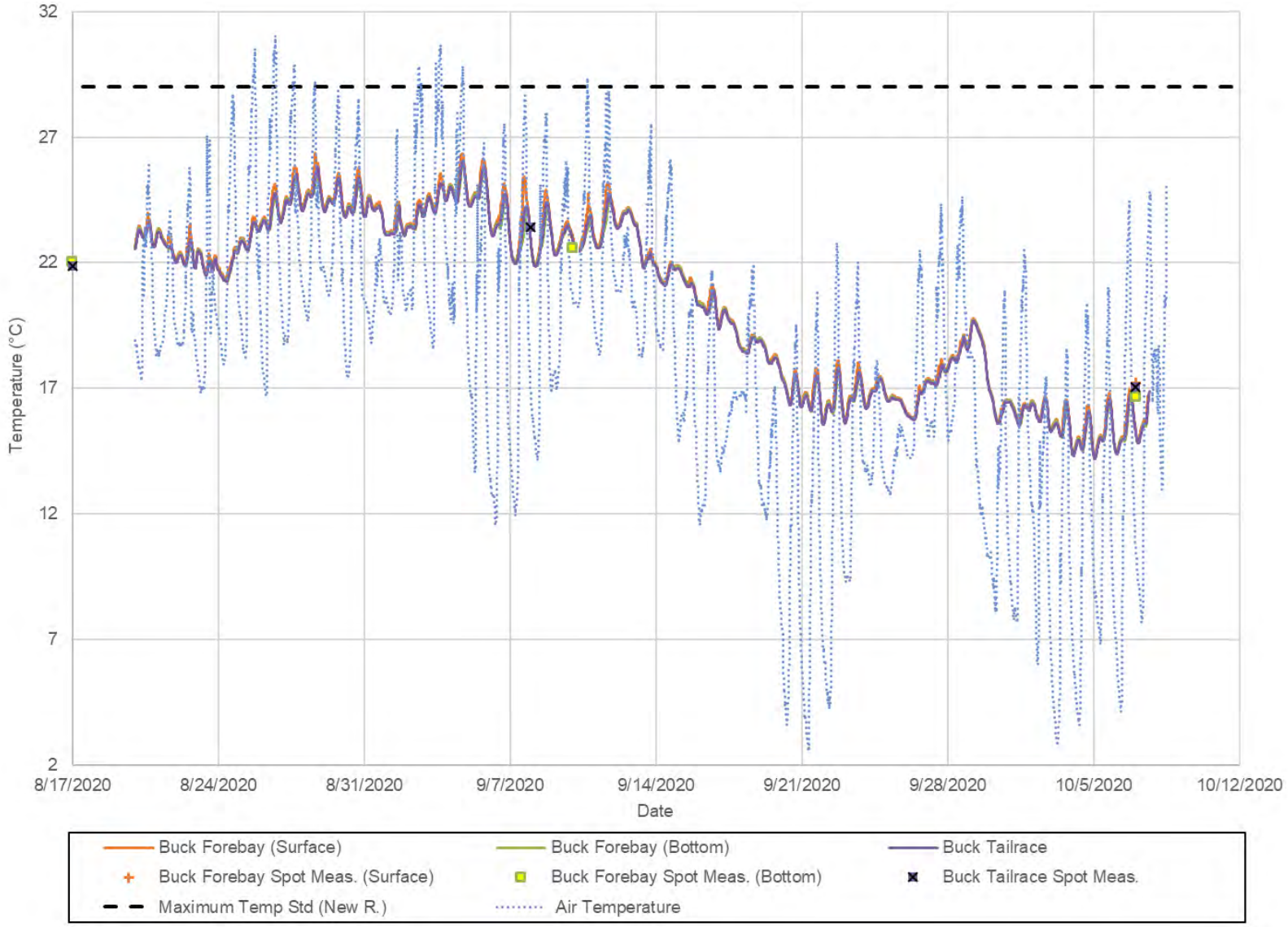

Figure 2-1. Continuous and Discrete Temperature Measurements at Buck Forebay and Tailrace Water Quality Monitoring Locations (2020)

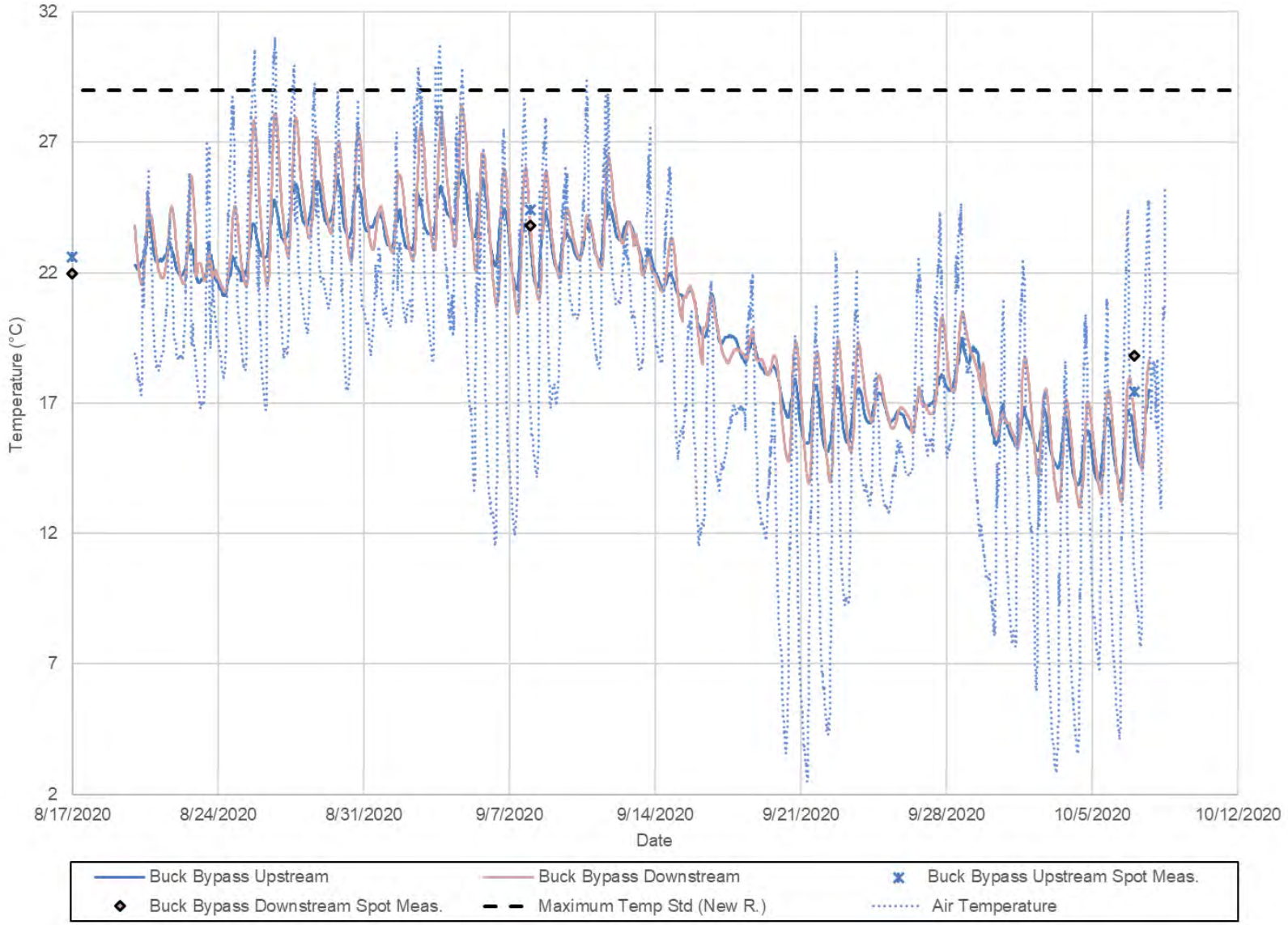

Figure 2-2. Continuous and Discrete Temperature Measurements at Buck Bypass Reach Water Quality Monitoring Locations (2020)

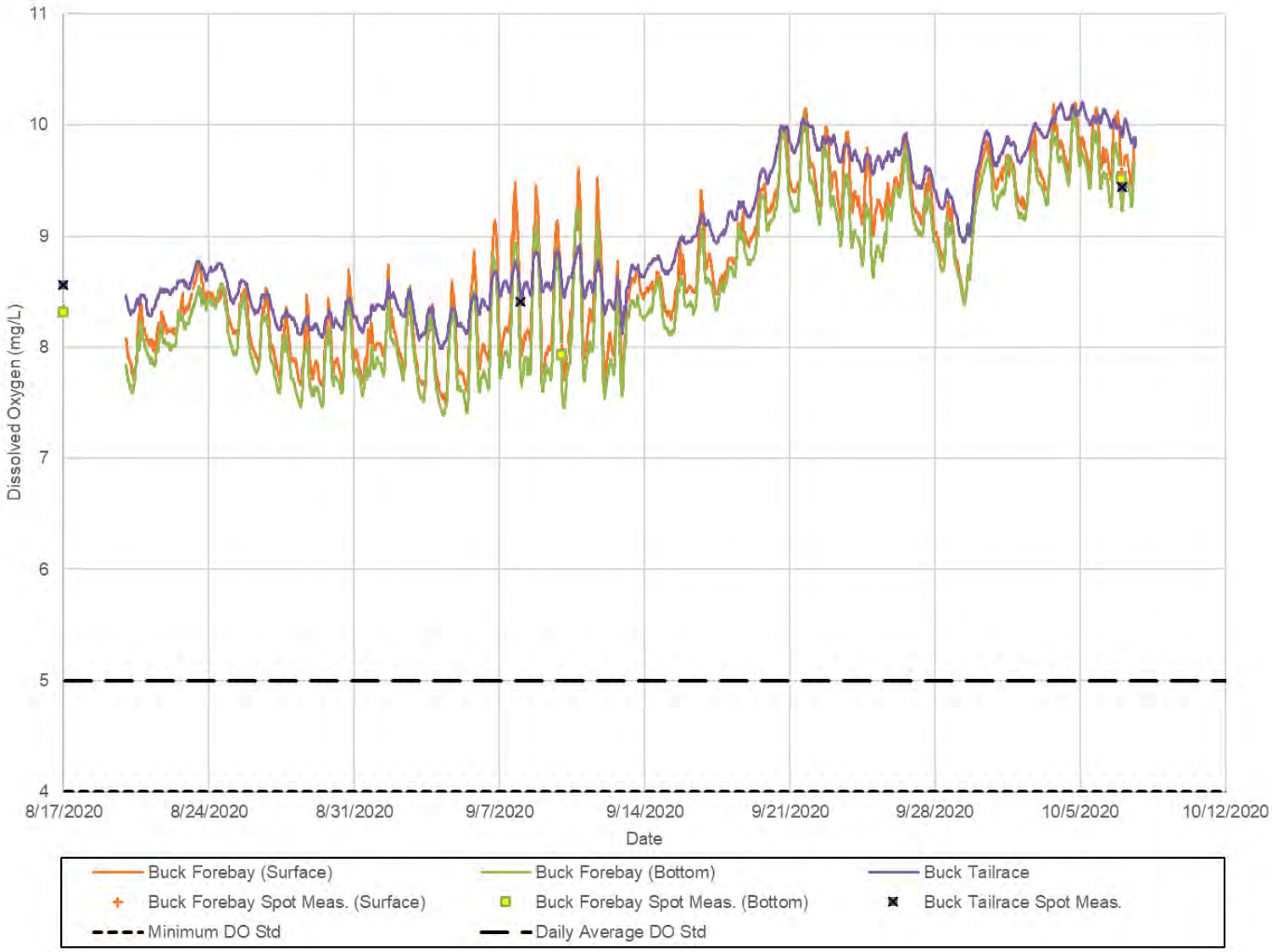

Figure 2-3. Continuous and Discrete Dissolved Oxygen Concentrations at Buck Forebay and Tailrace Water Quality Monitoring Locations (2020)

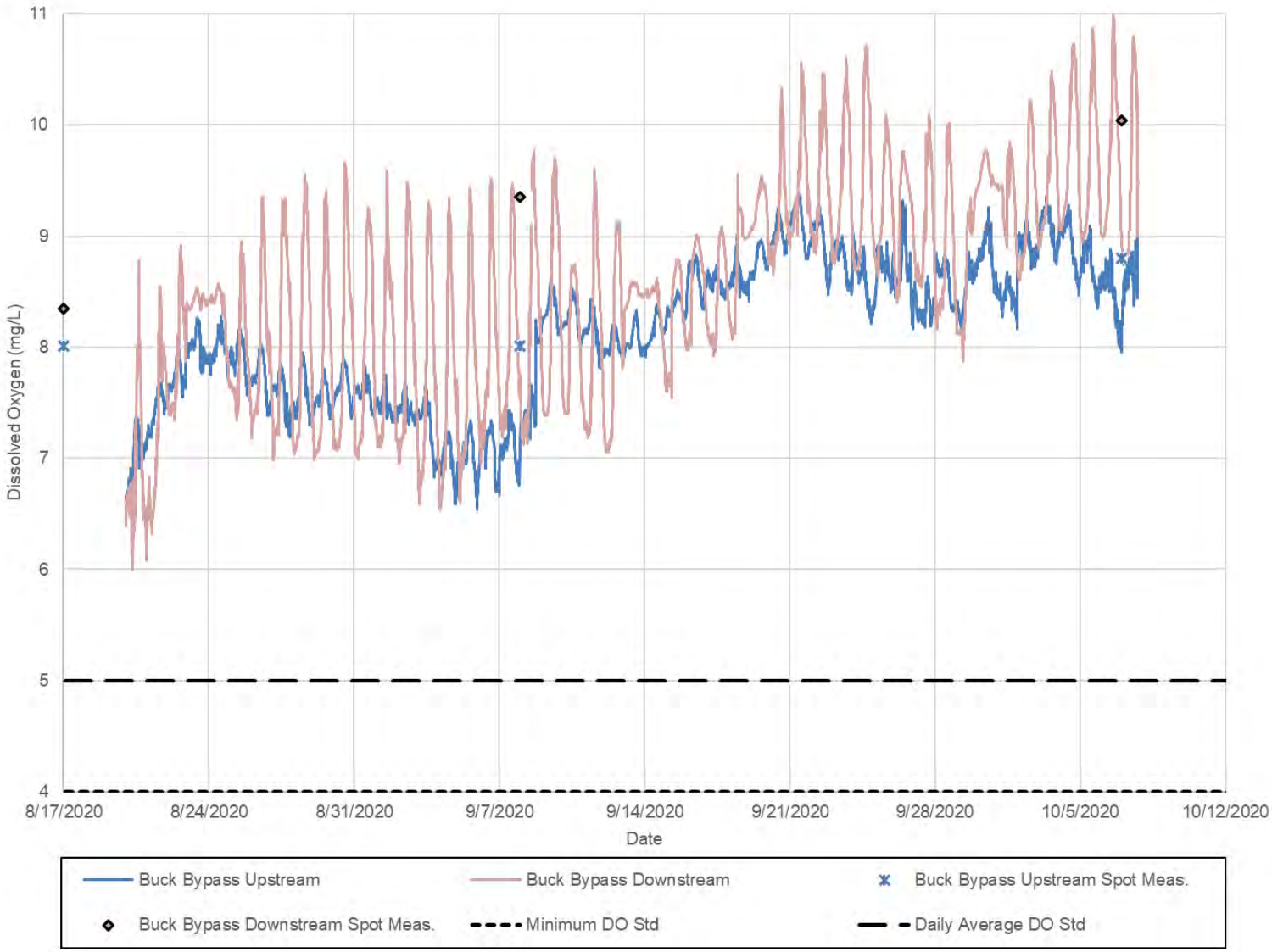

Figure 2-4. Continuous and Discrete Dissolved Oxygen Concentrations at Buck Bypass Reach Water Quality Monitoring Locations (2020)

Attachment 3

Attachment 3 – Byllesby Discrete Measurement Tables

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Table 3-1. Discrete Measurements at Byllesby Quality Monitoring Locations (2021)

Location	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (Standard Units)	Specific Conductance (µS/cm)
Upstream of Reservoir	6/15/2021	24.2	8.3	7.6	62
	6/28/2021	27.5	8.9	8.6	64
	7/14/2021	25.1	7.2	7.6	55
	7/14/2021	25.5	8.2	7.9	56
	7/29/2021	27.5	8.3	8.5	62
	8/25/2021	29.3	7.8	8.5	65
	9/28/2021	19.8	10.0	9.2	67
Forebay (Surface)	6/15/2021	22.7	7.1	7.1	62
	6/28/2021	25.7	7.2	8.7	66
	7/14/2021	26.1	6.8	7.0	59
	7/29/2021	28.2	7.3	8.4	68
	8/25/2021	28.0	6.8	7.2	66
	9/7/2021	25.1	7.8	7.3	65
	9/28/2021	19.2	9.0	8.9	69
Forebay (Middle)	6/15/2021	22.7	7.1	7.1	62
	6/28/2021	25.3	6.9	8.5	66
	7/14/2021	25.5	6.6	6.9	59
	7/29/2021	28.1	7.3	8.4	67
	8/25/2021	26.5	6.5	7.0	66
	9/7/2021	23.2	7.3	7.2	64
	9/28/2021	19.1	9.1	8.9	69
Forebay (Bottom)	7/14/2021	25.0	6.6	6.9	59
	7/29/2021	27.3	6.8	7.4	64
	8/25/2021	26.2	6.5	7.0	65
	9/7/2021	22.9	7.2	7.1	64
	9/28/2021	17.5	8.8	7.7	64
Tailrace	6/15/2021	23.4	7.1	6.9	60
	6/28/2021	25.3	6.8	7.0	66
	7/14/2021	25.6	6.9	7.1	62
	7/29/2021	28.1	7.2	7.8	67
	8/25/2021	26.8	6.9	7.2	65
	9/7/2021	23.8	7.5	7.3	65
	9/28/2021	18.7	8.7	8.8	68
Bypass Reach	6/15/2021	23.5	8.1	7.3	60
	6/28/2021	26.2	8.0	7.9	66
	7/14/2021	26.1	8.3	7.8	61
	7/29/2021	28.8	8.3	8.6	67

Location	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (Standard Units)	Specific Conductance (µS/cm)
	8/25/2021	25.3	7.1	7.0	65
	9/7/2021	25.3	9.6	8.4	64
	9/28/2021	19.7	10.9	8.9	67

Table 3-2. Discrete Measurements at Byllesby Quality Monitoring Location (2020)

Location	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (Standard Units)	Specific Conductance (µS/cm)
Tailrace	10/7/2020	15.64	8.72	7.13	60.9

Table 3-3. Byllesby Forebay Temperature Profile Data (2021)

	Temperature (°C)						
Depth (ft)	6/15/2021	6/28/2021	7/14/2021	7/29/2021	8/25/2021	9/7/2021	9/28/2021
1	--	--	26.1	28.2	28.0	25.1	19.2
2	22.7	25.7	--	--	--	--	--
3	--	--	26.0	28.2	27.0	25.0	19.1
4	22.8	25.3	--	--	--	--	--
5	--	--	25.6	28.2	27.1	24.3	19.1
6	22.9	25.3	--	--	--	--	--
7	--	--	25.6	28.2	26.8	24.4	19.1
8	22.8	25.2	--	--	--	--	--
9	--	--	25.7	28.2	26.9	23.4	19.1
10	22.7	25.0	--	--	--	--	--
11	--	--	25.4	28.2	26.6	23.5	19.1
12	22.7	25.3	--	--	--	--	--
13	--	--	25.5	28.2	26.5	23.2	19.1
14	--	25.2	--	--	--	--	--
15	--	--	25.5	28.2	26.6	23.0	19.1
17	--	--	25.2	28.1	26.5	22.9	18.6
19	--	--	25.2	28.0	26.5	22.8	17.7
21	--	--	25.2	27.8	26.3	22.8	17.6
23	--	--	25.1	27.5	26.3	22.8	17.5
25	--	--	25.0	27.3	26.2	22.9	17.5
26	--	--	--	27.3	--	--	--
27	--	--	25.1	27.3	26.0	22.8	--

Table 3-4. Byllesby Forebay Dissolved Oxygen Profile Data (2021)

	Dissolved Oxygen (mg/l)						
Depth (ft)	**6/15/2021**	**6/28/2021**	**7/14/2021**	**7/29/2021**	**8/25/2021**	**9/7/2021**	**9/28/2021**
1	--	--	6.8	7.3	6.8	7.8	9.0
2	7.1	7.2	--	--	--	--	--
3	--	--	6.8	7.4	6.7	7.7	9.0
4	7.1	7.1	--	--	--	--	--
5	--	--	6.7	7.4	6.8	7.5	9.0
6	7.0	7.0	--	--	--	--	--
7	--	--	6.7	7.3	6.8	7.4	9.0
8	7.1	6.9	--	--	--	--	--
9	--	--	6.7	7.3	6.7	7.4	9.1
10	7.1	6.8	--	--	--	--	--
11	--	--	6.7	7.4	6.6	7.4	9.0
12	7.1	6.9	--	--	--	--	--
13	--	--	6.6	7.3	6.5	7.3	9.1
14	--	7.0	--	--	--	--	--
15	--	--	6.7	7.3	6.7	7.3	9.1
17	--	--	6.7	7.4	6.7	7.3	9.0
19	--	--	6.6	7.2	6.7	7.3	8.7
21	--	--	6.6	7.0	6.6	7.3	8.8
23	--	--	6.6	6.9	6.6	7.2	8.8
25	--	--	6.6	6.8	6.5	7.2	8.8
26	--	--	--	6.8	--	--	--
27	--	--	6.6	6.8	6.5	7.2	--

Table 3-5. Byllesby Forebay pH Profile Data (2021)

	pH (Standard Units)						
Depth (ft)	**6/15/2021**	**6/28/2021**	**7/14/2021**	**7/29/2021**	**8/25/2021**	**9/7/2021**	**9/28/2021**
1	--	--	7.0	8.4	7.2	7.3	8.9
2	7.1	8.7	--	--	--	--	--
3	--	--	6.9	8.4	7.2	7.3	8.8
4	7.1	8.6	--	--	--	--	--
5	--	--	6.9	8.4	7.1	7.3	8.9
6	7.1	8.5	--	--	--	--	--
7	--	--	6.9	8.4	7.1	7.2	8.9
8	7.1	8.5	--	--	--	--	--
9	--	--	6.9	8.4	7.1	7.2	8.9
10	7.1	8.4	--	--	--	--	--
11	--	--	6.9	8.4	7.1	7.2	8.9
12	7.1	8.5	--	--	--	--	--
13	--	--	6.9	8.4	7.0	7.2	8.9
14	--	8.6	--	--	--	--	--
15	--	--	6.9	8.3	7.1	7.1	8.8
17	--	--	6.9	8.3	7.1	7.1	8.4
19	--	--	6.9	8.0	7.1	7.1	7.8
21	--	--	6.9	7.6	7.1	7.1	7.7
23	--	--	6.9	7.5	7.0	7.1	7.8
25	--	--	6.9	7.4	7.0	7.1	7.7
26	--	--	--	7.3	--	--	--
27	--	--	6.9	7.3	7.0	7.1	--

Table 3-6. Byllesby Forebay Specific Conductivity Profile Data (2021)

	Specific Conductance (µS/cm)						
Depth (ft)	**6/15/2021**	**6/28/2021**	**7/14/2021**	**7/29/2021**	**8/25/2021**	**9/7/2021**	**9/28/2021**
1	--	--	59	68	66	65	69
2	62	66	--	--	--	--	--
3	--	--	59	68	65	65	69
4	62	66	--	--	--	--	--
5	--	--	58	68	65	65	69
6	62	66	--	--	--	--	--
7	--	--	59	67	65	65	69
8	62	66	--	--	--	--	--
9	--	--	58	67	65	65	69
10	62	66	--	--	--	--	--
11	--	--	59	68	65	64	69
12	62	66	--	--	--	--	--
13	--	--	59	67	66	64	69
14	--	66	--	--	--	--	--
15	--	--	58	67	65	64	68
17	--	--	59	67	65	64	67
19	--	--	58	67	65	64	65
21	--	--	59	66	65	64	65
23	--	--	59	65	65	64	64
25	--	--	59	64	65	64	64
26	--	--	--	64	--	--	--
27	--	--	59	64	64	64	--

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Attachment 4

Attachment 4 – Buck Discrete Measurement Tables

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Table 4-1. Discrete Measurements at Buck Quality Monitoring Locations (2020)

Location	Date	Temperature (°C)	Dissolved Oxygen (mg/l)	pH (Standard Units)	Specific Conductance (µS/cm)
Forebay (Surface)	8/17/2020	22.1	8.3	7.3	53
	9/10/2020	22.6	8.0	7.7	61
	10/7/2020	17.2	9.6	7.7	61
Forebay (Bottom)	8/17/2020	22.0	8.3	7.3	53
	9/10/2020	22.6	7.9	7.6	61
	10/7/2020	16.7	9.5	7.6	61
Tailrace	8/17/2020	21.9	8.6	7.3	52
	9/8/2020	23.4	8.4	8.3	61
	10/7/2020	17.0	9.4	7.6	60
Bypass Reach Upstream	8/17/2020	22.6	8.0	7.2	57
	9/8/2020	24.4	8.0	7.3	62
	10/7/2020	17.4	8.8	7.6	61
Bypass Reach Downstream	8/17/2020	22.0	8.4	7.2	51
	9/8/2020	23.8	9.4	8.2	62
	10/7/2020	18.8	10.0	8.9	59

Table 4-2. Buck Forebay Profile Data (2020)

	Temperature (°C)			Dissolved Oxygen (mg/l)			pH (Standard Units)			Specific Conductance (µS/cm)		
Depth (ft)	**8/17/2020**	**9/10/2020**	**10/7/2020**	**8/17/2020**	**9/10/2020**	**10/7/2020**	**8/17/2020**	**9/10/2020**	**10/7/2020**	**8/17/2020**	**9/10/2020**	**10/7/2020**
1	--	22.6	17.3	--	8.0	9.6	--	7.6	7.7	--	61	61
2	22.1	22.6	17.2	8.3	8.0	9.6	7.3	7.7	7.7	53	61	61
3	--	22.6	17.1	--	8.0	9.6	--	7.7	7.7	--	61	61
4	22.0	22.6	17.1	8.3	8.0	9.6	7.3	7.7	7.7	53	61	61
5	--	22.6	16.9	--	8.0	9.5	--	7.6	7.7	--	61	61
6	22.0	22.6	17.0	8.3	8.0	9.6	7.3	7.7	7.7	53	61	61
7	--	22.6	16.9	--	8.0	9.6	--	7.6	7.7	--	61	61
8	22.0	22.6	16.7	8.3	8.0	9.6	7.3	7.6	7.7	53	61	61
9	--	22.6	16.7	--	8.0	9.5	--	7.6	7.7	--	61	61
10	22.0	22.6	16.7	8.3	7.9	9.5	7.3	7.6	7.6	53	61	61
11	--	22.6	16.6	--	8.0	9.6	--	7.6	7.6	--	61	60
12	--	22.6	16.6	--	7.9	9.5	--	7.5	7.6	--	61	61
13	--	22.6	16.6	--	7.9	9.5	--	7.5	7.6	--	61	60
13.5	--	--	16.6	--	--	9.5	--		7.6	--	--	61
14	--	22.6	--	--	7.9	--	--	7.5	--	--	61	--
15	--	22.6	--	--	7.9	--	--	7.5	--	--	61	--
15.5	--	22.6	--	--	7.9	--	--	7.5	--	--	61	--

Attachment 5

Attachment 5 – Byllesby Water Quality Vertical Profile Figures

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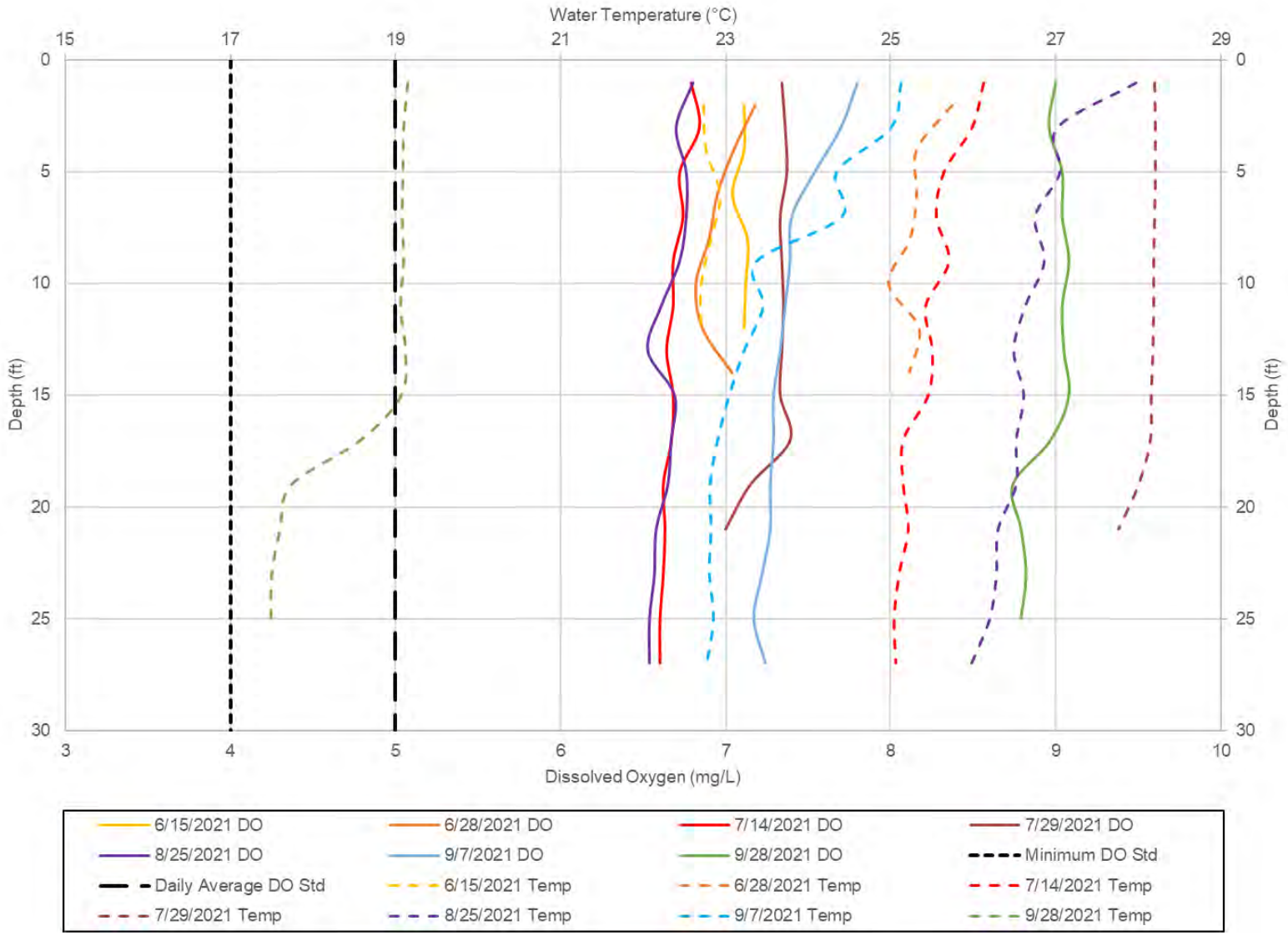

Figure 5-1. Forebay Vertical Profile —Temperature and Dissolved Oxygen Concentration (2021)

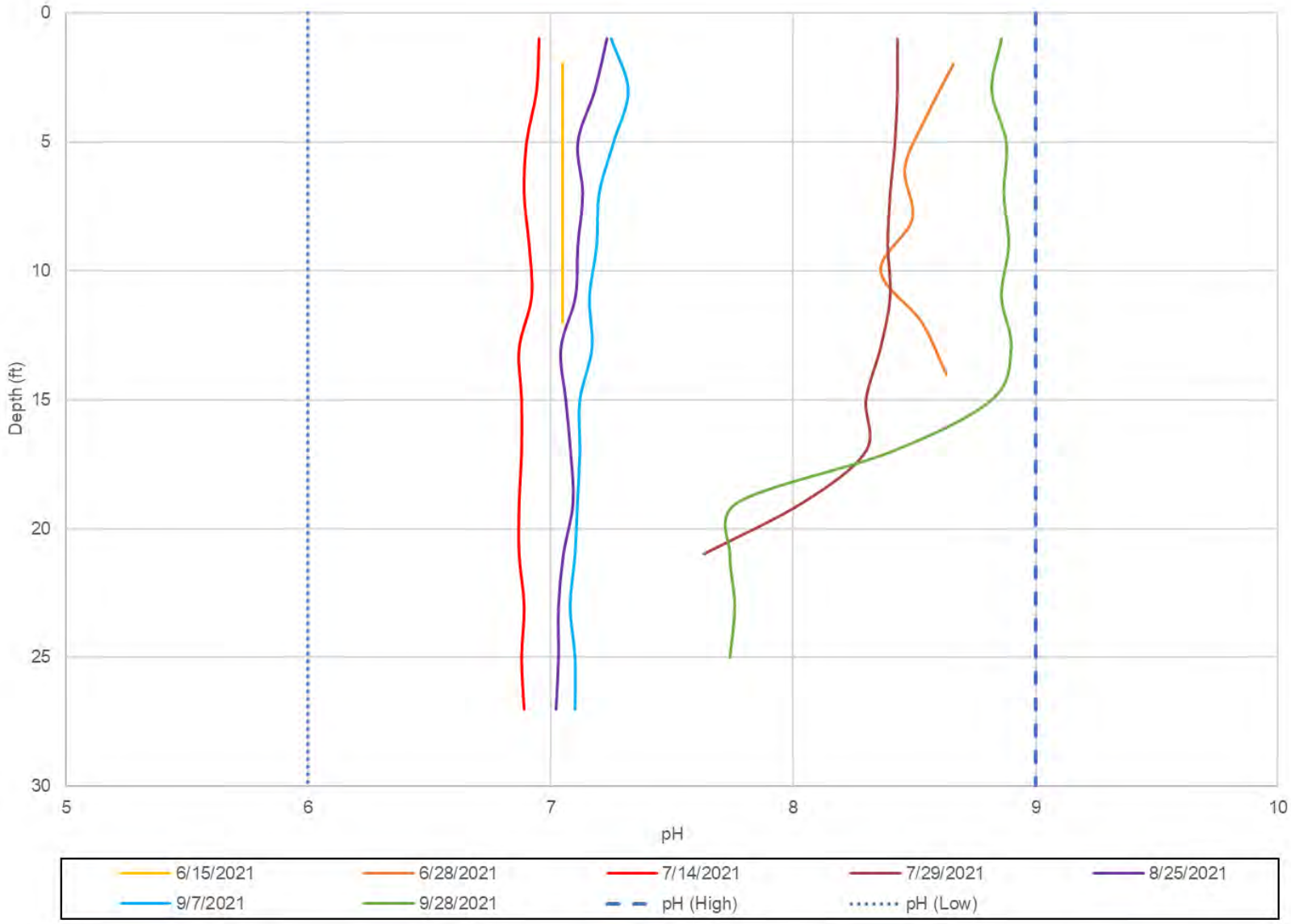

Figure 5-2. Forebay Vertical Profile —pH Profile (2021)

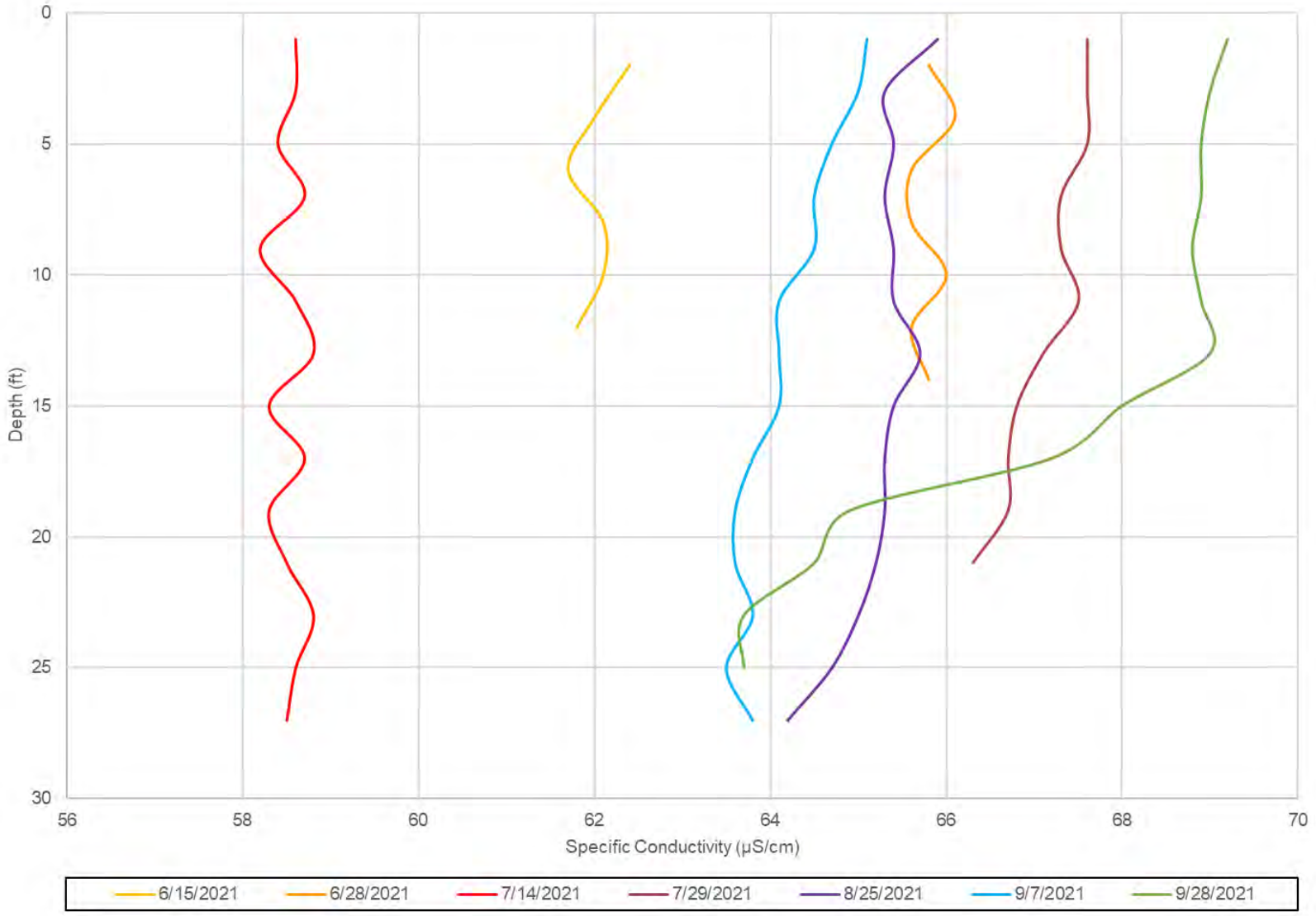

Figure 5-3. Forebay Vertical Profile —Specific Conductivity Profile (2021)

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Attachment 6

Attachment 6 – Buck Water Quality Vertical Profile Figures

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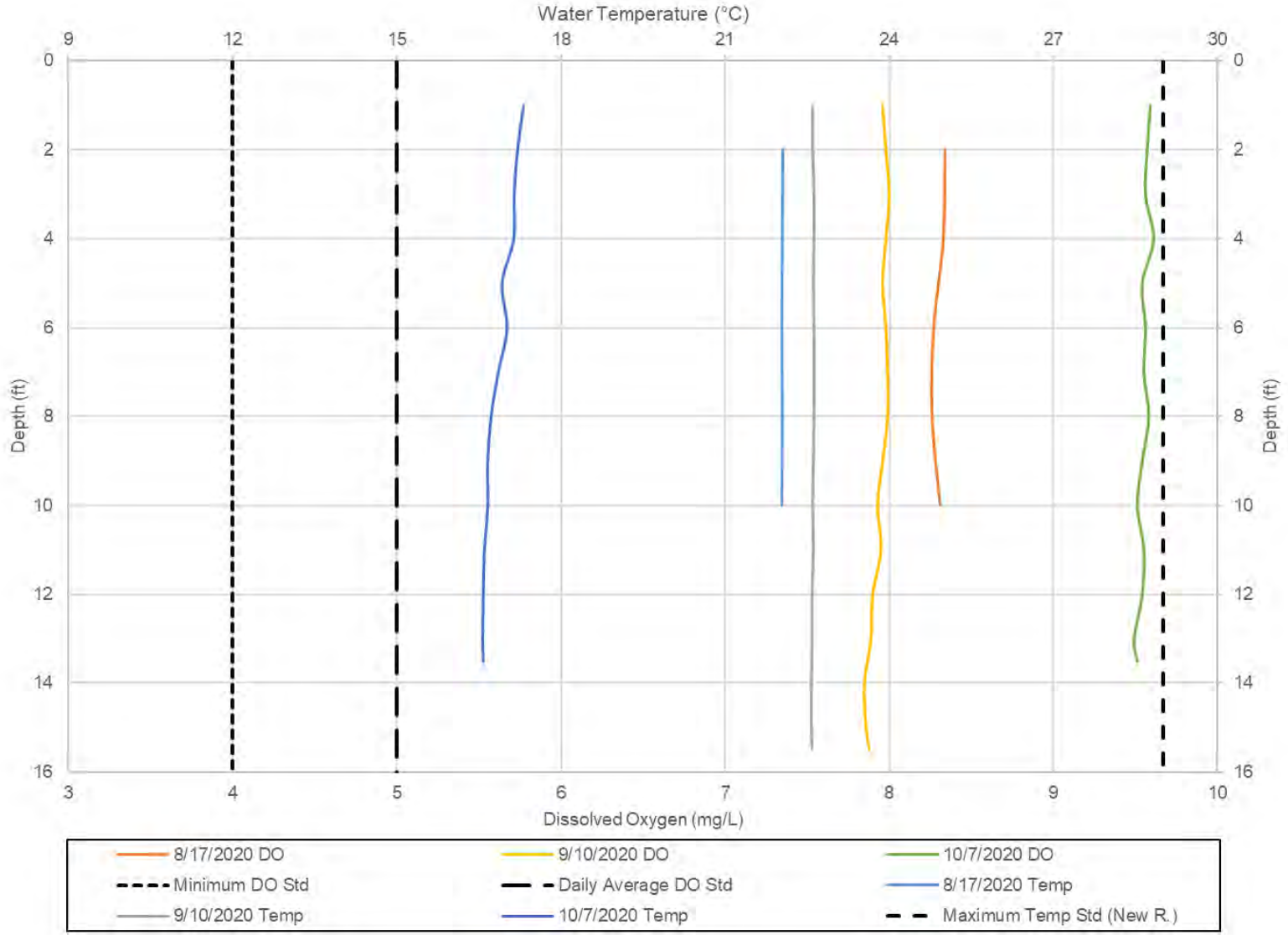

Figure 6-1. Forebay Vertical Profile —Temperature and Dissolved Oxygen Concentration (2020)

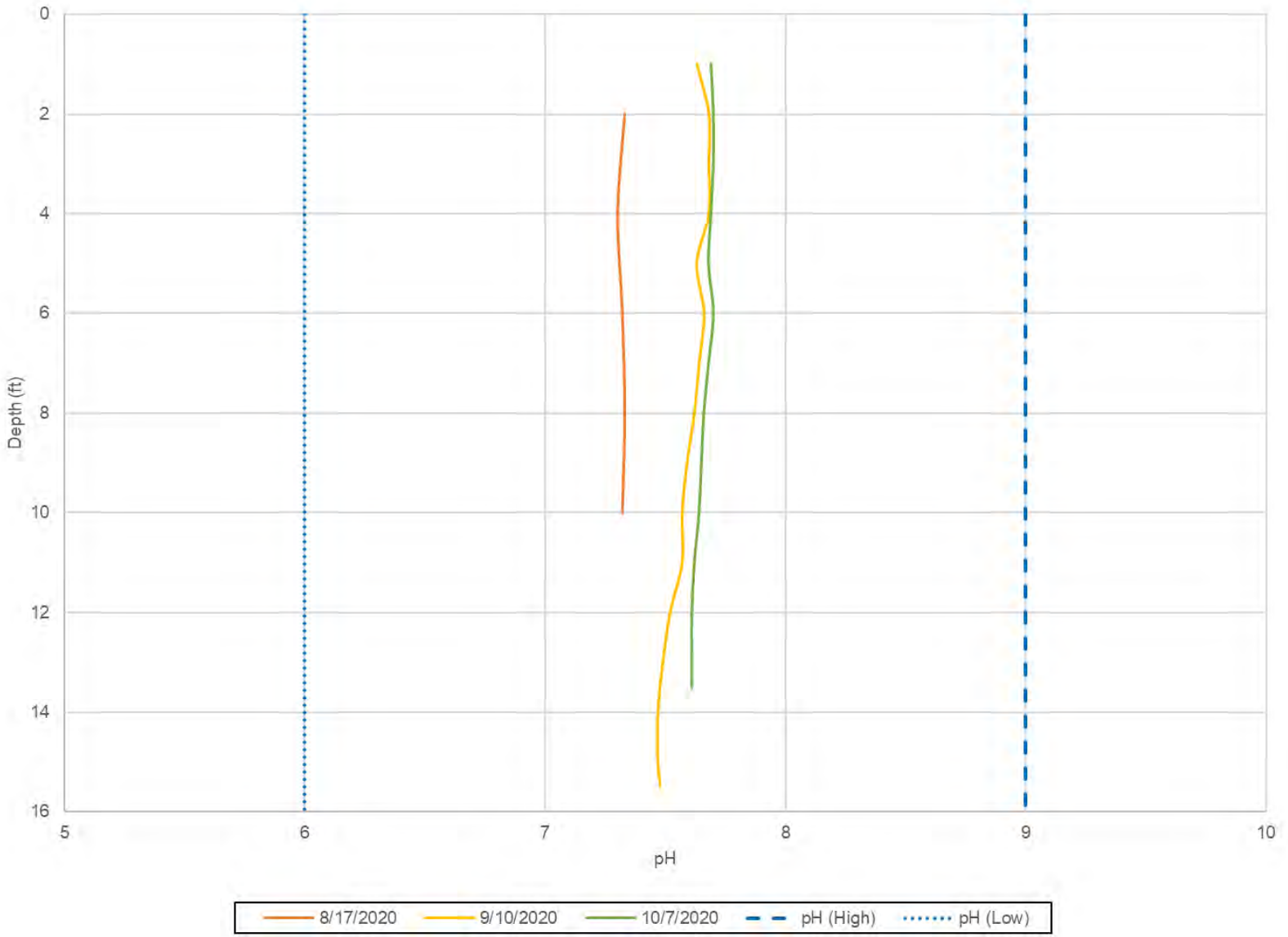

Figure 6-2. Forebay Vertical Profile — pH (2020)

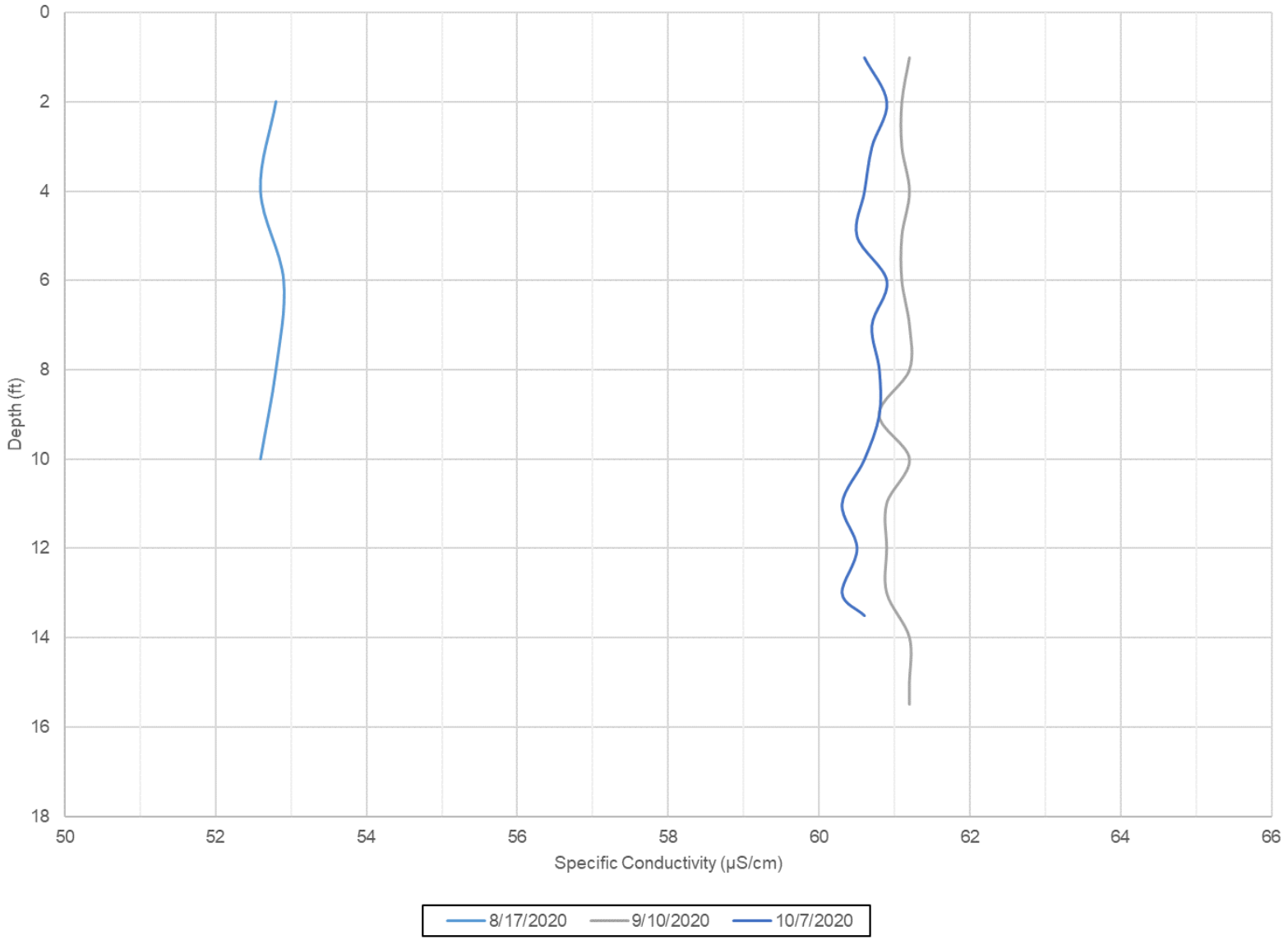

Figure 6-3. Forebay Vertical Profile — Specific Conductance (2020)

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Attachment 7

Attachment 7 – New River Flow and Meteorological Data

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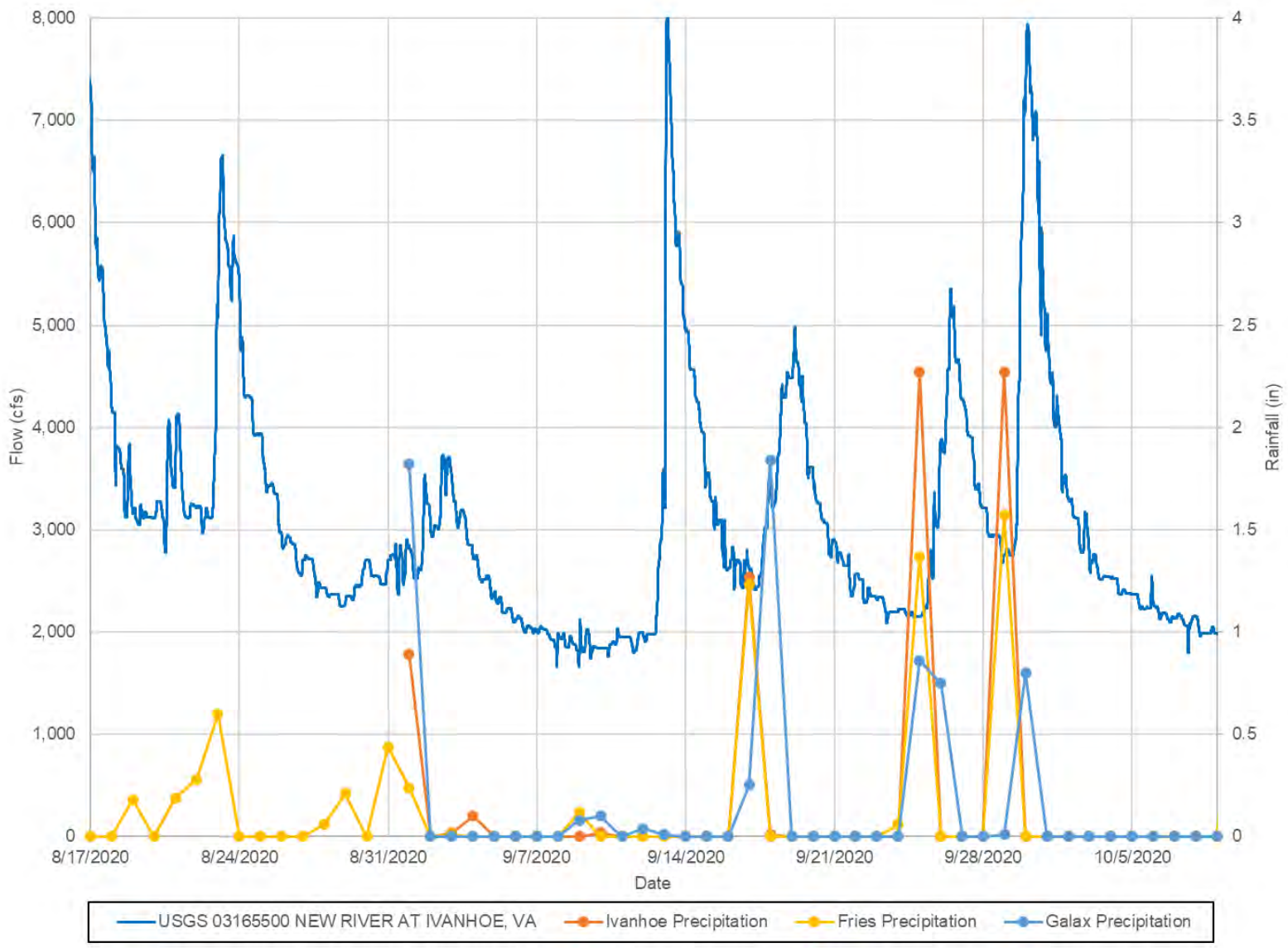

Figure 7-1. New River Flow (USGS 03165500) and Precipitation at Ivanhoe, Fries, and Galax, Virginia (2020)

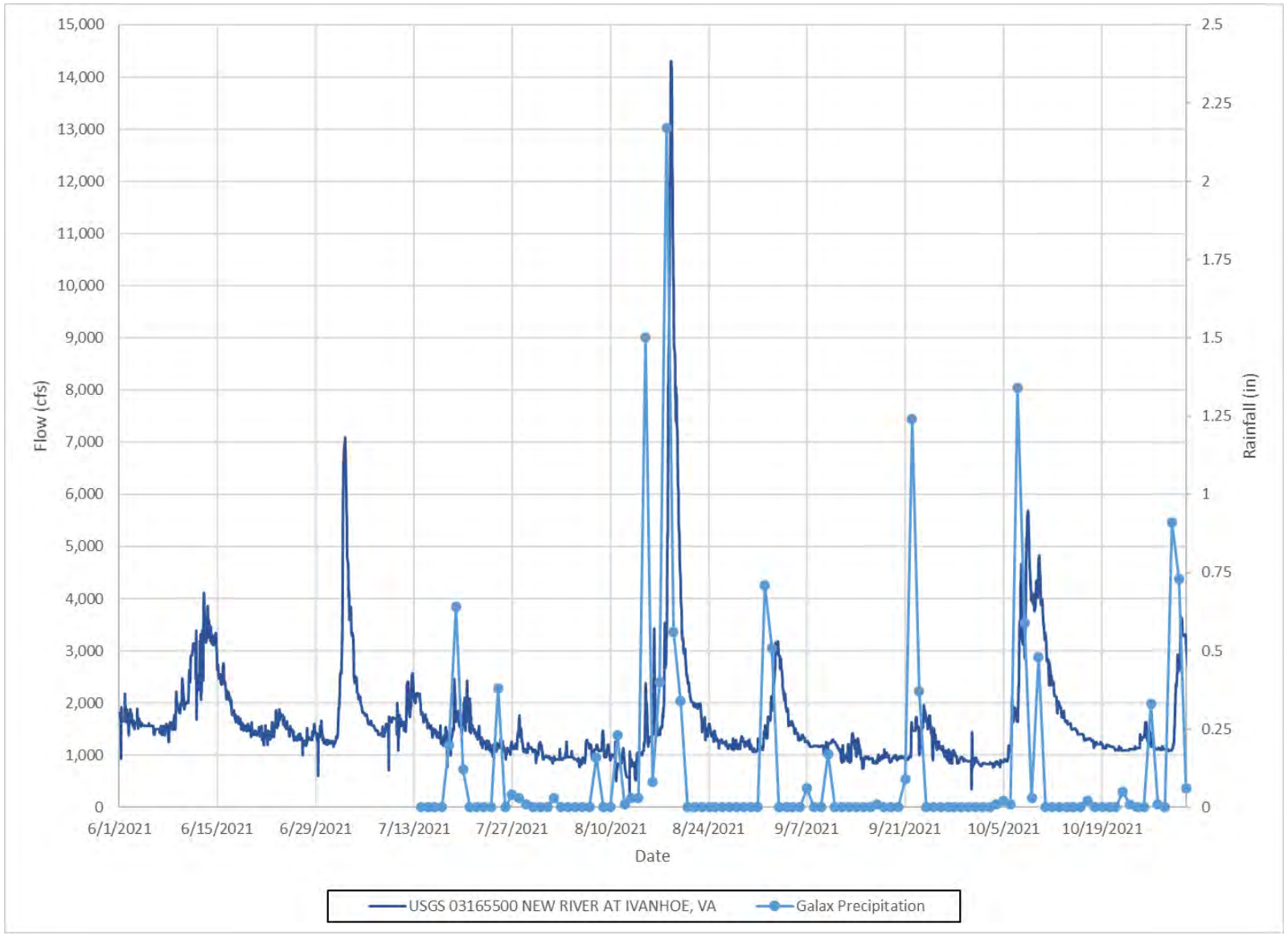

Figure 7-2. New River Flow (USGS 03165500) and Precipitation at Galax, Virginia (2021)

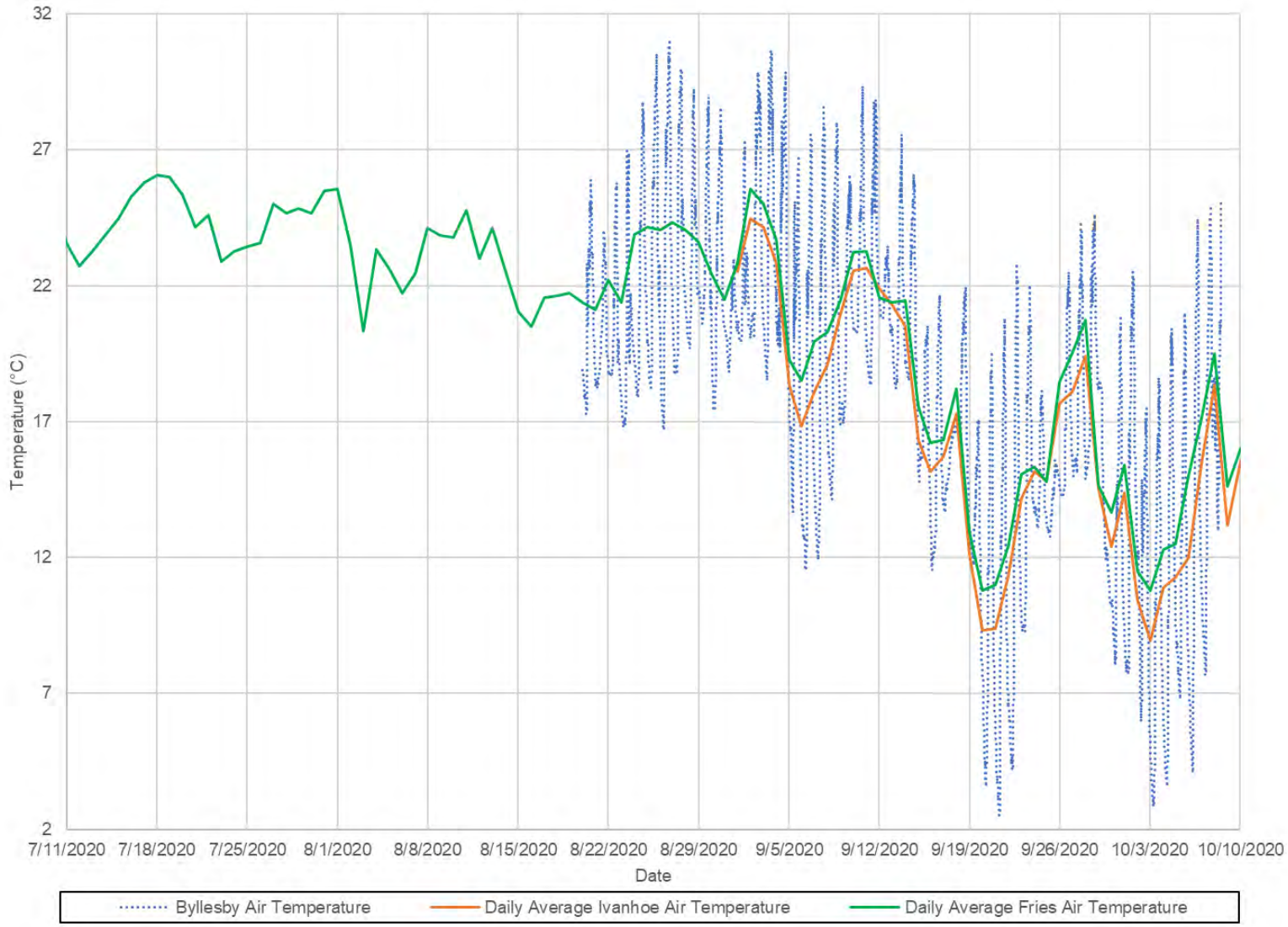

Figure 7-3. Air Temperature Comparison between Ivanhoe and Fries, Virginia (2020)

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Attachment 8

Attachment 8 – Turbidity Data

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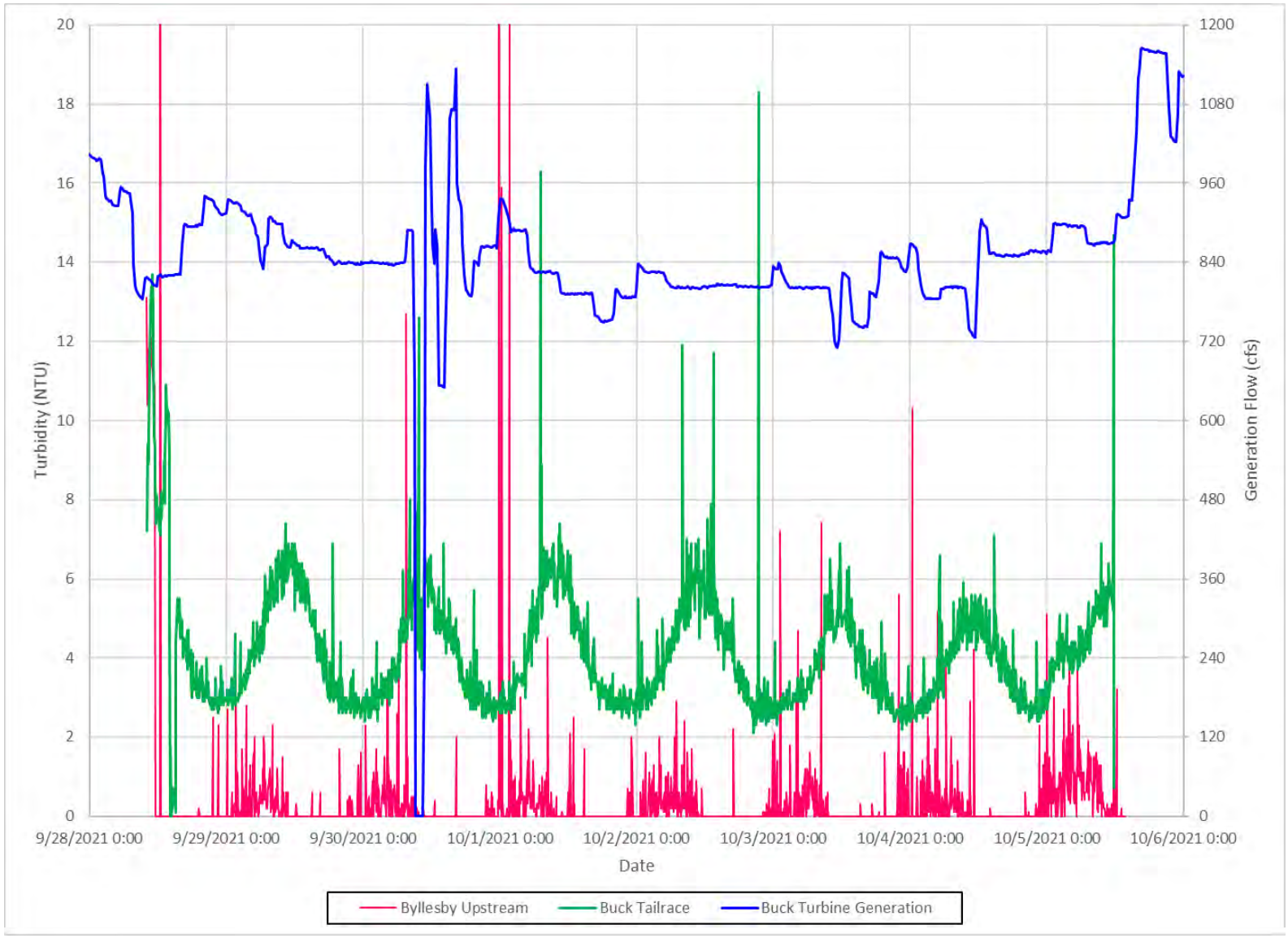
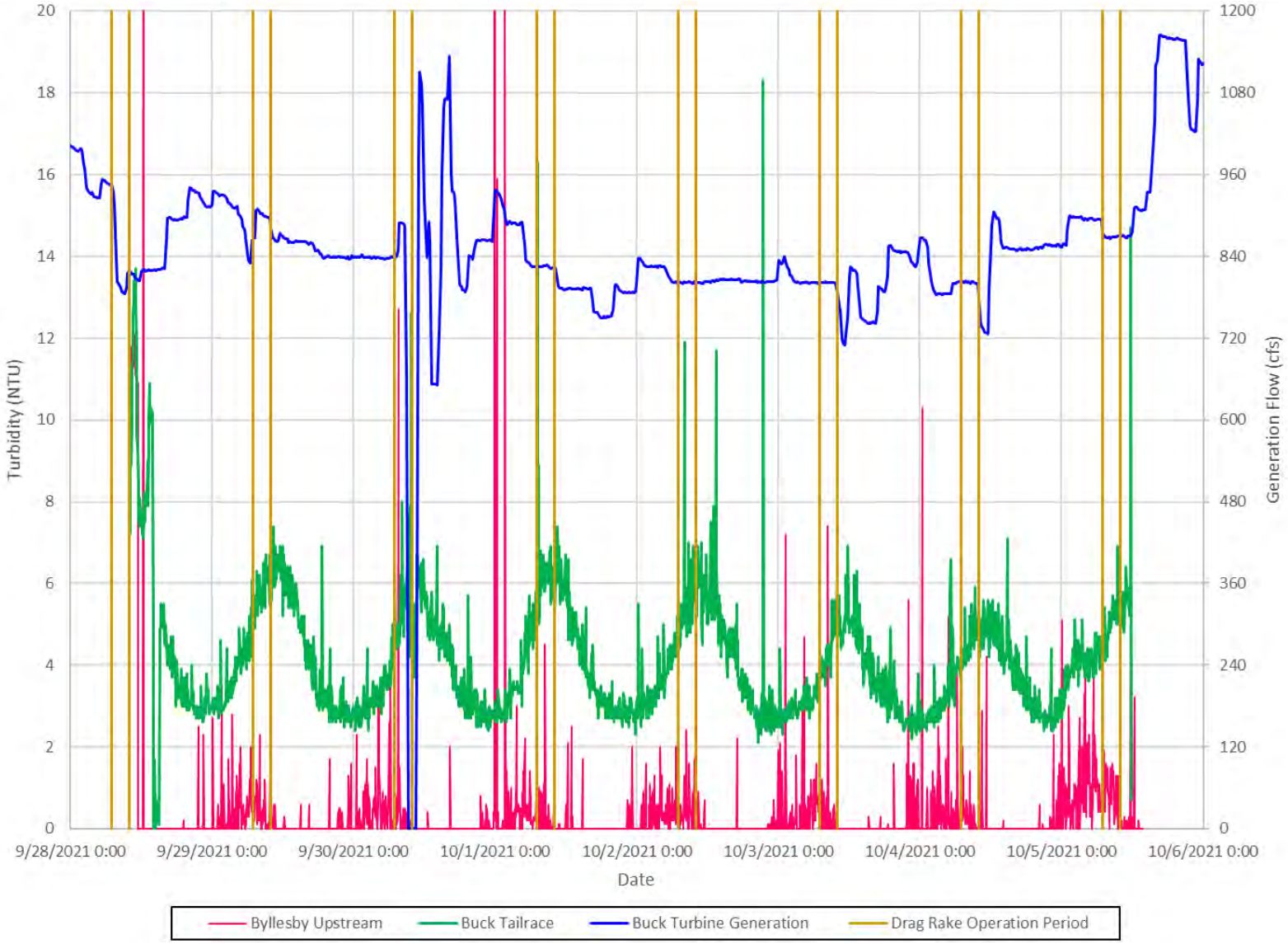

Turbidity (NTU)
Generation Flow (cfs)
Date
9/28/2021 0:00
9/29/2021 0:00
9/30/2021 0:00
10/1/2021 0:00
10/2/2021 0:00
10/3/2021 0:00
10/4/2021 0:00
10/5/2021 0:00
10/6/2021 0:00
Byllesby Upstream
Buck Tailrace
Buck Turbine Generation



Note that zero generation on September 30th was due to a brief powerhouse outage.

Figure 8-1. Turbidity and Buck Generation, September 29 – October 5, 2021

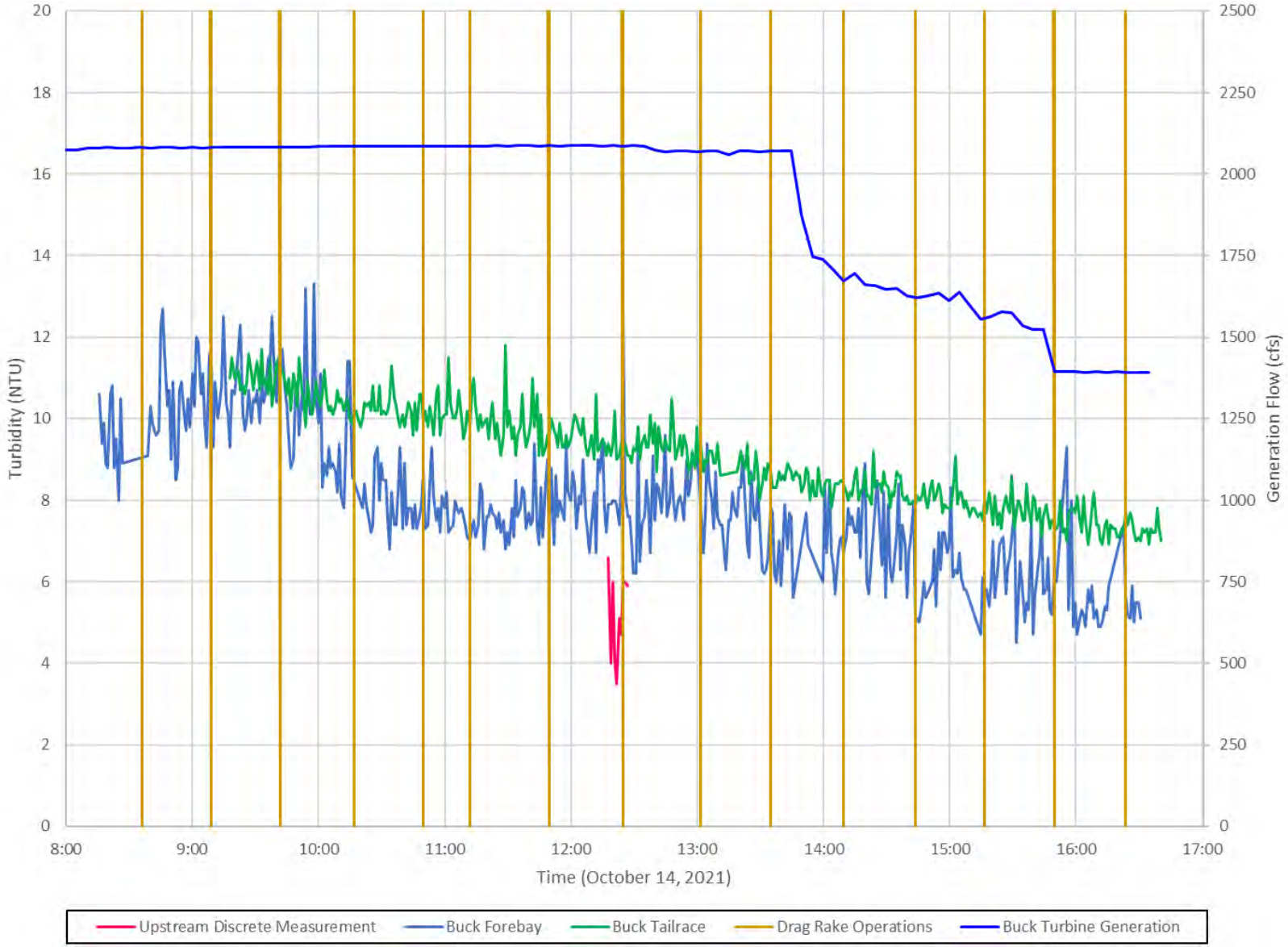


Figure 8-2. Turbidity and Buck Generation and Drag Rake Operations, October 14, 2021

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Attachment 9

Attachment 9 – Daily Water Quality Data Tables

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Table 1. Byllesby Upstream Monitoring Location - Daily Water Quality Data

Upstream	Min. DO mg/L	Ave. DO mg/L	Max. DO mg/L	Min. T °C	Ave. T °C	Max. T °C	Min. T °F	Ave. T °F	Max. T °F
6/16/21	7.8	8.1	8.7	22.9	23.8	24.1	0.0	0.0	0.0
6/17/21	6.3	7.9	9.0	21.0	22.6	24.1	73.3	74.8	75.4
6/18/21	5.3	6.7	7.8	21.5	23.3	24.9	69.8	72.8	75.3
6/19/21	5.3	6.4	7.8	23.1	24.6	26.2	70.7	73.9	76.8
6/20/21	5.3	6.3	7.6	23.9	25.3	27.0	73.7	76.3	79.1
6/21/21	4.6	5.7	6.8	25.0	26.3	28.0	75.0	77.6	80.5
6/22/21	4.3	4.9	5.9	23.6	25.2	26.6	77.1	79.4	82.3
6/23/21	0.0	0.0	0.0	21.9	23.2	24.8	74.5	77.3	79.8
6/24/21	0.0	0.0	0.0	22.0	22.8	23.9	71.4	73.8	76.6
6/25/21	0.0	0.0	0.0	21.5	23.2	25.0	71.6	73.0	75.1
6/26/21	0.0	0.0	0.0	22.9	24.5	26.1	70.7	73.8	77.0
6/27/21	0.0	0.0	0.0	24.0	25.3	26.7	73.3	76.1	79.1
6/28/21	6.7	8.0	8.9	24.5	26.0	27.8	75.1	77.5	80.1
6/29/21	5.5	6.4	7.7	25.6	26.9	28.3	76.0	78.9	82.0
6/30/21	5.0	5.9	6.8	25.8	27.2	28.6	78.1	80.4	82.9
7/1/21	0.0	0.0	0.0	25.7	26.7	27.9	78.5	80.9	83.5
7/2/21	0.0	0.0	0.0	23.3	24.9	25.7	78.3	80.0	82.3
7/3/21	0.0	0.0	0.0	21.0	21.8	23.2	74.0	76.9	78.2
7/4/21	0.0	0.0	0.0	19.7	21.6	23.3	69.8	71.2	73.8
7/5/21	0.0	0.0	0.0	21.9	23.8	25.7	67.5	70.9	73.9
7/6/21	0.0	0.0	0.0	23.8	25.4	27.4	71.5	74.8	78.3
7/7/21	0.0	0.0	0.0	24.9	26.1	27.4	74.8	77.8	81.3
7/8/21	0.0	0.0	0.0	24.9	25.4	25.9	76.8	78.9	81.3
7/9/21	0.0	0.0	0.0	23.9	24.8	25.7	76.8	77.7	78.6
7/10/21	0.0	0.0	0.0	23.7	25.0	26.4	75.1	76.7	78.2
7/11/21	0.0	0.0	0.0	24.6	25.9	27.7	74.7	77.0	79.5
7/12/21	0.0	0.0	0.0	25.1	26.1	26.9	76.3	78.6	81.9
7/13/21	0.0	0.0	0.0	25.0	26.1	26.9	77.3	79.1	80.4
7/14/21	7.3	7.8	8.4	24.5	25.8	27.0	77.0	79.0	80.4
7/15/21	7.2	7.7	8.4	25.0	26.4	27.6	76.1	78.5	80.6
7/16/21	7.1	7.6	8.3	25.4	26.8	28.3	77.1	79.6	81.8
7/17/21	7.0	7.6	8.3	26.1	27.1	28.5	77.7	80.2	82.9
7/18/21	7.0	7.6	8.3	25.7	26.5	27.6	78.9	80.9	83.3
7/19/21	7.2	7.7	8.3	24.5	25.2	26.0	78.3	79.8	81.6
7/20/21	7.3	7.8	8.5	23.9	24.9	25.9	76.1	77.4	78.8
7/21/21	7.3	7.9	8.7	23.5	24.9	26.3	75.0	76.8	78.6
7/22/21	7.2	7.8	8.7	23.9	25.4	27.1	74.3	76.9	79.3
7/23/21	7.0	7.7	8.6	24.2	26.0	28.0	75.1	77.7	80.7

Upstream	Min. DO	Ave. DO	Max. DO	Min. T	Ave. T	Max. T	Min. T	Ave. T	Max. T
	mg/L	*mg/L*	*mg/L*	*°C*	*°C*	*°C*	*°F*	*°F*	*°F*
7/24/21	6.9	7.5	8.5	25.2	26.6	28.2	75.5	78.8	82.4
7/25/21	6.8	7.5	8.5	25.5	26.9	28.6	77.3	79.9	82.8
7/26/21	6.7	7.3	8.2	26.4	27.7	29.5	77.9	80.4	83.4
7/27/21	6.7	7.3	8.4	26.2	27.8	29.6	79.5	81.9	85.1
7/28/21	6.5	7.2	8.3	26.7	28.3	30.0	79.1	82.1	85.4
7/29/21	6.5	7.3	8.5	26.2	28.0	29.9	80.0	82.9	86.1
7/30/21	6.7	7.4	8.3	26.9	27.9	29.4	79.2	82.5	85.9
7/31/21	6.8	7.5	8.6	25.8	27.5	29.4	80.4	82.2	85.0
8/1/21	6.8	7.4	8.6	26.1	26.9	28.2	78.5	81.5	85.0
8/2/21	7.0	7.8	8.9	23.9	25.7	27.4	78.9	80.5	82.8
8/3/21	7.1	7.8	8.9	24.1	25.1	26.5	75.1	78.2	81.3
8/4/21	7.2	7.9	9.0	22.7	24.3	26.3	75.4	77.2	79.7
8/5/21	7.1	7.8	9.0	22.6	24.8	27.3	72.9	75.7	79.3
8/6/21	6.7	7.7	9.0	23.2	25.3	27.6	72.7	76.6	81.1
8/7/21	6.2	7.4	8.8	23.7	25.1	26.9	73.8	77.6	81.6
8/8/21	6.2	7.8	8.9	23.2	25.2	27.2	74.7	77.1	80.5
8/9/21	6.6	7.5	8.6	24.2	25.9	27.9	73.8	77.3	80.9
8/10/21	6.5	7.4	8.8	24.8	26.4	28.1	75.5	78.7	82.2
8/11/21	6.2	7.2	8.6	25.3	26.9	29.2	76.6	79.5	82.6
8/12/21	6.4	7.3	8.8	25.4	26.8	29.0	77.5	80.4	84.5
8/13/21	6.6	7.3	8.4	25.0	26.7	28.5	77.8	80.2	84.3
8/14/21	6.1	7.1	8.2	25.4	27.0	29.2	77.0	80.0	83.2
8/15/21	5.8	7.3	8.3	24.3	25.7	26.7	77.7	80.6	84.6
8/16/21	7.0	7.5	8.3	25.1	25.8	27.1	75.8	78.2	80.0
8/17/21	7.0	7.4	7.9	23.6	24.7	25.6	77.1	78.4	80.8
8/18/21	6.3	7.9	8.1	21.8	22.4	23.6	74.5	76.4	78.0
8/19/21	7.7	8.0	8.2	21.3	22.2	23.3	71.3	72.3	74.4
8/20/21	7.4	7.7	7.8	22.5	23.5	25.0	70.4	71.9	74.0
8/21/21	7.2	7.5	7.9	22.9	24.5	25.9	72.5	74.4	77.0
8/22/21	7.0	7.4	7.9	23.8	25.3	26.8	73.3	76.1	78.6
8/23/21	6.6	7.3	8.0	24.6	25.9	27.1	74.9	77.6	80.2
8/24/21	5.8	7.0	8.1	25.1	26.6	28.2	76.4	78.6	80.9
8/25/21	5.7	6.9	8.0	26.2	27.4	29.3	77.3	79.9	82.8
8/26/21	7.0	7.4	8.2	26.3	27.4	29.1	79.1	81.4	84.8
8/27/21	7.0	7.5	8.4	25.9	27.3	29.3	79.4	81.3	84.4
8/28/21	6.9	7.5	8.4	26.2	27.6	29.4	78.6	81.1	84.7
8/29/21	6.9	7.4	8.5	26.4	27.6	29.2	79.1	81.6	84.9
8/30/21	6.9	7.4	8.6	26.3	27.2	28.4	79.5	81.8	84.6
8/31/21	6.9	7.4	8.4	24.4	25.5	26.4	79.4	80.9	83.1

Upstream	Min. DO	Ave. DO	Max. DO	Min. T	Ave. T	Max. T	Min. T	Ave. T	Max. T
	mg/L	*mg/L*	*mg/L*	*°C*	*°C*	*°C*	*°F*	*°F*	*°F*
9/1/21	7.3	7.7	8.5	23.5	24.1	25.0	75.9	78.0	79.6
9/2/21	5.9	7.8	8.3	21.6	23.0	23.9	74.2	75.4	77.0
9/3/21	7.7	8.1	8.7	20.8	22.4	23.7	71.0	73.5	75.0
9/4/21	7.5	8.1	8.9	21.4	22.8	23.8	69.4	72.4	74.6
9/5/21	7.3	7.9	9.0	22.1	23.3	24.6	70.6	73.0	74.8
9/6/21	7.3	7.9	8.9	22.6	23.6	24.8	71.8	74.0	76.2
9/7/21	7.3	8.0	9.2	21.9	23.3	24.8	72.6	74.4	76.6
9/8/21	6.8	7.8	9.1	22.7	23.9	25.3	71.5	74.0	76.7
9/9/21	6.1	7.8	9.3	22.7	23.6	24.8	72.9	74.9	77.5
9/10/21	7.7	8.5	9.7	20.9	22.2	23.4	72.8	74.4	76.6
9/11/21	7.9	8.6	10.0	20.2	21.7	23.3	69.7	71.9	74.2
9/12/21	7.5	8.6	10.3	20.5	22.2	24.3	68.3	71.0	73.9
9/13/21	7.2	8.4	10.2	21.8	23.3	25.2	68.9	72.0	75.8
9/14/21	6.8	8.1	10.2	22.4	24.1	26.3	71.3	74.0	77.4
9/15/21	6.7	8.0	10.2	22.8	24.2	26.0	72.4	75.3	79.3
9/16/21	6.6	7.9	9.9	23.0	23.8	24.8	73.0	75.6	78.8
9/17/21	6.3	7.7	10.0	22.7	23.7	25.2	73.5	74.9	76.6
9/18/21	5.9	7.6	9.9	22.6	23.8	25.2	72.8	74.7	77.4
9/19/21	5.1	7.2	10.0	22.7	24.0	25.7	72.6	74.9	77.4
9/20/21	4.9	7.5	9.6	22.9	23.5	24.2	72.9	75.1	78.2
9/21/21	7.0	7.9	8.9	20.9	21.7	22.8	73.2	74.3	75.6
9/22/21	7.6	8.2	9.3	19.9	20.9	22.0	69.7	71.0	73.1
9/23/21	7.9	8.7	9.8	18.5	19.3	20.1	67.8	69.6	71.7
9/24/21	8.3	9.0	10.2	17.4	18.6	19.8	65.3	66.7	68.2
9/25/21	8.3	9.0	10.3	17.3	18.5	19.8	63.3	65.4	67.6
9/26/21	8.1	8.9	10.4	17.4	18.7	20.4	63.1	65.3	67.7
9/27/21	7.9	8.9	10.5	17.0	18.9	20.9	63.3	65.7	68.7
9/28/21	7.8	8.3	10.0	18.3	18.5	19.6	62.6	65.9	69.6

Table 2. Byllesby Forebay Bottom Monitoring Location - Daily Water Quality Data

Forebay Bottom	Min. DO mg/L	Ave. DO mg/L	Max. DO mg/L	Min. T °C	Ave. T °C	Max. T °C	Min. T °F	Ave. T °F	Max. T °F
6/16/21	7.2	7.7	8.3	22.1	22.5	23.2	0.0	0.0	0.0
6/17/21	7.0	7.6	8.2	21.2	22.3	23.6	71.7	72.5	73.8
6/18/21	6.6	7.3	8.1	21.5	22.2	23.0	70.1	72.1	74.5
6/19/21	6.7	7.3	8.1	22.3	23.2	24.1	70.8	72.0	73.4
6/20/21	6.3	6.9	7.7	23.7	24.0	24.4	72.1	73.7	75.3
6/21/21	6.0	6.6	7.4	24.0	24.7	25.2	74.6	75.3	75.9
6/22/21	5.5	6.2	6.9	24.6	25.1	25.5	75.2	76.4	77.4
6/23/21	6.5	7.1	8.5	21.8	23.0	24.8	76.3	77.2	78.0
6/24/21	7.1	7.7	8.5	21.9	22.5	23.4	71.3	73.4	76.6
6/25/21	7.0	7.8	8.7	21.4	22.0	22.7	71.4	72.5	74.1
6/26/21	6.3	7.2	8.0	21.6	22.4	22.7	70.5	71.7	72.9
6/27/21	6.0	6.7	7.6	22.8	23.5	23.9	71.0	72.3	72.9
6/28/21	6.3	6.8	7.1	23.8	24.4	26.1	73.1	74.2	75.1
6/29/21	6.2	7.0	8.2	24.5	25.5	26.3	74.9	75.9	79.1
6/30/21	5.8	6.6	7.5	25.3	25.7	26.1	76.1	77.8	79.4
7/1/21	5.6	6.3	7.0	25.2	25.8	26.4	77.5	78.3	78.9
7/2/21	6.5	7.3	8.7	23.2	24.7	25.9	77.3	78.4	79.6
7/3/21	7.8	8.3	8.6	21.2	22.1	24.3	73.7	76.5	78.7
7/4/21	8.2	8.4	8.7	20.2	21.0	22.6	70.2	71.8	75.7
7/5/21	7.5	7.9	8.4	22.4	22.7	23.7	68.4	69.8	72.6
7/6/21	6.4	7.1	8.2	23.8	24.3	24.9	72.3	72.9	74.7
7/7/21	5.7	6.3	7.2	24.4	25.1	25.5	74.9	75.8	76.8
7/8/21	5.6	6.1	6.8	24.6	25.1	25.6	76.0	77.2	77.9
7/9/21	5.9	6.5	7.2	23.8	24.5	25.1	76.3	77.2	78.1
7/10/21	5.0	6.2	6.9	24.0	24.5	25.1	74.9	76.1	77.1
7/11/21	5.7	6.8	7.8	24.0	24.9	25.6	75.2	76.0	77.1
7/12/21	6.8	7.3	8.3	24.7	25.7	26.7	75.2	76.7	78.1
7/13/21	6.5	7.5	8.4	25.4	26.1	26.7	76.4	78.2	80.1
7/14/21	6.3	7.4	8.3	25.0	25.6	26.4	77.7	78.9	80.1
7/15/21	6.9	7.5	8.2	25.1	25.6	26.1	77.0	78.0	79.6
7/16/21	6.7	7.4	8.2	25.6	26.1	26.6	77.3	78.1	78.9
7/17/21	6.4	7.2	8.0	25.5	26.0	26.6	78.1	78.9	79.9
7/18/21	6.8	7.6	8.6	25.0	26.2	26.9	78.0	78.8	79.9
7/19/21	7.4	7.7	8.6	23.7	24.6	26.6	77.0	79.1	80.4
7/20/21	7.2	7.8	8.8	23.9	24.3	24.9	74.7	76.3	79.9
7/21/21	6.6	7.6	8.9	23.7	24.3	25.1	75.1	75.8	76.8
7/22/21	6.3	7.5	8.5	23.7	24.3	25.0	74.7	75.8	77.1
7/23/21	6.1	7.1	8.1	23.9	24.5	25.3	74.7	75.8	77.0

Forebay Bottom	Min. DO	Ave. DO	Max. DO	Min. T	Ave. T	Max. T	Min. T	Ave. T	Max. T
	mg/L	*mg/L*	*mg/L*	*°C*	*°C*	*°C*	*°F*	*°F*	*°F*
7/24/21	3.9	6.1	7.1	24.1	24.8	25.1	75.1	76.1	77.5
7/25/21	4.5	6.1	7.4	24.9	25.2	25.5	75.5	76.6	77.2
7/26/21	4.2	5.9	6.9	25.3	25.8	26.2	76.8	77.3	77.8
7/27/21	5.0	6.2	7.1	25.9	26.4	27.0	77.5	78.5	79.1
7/28/21	4.4	6.1	7.9	26.6	27.1	27.8	78.6	79.5	80.5
7/29/21	4.5	6.1	7.1	26.5	27.0	27.8	79.9	80.8	82.0
7/30/21	6.0	6.6	7.3	26.7	27.0	27.4	79.7	80.7	82.1
7/31/21	5.7	6.7	7.5	26.0	26.8	27.4	80.1	80.6	81.3
8/1/21	5.5	6.3	6.9	26.1	26.3	26.7	78.8	80.3	81.3
8/2/21	6.0	6.6	7.3	24.5	25.6	26.2	78.9	79.4	80.1
8/3/21	6.2	6.9	7.6	24.1	24.8	25.2	76.2	78.1	79.2
8/4/21	6.3	6.9	7.6	23.0	23.8	24.4	75.4	76.7	77.4
8/5/21	5.9	6.9	7.7	23.1	23.3	23.7	73.4	74.8	76.0
8/6/21	5.6	6.5	7.2	23.3	23.7	24.2	73.5	74.0	74.7
8/7/21	5.4	6.4	7.3	23.7	24.3	24.9	73.9	74.7	75.6
8/8/21	0.0	0.0	0.0	23.1	24.7	26.9	74.7	75.7	76.8
8/9/21	0.0	0.0	0.0	23.7	25.6	27.8	73.7	76.4	80.5
8/10/21	0.0	0.0	0.0	24.5	25.7	27.4	74.6	78.1	82.1
8/11/21	0.0	0.0	0.0	25.2	26.2	27.8	76.2	78.3	81.4
8/12/21	0.0	0.0	0.0	25.5	26.5	28.0	77.3	79.2	82.1
8/13/21	4.8	5.8	6.4	25.3	25.9	26.6	77.9	79.8	82.5
8/14/21	4.1	5.6	7.5	25.6	25.9	27.0	77.6	78.6	79.9
8/15/21	6.4	6.8	7.7	24.8	26.0	27.5	78.0	78.7	80.6
8/16/21	6.5	7.2	7.6	22.3	23.5	25.6	76.6	78.7	81.5
8/17/21	7.0	7.4	8.0	22.2	23.7	24.5	72.2	74.4	78.0
8/18/21	6.7	7.6	8.0	21.6	22.2	23.1	72.0	74.6	76.1
8/19/21	7.7	8.1	8.3	21.4	22.0	22.9	70.8	72.0	73.7
8/20/21	7.5	7.7	7.8	22.5	23.0	24.6	70.5	71.6	73.2
8/21/21	7.2	7.4	7.7	23.3	24.0	24.7	72.4	73.5	76.3
8/22/21	7.1	7.3	7.7	24.2	24.8	25.6	74.0	75.2	76.5
8/23/21	6.8	7.1	7.7	25.1	25.5	26.1	75.5	76.6	78.0
8/24/21	6.7	7.1	7.6	25.1	25.7	26.2	77.1	77.8	78.9
8/25/21	6.3	6.8	7.5	26.2	26.7	27.3	77.3	78.2	79.1
8/26/21	6.1	6.6	7.2	26.5	27.1	27.7	79.2	80.1	81.1
8/27/21	6.1	6.6	7.1	26.2	26.8	27.4	79.6	80.8	81.9
8/28/21	6.2	6.6	7.4	26.3	26.9	27.5	79.1	80.3	81.3
8/29/21	5.9	6.5	7.3	26.8	27.3	27.9	79.3	80.5	81.4
8/30/21	5.7	6.3	6.9	26.6	27.2	27.8	80.2	81.2	82.2
8/31/21	5.9	6.5	7.1	25.1	26.2	26.8	79.9	81.0	82.0

Forebay Bottom	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
9/1/21	6.6	7.0	7.6	23.4	24.3	25.2	77.2	79.2	80.3
9/2/21	7.2	7.7	8.3	22.3	23.1	23.9	74.1	75.8	77.3
9/3/21	7.5	7.8	8.4	21.3	22.3	23.5	72.1	73.5	75.1
9/4/21	7.0	7.6	8.4	22.0	22.5	23.3	70.3	72.2	74.3
9/5/21	7.0	7.5	8.2	22.4	22.8	23.2	71.6	72.6	74.0
9/6/21	6.8	7.5	8.2	22.8	23.3	23.6	72.3	73.1	73.8
9/7/21	7.0	7.7	8.3	22.1	23.0	24.0	73.0	73.9	74.5
9/8/21	7.4	7.9	8.4	22.2	22.4	22.7	71.8	73.5	75.2
9/9/21	7.3	7.8	8.4	22.4	22.8	23.1	71.9	72.4	72.8
9/10/21	7.6	8.0	8.7	21.4	22.3	23.2	72.4	73.0	73.5
9/11/21	7.8	8.5	9.3	20.3	21.2	21.9	70.5	72.2	73.8
9/12/21	7.9	8.5	9.0	20.3	20.6	21.1	68.6	70.2	71.4
9/13/21	7.7	8.3	8.9	20.6	21.1	21.4	68.5	69.1	70.1
9/14/21	7.0	7.9	8.6	21.4	21.9	22.2	69.1	69.9	70.5
9/15/21	7.0	7.7	8.2	21.9	22.4	23.2	70.5	71.4	71.9
9/16/21	6.9	7.6	8.2	22.3	22.6	23.0	71.4	72.4	73.7
9/17/21	6.9	7.6	8.2	22.4	22.7	23.2	72.2	72.8	73.3
9/18/21	7.0	7.6	8.3	22.5	22.8	23.3	72.3	72.8	73.8
9/19/21	6.7	7.5	8.3	22.6	23.0	23.5	72.4	73.0	74.0
9/20/21	5.6	7.0	7.8	22.5	22.9	23.4	72.8	73.3	74.3
9/21/21	5.7	6.6	7.3	21.3	22.3	22.9	72.5	73.3	74.2
9/22/21	7.4	8.0	8.5	19.7	20.3	21.3	70.4	72.1	73.3
9/23/21	8.0	8.3	9.2	18.7	19.3	20.2	67.5	68.6	70.4
9/24/21	7.3	8.4	9.5	17.5	18.2	19.5	65.7	66.7	68.4
9/25/21	7.2	8.6	9.6	17.0	17.8	18.6	63.6	64.8	67.1
9/26/21	5.5	7.8	9.3	16.8	17.5	18.2	62.5	64.0	65.4
9/27/21	6.5	7.5	8.6	17.0	17.4	18.2	62.3	63.5	64.8
9/28/21	0.0	0.0	0.0	17.2	17.6	17.8	62.5	63.4	64.7

Table 3. Byllesby Forebay Middle Monitoring Location - Daily Water Quality Data

Forebay Middle	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
6/16/21	7.3	7.7	8.3	22.0	22.6	23.1	71.7	72.7	73.7
6/17/21	7.0	7.7	8.4	21.3	22.4	23.6	70.3	72.3	74.4
6/18/21	7.1	7.6	8.2	21.9	22.6	23.1	71.4	72.7	73.6
6/19/21	6.9	7.6	8.4	22.9	23.7	24.5	73.3	74.6	76.1
6/20/21	6.4	7.3	8.2	24.1	24.6	24.9	75.3	76.2	76.9
6/21/21	6.3	7.2	8.1	24.8	25.6	26.0	76.6	78.0	78.9
6/22/21	6.0	6.9	7.9	24.9	25.9	26.6	76.9	78.6	79.8
6/23/21	6.8	7.5	8.5	22.1	23.3	24.9	71.9	74.0	76.8
6/24/21	7.1	7.7	8.6	22.2	22.8	23.6	71.9	73.0	74.4
6/25/21	6.9	7.7	8.7	21.8	22.3	22.8	71.2	72.1	73.1
6/26/21	6.5	7.4	8.5	22.4	23.3	24.0	72.3	74.0	75.1
6/27/21	6.1	6.9	8.0	23.7	24.4	24.9	74.6	76.0	76.9
6/28/21	6.3	6.9	7.6	24.8	25.1	25.7	76.6	77.2	78.2
6/29/21	6.2	7.0	8.1	25.4	26.3	27.1	77.7	79.4	80.8
6/30/21	5.8	6.7	7.7	26.1	26.6	27.0	79.1	79.9	80.6
7/1/21	5.5	6.4	7.3	25.8	26.5	27.2	78.5	79.8	81.0
7/2/21	6.5	7.0	8.1	23.9	25.1	26.4	75.0	77.2	79.5
7/3/21	7.2	7.8	8.1	21.2	22.0	24.2	70.1	71.6	75.6
7/4/21	7.8	8.0	8.2	20.1	21.0	22.6	68.2	69.7	72.7
7/5/21	7.2	7.6	8.1	22.4	22.8	24.0	72.3	73.1	75.1
7/6/21	6.6	7.3	8.2	24.0	24.6	25.5	75.2	76.3	77.9
7/7/21	6.2	6.9	7.8	25.2	25.6	26.0	77.4	78.2	78.8
7/8/21	6.0	6.8	7.6	25.1	25.6	26.3	77.1	78.2	79.3
7/9/21	6.5	7.0	7.7	24.0	24.7	25.3	75.2	76.4	77.5
7/10/21	6.5	7.0	7.9	24.2	24.6	25.1	75.6	76.3	77.2
7/11/21	6.5	7.2	8.0	24.7	25.3	26.1	76.4	77.5	78.9
7/12/21	6.7	7.2	7.9	24.8	25.9	26.7	76.6	78.7	80.0
7/13/21	6.6	7.1	7.8	25.7	26.1	26.7	78.2	79.0	80.0
7/14/21	6.4	7.1	7.9	25.0	25.6	26.4	77.1	78.1	79.5
7/15/21	6.6	7.2	7.8	25.6	25.9	26.3	78.0	78.7	79.4
7/16/21	6.4	7.0	7.9	25.9	26.3	26.7	78.7	79.3	80.0
7/17/21	6.2	7.0	7.7	26.1	26.5	27.0	78.9	79.7	80.5
7/18/21	6.4	7.3	8.1	25.9	26.6	27.1	78.7	80.0	80.9
7/19/21	6.7	7.2	8.0	24.4	25.1	26.9	75.9	77.2	80.4
7/20/21	6.7	7.4	8.1	24.1	24.5	25.1	75.5	76.2	77.1
7/21/21	6.8	7.4	8.1	24.1	24.6	25.2	75.4	76.3	77.4
7/22/21	6.2	7.1	8.1	24.1	24.6	25.3	75.3	76.4	77.5
7/23/21	5.7	6.7	7.6	24.3	25.0	25.5	75.8	76.9	77.8

Forebay Middle	Min. DO mg/L	Ave. DO mg/L	Max. DO mg/L	Min. T °C	Ave. T °C	Max. T °C	Min. T °F	Ave. T °F	Max. T °F
7/24/21	5.3	6.3	7.0	24.8	25.7	26.3	76.7	78.2	79.4
7/25/21	5.6	6.5	7.4	25.6	26.1	26.6	78.1	78.9	79.8
7/26/21	5.3	6.3	7.4	25.9	26.5	27.1	78.7	79.8	80.7
7/27/21	5.6	6.5	7.3	26.3	27.1	27.9	79.4	80.7	82.2
7/28/21	4.7	6.1	7.2	26.9	27.5	28.3	80.5	81.6	82.9
7/29/21	5.2	6.7	7.5	26.3	27.6	28.2	79.4	81.7	82.8
7/30/21	6.3	7.1	8.0	27.1	27.6	28.0	80.8	81.6	82.4
7/31/21	6.1	7.0	7.6	26.3	27.1	27.5	79.3	80.8	81.5
8/1/21	6.0	6.9	7.8	26.4	26.8	27.3	79.5	80.3	81.1
8/2/21	6.3	6.8	7.5	24.6	25.7	26.5	76.4	78.3	79.7
8/3/21	6.4	7.3	8.1	24.4	25.1	25.5	76.0	77.2	77.9
8/4/21	6.6	7.1	7.9	23.1	24.0	24.5	73.7	75.1	76.2
8/5/21	6.4	7.4	8.2	23.2	23.8	24.1	73.8	74.8	75.3
8/6/21	6.5	7.2	8.0	23.8	24.3	24.7	74.9	75.7	76.4
8/7/21	6.9	7.2	7.4	24.0	24.5	25.1	75.2	76.1	77.1
8/8/21	0.0	0.0	0.0	23.2	24.8	26.9	73.8	76.6	80.4
8/9/21	0.0	0.0	0.0	23.6	25.6	27.9	74.5	78.1	82.2
8/10/21	0.0	0.0	0.0	24.5	25.7	27.4	76.0	78.3	81.3
8/11/21	0.0	0.0	0.0	25.2	26.3	27.9	77.4	79.4	82.3
8/12/21	0.0	0.0	0.0	25.8	26.7	28.1	78.4	80.1	82.5
8/13/21	5.4	5.8	6.1	25.7	26.2	26.8	78.3	79.2	80.2
8/14/21	5.5	6.3	7.6	26.1	26.5	27.1	79.0	79.6	80.7
8/15/21	6.5	6.9	7.7	25.0	26.0	27.4	77.0	78.8	81.3
8/16/21	6.4	7.2	7.6	22.7	24.1	25.6	72.9	75.4	78.0
8/17/21	7.0	7.5	7.9	22.8	24.3	25.6	73.1	75.8	78.1
8/18/21	6.7	7.5	8.0	21.5	22.2	23.1	70.7	71.9	73.7
8/19/21	7.6	8.0	8.2	21.3	21.9	22.8	70.4	71.5	73.1
8/20/21	7.4	7.6	7.8	22.5	23.0	24.6	72.4	73.4	76.2
8/21/21	7.0	7.4	7.7	23.2	23.9	24.7	73.8	75.0	76.4
8/22/21	7.1	7.3	7.7	24.1	24.7	25.4	75.3	76.4	77.8
8/23/21	6.8	7.1	7.6	24.9	25.3	26.0	76.8	77.6	78.8
8/24/21	6.7	7.0	7.6	25.0	25.5	25.9	77.0	77.8	78.7
8/25/21	6.4	6.9	7.5	25.7	26.3	26.8	78.3	79.4	80.2
8/26/21	6.0	6.8	7.4	26.1	26.8	27.5	79.1	80.2	81.5
8/27/21	6.4	6.9	7.4	25.9	26.6	27.1	78.7	79.8	80.9
8/28/21	6.4	7.0	7.6	26.1	26.7	27.2	78.9	80.0	81.0
8/29/21	6.1	6.9	7.8	26.5	27.1	27.7	79.8	80.7	81.8
8/30/21	6.2	6.8	7.5	26.3	26.9	27.6	79.4	80.5	81.6
8/31/21	6.3	6.8	7.6	25.0	26.0	26.7	77.0	78.7	80.1

Forebay Middle	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
9/1/21	6.8	7.2	7.7	23.3	24.2	25.1	74.0	75.6	77.1
9/2/21	7.4	7.9	8.3	22.2	23.0	23.9	72.0	73.4	75.0
9/3/21	7.6	8.0	8.6	21.2	22.2	23.5	70.1	72.0	74.3
9/4/21	7.4	7.9	8.5	21.7	22.4	23.3	71.1	72.4	73.9
9/5/21	7.3	7.8	8.5	22.3	22.7	23.1	72.2	72.9	73.6
9/6/21	7.1	7.7	8.5	22.7	23.1	23.5	72.8	73.7	74.2
9/7/21	7.3	7.9	8.4	22.4	23.1	23.8	72.3	73.6	74.9
9/8/21	7.3	8.0	8.8	22.6	23.0	23.3	72.8	73.4	73.9
9/9/21	7.2	7.8	8.6	22.9	23.3	23.8	73.3	73.9	74.8
9/10/21	7.5	8.1	8.8	21.5	22.4	23.2	70.7	72.3	73.8
9/11/21	7.8	8.5	9.3	20.5	21.3	21.9	68.9	70.4	71.4
9/12/21	7.8	8.5	9.2	20.4	21.0	21.3	68.8	69.8	70.3
9/13/21	7.5	8.3	9.3	20.8	21.6	22.1	69.4	70.8	71.8
9/14/21	7.1	7.9	8.8	21.7	22.4	22.9	71.1	72.4	73.2
9/15/21	6.9	7.7	8.7	22.2	22.9	23.4	72.0	73.3	74.2
9/16/21	7.0	7.6	8.4	22.6	23.1	23.5	72.8	73.6	74.2
9/17/21	7.0	7.7	8.6	22.7	23.1	23.5	72.9	73.6	74.3
9/18/21	7.0	7.7	8.6	22.7	23.1	23.4	72.9	73.5	74.2
9/19/21	6.9	7.8	8.5	22.8	23.3	23.6	73.1	73.9	74.4
9/20/21	6.8	7.7	8.4	22.8	23.4	23.8	73.1	74.0	74.9
9/21/21	6.9	7.6	8.3	21.5	22.6	23.0	70.7	72.7	73.5
9/22/21	7.2	8.0	8.5	20.0	20.4	21.5	68.0	68.8	70.6
9/23/21	8.0	8.4	9.3	18.7	19.5	20.7	65.7	67.1	69.2
9/24/21	8.3	8.8	9.7	17.7	18.3	19.4	63.8	65.0	67.0
9/25/21	8.4	9.0	9.8	17.3	18.0	18.6	63.1	64.3	65.5
9/26/21	8.0	8.9	9.6	17.2	17.8	18.3	62.9	64.0	64.9
9/27/21	8.0	8.7	9.2	17.3	17.8	18.2	63.1	64.1	64.8
9/28/21	8.1	8.7	9.2	17.7	18.1	18.5	63.9	64.5	65.3

Table 4. Byllesby Forebay Surface Monitoring Location - Daily Water Quality Data

Forebay Surface	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
6/16/21	7.3	7.8	8.2	22.7	23.0	23.4	72.8	73.4	74.1
6/17/21	7.2	7.8	8.4	22.1	22.9	23.8	71.8	73.3	74.9
6/18/21	7.1	7.7	8.5	22.5	23.2	24.0	72.5	73.8	75.1
6/19/21	7.0	7.7	8.4	23.6	24.2	25.5	74.4	75.5	77.8
6/20/21	6.8	7.6	8.3	24.8	25.5	26.3	76.6	77.8	79.4
6/21/21	6.6	7.4	8.1	25.5	26.1	26.7	78.0	78.9	80.0
6/22/21	6.3	7.1	7.9	25.0	26.2	26.7	77.0	79.1	80.1
6/23/21	6.8	7.6	8.6	23.1	23.8	25.0	73.6	74.8	76.9
6/24/21	7.1	7.7	8.7	22.4	23.1	23.7	72.3	73.6	74.7
6/25/21	7.2	8.0	8.7	22.3	23.2	24.5	72.2	73.8	76.1
6/26/21	6.8	7.8	8.7	23.4	24.4	25.5	74.2	75.8	77.9
6/27/21	6.7	7.6	8.5	24.9	25.3	26.2	76.8	77.6	79.1
6/28/21	6.6	7.4	8.4	25.4	26.1	27.5	77.8	78.9	81.5
6/29/21	6.5	7.3	8.1	26.4	26.9	27.9	79.6	80.5	82.3
6/30/21	6.3	7.1	7.7	26.8	27.5	29.2	80.3	81.4	84.5
7/1/21	6.0	6.6	7.2	26.2	27.1	27.8	79.2	80.7	82.0
7/2/21	6.5	7.0	8.1	24.3	25.5	26.5	75.8	77.8	79.7
7/3/21	7.2	7.8	8.0	21.2	22.1	24.3	70.2	71.7	75.7
7/4/21	7.4	7.9	8.2	20.4	21.3	22.7	68.7	70.4	72.8
7/5/21	7.0	7.6	8.2	22.6	23.3	24.7	72.6	74.0	76.5
7/6/21	6.7	7.5	8.2	24.5	25.3	27.3	76.1	77.5	81.2
7/7/21	6.4	7.2	8.0	25.7	26.2	27.0	78.2	79.2	80.6
7/8/21	6.3	6.9	7.7	25.4	26.0	26.5	77.7	78.8	79.7
7/9/21	6.2	6.8	7.5	24.9	25.5	26.4	76.9	77.9	79.6
7/10/21	6.6	7.2	8.1	24.5	25.1	26.4	76.2	77.3	79.5
7/11/21	6.7	7.3	7.9	24.8	25.8	26.6	76.6	78.4	80.0
7/12/21	6.5	7.1	7.8	24.9	26.1	26.7	76.8	79.0	80.1
7/13/21	6.4	7.1	7.6	25.8	26.2	26.7	78.4	79.2	80.1
7/14/21	6.5	7.2	7.9	25.4	26.0	26.4	77.8	78.7	79.6
7/15/21	6.9	7.4	8.0	25.8	26.5	27.5	78.4	79.7	81.5
7/16/21	6.7	7.4	8.0	26.5	26.9	28.2	79.6	80.5	82.7
7/17/21	6.8	7.3	7.8	26.8	27.0	27.6	80.2	80.6	81.6
7/18/21	6.8	7.4	8.0	26.3	27.0	27.6	79.3	80.6	81.6
7/19/21	6.8	7.3	8.0	24.7	25.5	26.9	76.5	78.0	80.5
7/20/21	6.7	7.3	8.0	24.4	24.8	25.5	76.0	76.7	77.8
7/21/21	6.7	7.4	8.0	24.5	25.0	25.5	76.1	77.1	78.0
7/22/21	6.5	7.3	7.9	25.0	25.4	26.4	76.9	77.7	79.5
7/23/21	6.3	7.2	8.2	25.5	26.0	28.0	77.9	78.8	82.3

Forebay Surface	Min. DO mg/L	Ave. DO mg/L	Max. DO mg/L	Min. T °C	Ave. T °C	Max. T °C	Min. T °F	Ave. T °F	Max. T °F
7/24/21	6.7	7.3	8.2	26.4	26.8	28.0	79.5	80.3	82.4
7/25/21	6.6	7.3	7.8	26.4	26.8	27.6	79.6	80.3	81.6
7/26/21	6.7	7.2	7.8	26.9	27.4	29.3	80.5	81.4	84.8
7/27/21	6.2	7.0	8.0	27.2	27.8	29.3	81.0	82.1	84.8
7/28/21	5.8	6.7	7.7	27.7	28.3	29.4	81.9	83.0	84.9
7/29/21	6.6	7.3	7.8	27.8	28.4	29.0	82.1	83.1	84.1
7/30/21	6.6	7.4	8.0	27.7	28.2	28.4	81.8	82.7	83.1
7/31/21	6.5	7.2	7.6	27.3	28.0	29.4	81.1	82.4	85.0
8/1/21	6.3	7.1	7.7	26.9	27.4	28.0	80.5	81.3	82.4
8/2/21	6.4	7.0	7.7	26.1	26.5	26.9	78.9	79.7	80.5
8/3/21	6.8	7.4	7.9	24.7	25.6	26.5	76.4	78.2	79.7
8/4/21	6.9	7.5	7.9	24.3	24.8	25.8	75.7	76.7	78.4
8/5/21	7.1	7.6	8.2	24.0	25.1	26.8	75.3	77.1	80.3
8/6/21	6.8	7.6	8.1	24.4	25.2	26.6	75.9	77.3	79.8
8/7/21	5.8	6.8	7.9	24.1	25.0	25.4	75.3	77.0	77.8
8/8/21	5.3	6.3	7.4	23.7	25.0	27.0	74.6	77.0	80.5
8/9/21	4.9	6.0	6.9	23.7	25.7	27.9	74.6	78.3	82.3
8/10/21	6.0	6.4	7.0	24.5	25.9	27.4	76.1	78.7	81.4
8/11/21	6.0	6.7	7.5	25.5	26.7	28.0	77.9	80.1	82.5
8/12/21	5.3	6.5	7.3	26.5	27.3	28.2	79.7	81.1	82.7
8/13/21	4.9	6.8	7.5	26.6	27.3	29.1	79.8	81.1	84.5
8/14/21	6.8	7.3	7.6	26.5	27.1	28.8	79.6	80.7	83.9
8/15/21	6.5	7.0	7.6	25.5	26.5	27.4	78.0	79.7	81.4
8/16/21	6.4	7.2	7.7	23.5	25.2	26.0	74.2	77.4	78.9
8/17/21	7.0	7.5	8.0	23.4	24.9	25.9	74.1	76.8	78.7
8/18/21	6.7	7.5	8.0	21.5	22.2	23.4	70.7	72.0	74.2
8/19/21	7.8	8.1	8.3	21.4	22.0	22.9	70.5	71.6	73.2
8/20/21	7.6	7.8	8.0	22.5	23.1	24.6	72.5	73.6	76.2
8/21/21	7.3	7.5	7.8	23.6	24.2	24.9	74.4	75.6	76.8
8/22/21	7.1	7.4	7.8	24.5	25.1	25.9	76.1	77.2	78.6
8/23/21	7.0	7.3	7.8	25.2	26.0	26.9	77.3	78.7	80.4
8/24/21	6.8	7.3	7.9	25.6	26.4	27.6	78.1	79.5	81.6
8/25/21	6.7	7.3	7.9	26.8	27.4	29.5	80.2	81.3	85.0
8/26/21	6.7	7.2	7.6	27.2	27.7	29.2	80.9	81.8	84.6
8/27/21	6.7	7.2	7.7	26.8	27.3	28.0	80.3	81.1	82.4
8/28/21	6.6	7.3	8.0	26.9	27.6	29.1	80.4	81.7	84.4
8/29/21	6.6	7.3	7.9	27.5	27.9	28.7	81.5	82.1	83.7
8/30/21	6.5	7.1	7.8	26.7	27.5	27.8	80.1	81.5	82.0
8/31/21	6.5	7.0	7.7	25.1	26.4	26.9	77.1	79.5	80.4

Forebay Surface	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
9/1/21	6.9	7.3	7.9	23.5	24.4	25.1	74.3	76.0	77.3
9/2/21	7.5	7.9	8.3	22.5	23.1	24.1	72.5	73.6	75.3
9/3/21	7.6	8.0	8.6	21.7	22.4	23.5	71.1	72.4	74.2
9/4/21	7.6	8.0	8.6	22.2	22.9	23.9	72.0	73.2	75.0
9/5/21	7.5	7.9	8.6	22.4	23.0	23.9	72.4	73.4	75.0
9/6/21	7.3	7.9	8.6	23.1	23.6	24.4	73.7	74.5	75.9
9/7/21	7.5	8.1	8.5	23.2	23.6	24.8	73.8	74.5	76.6
9/8/21	7.5	8.2	8.8	23.3	23.7	24.3	73.9	74.7	75.8
9/9/21	7.3	8.0	8.7	23.2	23.9	24.2	73.8	75.1	75.5
9/10/21	7.5	8.1	8.7	22.0	22.9	23.3	71.6	73.1	73.9
9/11/21	7.8	8.5	9.2	21.3	22.1	22.9	70.3	71.7	73.2
9/12/21	7.9	8.7	9.4	21.2	22.0	23.0	70.2	71.5	73.4
9/13/21	7.6	8.6	9.6	22.1	22.8	24.1	71.8	73.1	75.3
9/14/21	7.6	8.5	9.4	23.0	23.9	25.7	73.5	75.0	78.2
9/15/21	7.3	8.3	9.1	23.8	24.3	25.7	74.8	75.8	78.3
9/16/21	7.1	8.1	9.0	23.6	24.2	24.9	74.5	75.5	76.9
9/17/21	7.1	8.0	8.9	23.3	23.9	24.6	73.9	75.0	76.4
9/18/21	7.1	8.0	8.9	23.2	23.9	24.8	73.8	75.0	76.6
9/19/21	7.2	8.0	8.8	23.5	24.2	25.2	74.3	75.5	77.4
9/20/21	7.0	7.9	8.8	23.3	23.9	24.4	74.0	75.0	75.9
9/21/21	7.0	7.8	8.6	21.6	22.9	23.3	70.9	73.2	73.9
9/22/21	7.2	8.0	8.5	20.2	20.8	21.6	68.4	69.5	70.8
9/23/21	8.0	8.5	9.3	18.8	19.7	20.8	65.8	67.4	69.4
9/24/21	8.2	8.8	9.7	17.9	18.7	19.4	64.3	65.7	67.0
9/25/21	8.4	9.1	9.9	18.0	18.5	18.8	64.5	65.2	65.8
9/26/21	8.4	9.1	9.9	18.0	18.6	19.4	64.4	65.5	66.9
9/27/21	8.4	9.0	9.8	18.0	18.8	19.9	64.5	65.8	67.9
9/28/21	9.0	9.4	9.8	18.6	18.9	19.2	65.4	65.9	66.5

Table 5. Byllesby Tailrace Monitoring Location - Daily Water Quality Data

Tailrace	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
6/15/21	7.3	7.6	7.8	23.2	23.5	23.8	73.8	74.2	74.8
6/16/21	7.3	7.6	8.0	22.6	23.0	23.8	72.7	73.5	74.8
6/17/21	7.3	7.7	8.3	21.9	22.7	23.5	71.5	72.8	74.3
6/18/21	7.3	7.8	8.3	22.4	22.9	23.5	72.3	73.2	74.2
6/19/21	7.1	7.6	8.2	23.4	23.9	24.5	74.1	75.0	76.1
6/20/21	6.8	7.4	8.0	24.5	25.0	25.3	76.1	77.0	77.6
6/21/21	6.5	7.2	7.9	25.2	25.8	26.2	77.3	78.5	79.2
6/22/21	6.4	6.9	7.7	25.0	26.0	26.5	77.0	78.8	79.7
6/23/21	6.6	7.5	8.4	22.8	23.5	25.0	73.0	74.3	77.0
6/24/21	7.2	7.7	8.5	22.3	22.9	23.5	72.1	73.3	74.4
6/25/21	7.1	7.9	8.7	22.2	22.8	23.2	72.0	73.0	73.8
6/26/21	6.5	7.6	8.5	23.0	23.9	24.5	73.4	74.9	76.0
6/27/21	6.5	7.4	8.2	24.4	24.9	25.4	75.9	76.9	77.7
6/28/21	6.3	7.2	7.8	25.1	25.6	26.2	77.2	78.0	79.1
6/29/21	6.4	7.4	8.0	26.0	26.6	27.2	78.8	79.8	81.0
6/30/21	6.7	7.2	7.8	26.6	27.0	27.6	79.8	80.7	81.8
7/1/21	6.1	6.9	7.4	26.1	26.8	27.1	79.1	80.2	80.9
7/2/21	6.8	7.1	8.0	24.2	25.3	26.3	75.6	77.5	79.3
7/3/21	6.9	7.6	8.0	21.3	22.1	24.4	70.3	71.8	75.9
7/4/21	7.7	7.9	8.2	20.4	21.1	22.5	68.7	70.0	72.6
7/5/21	7.2	7.6	8.0	22.6	23.1	24.2	72.6	73.6	75.5
7/6/21	5.9	7.2	8.0	24.2	24.9	25.6	75.6	76.9	78.2
7/7/21	6.2	6.9	7.7	25.5	25.9	26.2	77.9	78.6	79.2
7/8/21	5.9	6.7	7.5	25.3	25.8	26.3	77.5	78.4	79.3
7/9/21	5.8	7.0	7.6	24.8	25.1	25.4	76.6	77.2	77.7
7/10/21	6.8	7.2	7.7	24.6	24.9	25.4	76.3	76.7	77.7
7/11/21	6.8	7.3	7.8	24.7	25.5	26.1	76.5	77.8	79.0
7/12/21	6.7	7.2	7.7	24.9	25.9	26.6	76.8	78.6	79.8
7/13/21	6.5	7.0	7.5	25.7	26.1	26.6	78.3	79.0	79.9
7/14/21	6.6	7.2	7.7	25.5	25.8	26.3	77.9	78.5	79.4
7/15/21	6.9	7.3	7.8	25.7	26.2	26.7	78.2	79.1	80.1
7/16/21	6.6	7.2	7.7	26.4	26.6	27.1	79.5	79.9	80.8
7/17/21	6.3	7.1	7.6	26.5	26.7	27.0	79.7	80.1	80.6
7/18/21	5.8	7.1	7.8	26.2	26.8	27.2	79.1	80.3	80.9
7/19/21	6.9	7.4	7.8	24.7	25.4	26.8	76.5	77.6	80.2
7/20/21	6.9	7.2	7.8	24.3	24.7	25.1	75.8	76.5	77.1
7/21/21	6.8	7.3	7.9	24.5	24.8	25.2	76.0	76.7	77.3
7/22/21	6.4	7.1	7.8	24.7	25.0	25.5	76.5	77.0	77.8

Tailrace	Min. DO	Ave. DO	Max. DO	Min. T	Ave. T	Max. T	Min. T	Ave. T	Max. T
	mg/L	*mg/L*	*mg/L*	*°C*	*°C*	*°C*	*°F*	*°F*	*°F*
7/23/21	6.1	6.9	7.6	25.0	25.5	26.1	77.0	77.9	79.0
7/24/21	5.6	6.7	7.4	26.1	26.3	26.6	78.9	79.3	80.0
7/25/21	5.6	6.4	7.1	26.1	26.5	26.7	79.1	79.6	80.1
7/26/21	5.2	6.2	7.3	26.6	27.0	27.8	79.8	80.6	82.0
7/27/21	5.4	6.2	7.1	26.9	27.4	28.3	80.4	81.2	83.0
7/28/21	6.1	6.7	7.6	27.5	27.9	28.5	81.5	82.3	83.3
7/29/21	6.6	7.2	7.7	27.4	28.0	28.4	81.4	82.5	83.1
7/30/21	6.6	7.2	7.7	27.6	27.9	28.1	81.6	82.2	82.5
7/31/21	6.6	7.1	7.5	27.1	27.5	28.1	80.7	81.6	82.6
8/1/21	6.5	7.0	7.5	26.7	27.2	27.3	80.1	80.9	81.2
8/2/21	6.6	7.0	7.4	25.6	26.2	26.7	78.0	79.1	80.1
8/3/21	6.7	7.2	7.7	24.6	25.4	25.8	76.3	77.8	78.4
8/4/21	6.7	7.2	7.6	24.0	24.4	24.8	75.2	76.0	76.6
8/5/21	6.8	7.3	7.8	24.0	24.5	25.3	75.1	76.1	77.6
8/6/21	6.5	7.1	7.6	24.2	24.7	25.3	75.6	76.5	77.5
8/7/21	5.7	6.5	7.3	24.1	24.8	25.2	75.3	76.6	77.4
8/8/21	6.0	6.3	6.5	23.6	24.9	26.9	74.5	76.8	80.5
8/9/21	0.0	0.0	0.0	23.7	25.7	27.9	74.7	78.2	82.2
8/10/21	0.0	0.0	0.0	24.6	25.9	27.5	76.2	78.5	81.5
8/11/21	0.0	0.0	0.0	25.4	26.5	27.9	77.8	79.7	82.3
8/12/21	0.0	0.0	0.0	26.4	27.0	28.1	79.5	80.7	82.6
8/13/21	0.0	0.0	0.0	26.4	26.9	27.4	79.5	80.3	81.3
8/14/21	0.0	0.0	0.0	26.3	26.7	27.3	79.4	80.1	81.2
8/15/21	0.0	0.0	0.0	25.3	26.3	27.3	77.6	79.3	81.1
8/16/21	0.0	0.0	0.0	23.3	24.8	25.5	74.0	76.6	77.9
8/17/21	0.0	0.0	0.0	23.1	24.5	25.6	73.5	76.2	78.2
8/18/21	0.0	0.0	0.0	21.6	22.2	23.0	70.8	72.0	73.5
8/19/21	0.0	0.0	0.0	22.3	22.5	22.6	72.2	72.4	72.6
8/20/21	0.0	0.0	0.0	22.6	22.9	23.8	72.6	73.2	74.9
8/21/21	0.0	0.0	0.0	23.6	24.0	24.4	74.5	75.2	76.0
8/22/21	0.0	0.0	0.0	24.5	24.9	25.4	76.0	76.8	77.8
8/23/21	0.0	0.0	0.0	25.3	25.6	26.1	77.6	78.1	79.0
8/24/21	0.0	0.0	0.0	25.6	26.0	26.9	78.1	78.8	80.5
8/25/21	6.8	7.0	7.3	26.7	27.0	27.9	80.1	80.7	82.2
8/26/21	6.8	7.1	7.5	27.0	27.3	27.8	80.6	81.2	82.0
8/27/21	6.8	7.1	7.5	26.5	27.0	27.4	79.7	80.6	81.3
8/28/21	6.6	7.1	7.5	26.8	27.2	27.8	80.2	81.0	82.0
8/29/21	6.6	7.1	7.6	27.3	27.6	27.9	81.1	81.6	82.2
8/30/21	6.7	7.1	7.5	26.7	27.3	27.6	80.1	81.1	81.7

Tailrace	Min. DO	Ave. DO	Max. DO	Min. T	Ave. T	Max. T	Min. T	Ave. T	Max. T
	mg/L	*mg/L*	*mg/L*	*°C*	*°C*	*°C*	*°F*	*°F*	*°F*
8/31/21	6.6	7.0	7.5	25.0	26.2	26.7	77.1	79.2	80.1
9/1/21	6.7	7.1	7.5	23.3	24.4	25.0	74.0	75.9	77.1
9/2/21	7.5	7.8	8.1	22.4	23.0	23.7	72.3	73.4	74.7
9/3/21	7.6	8.0	8.5	21.8	22.3	23.4	71.3	72.2	74.2
9/4/21	7.2	7.9	8.4	22.2	22.7	23.2	72.0	72.8	73.7
9/5/21	7.3	7.7	8.3	22.3	22.9	23.4	72.1	73.2	74.2
9/6/21	7.1	7.5	8.1	23.1	23.4	23.8	73.6	74.1	74.8
9/7/21	7.2	7.7	8.2	23.0	23.4	23.9	73.3	74.1	75.1
9/8/21	6.8	7.7	8.5	23.1	23.4	23.9	73.5	74.2	75.0
9/9/21	7.4	7.9	8.6	23.2	23.7	23.9	73.8	74.7	75.1
9/10/21	7.6	8.0	8.5	21.9	22.7	23.2	71.4	72.9	73.8
9/11/21	7.8	8.3	8.9	21.2	21.8	22.2	70.2	71.3	72.0
9/12/21	7.9	8.5	9.0	21.1	21.7	22.3	70.1	71.0	72.2
9/13/21	7.7	8.3	9.0	21.8	22.4	23.0	71.3	72.4	73.3
9/14/21	7.4	8.1	8.8	22.9	23.4	24.2	73.2	74.1	75.6
9/15/21	7.2	8.0	8.6	23.4	23.8	24.5	74.2	74.9	76.1
9/16/21	6.8	7.8	8.5	23.5	23.8	24.1	74.2	74.8	75.4
9/17/21	7.1	7.9	8.6	23.3	23.5	23.8	73.9	74.4	74.9
9/18/21	7.3	7.9	8.6	23.2	23.6	23.9	73.7	74.4	75.0
9/19/21	7.2	7.9	8.6	23.4	23.8	24.5	74.2	74.8	76.0
9/20/21	7.0	7.7	8.4	23.2	23.7	24.0	73.7	74.6	75.2
9/21/21	7.0	7.7	8.3	21.7	22.8	23.2	71.0	73.1	73.7
9/22/21	7.2	7.9	8.4	20.2	20.7	21.6	68.4	69.3	71.0
9/23/21	7.9	8.4	9.2	18.8	19.6	20.6	65.8	67.3	69.1
9/24/21	8.2	8.7	9.5	18.0	18.6	19.4	64.5	65.4	66.9
9/25/21	8.5	8.9	9.6	18.0	18.3	18.6	64.4	64.9	65.6
9/26/21	8.5	8.9	9.5	18.0	18.3	18.6	64.4	65.0	65.4
9/27/21	8.3	8.8	9.4	18.0	18.5	19.0	64.4	65.2	66.2
9/28/21	8.6	9.0	9.4	18.3	18.6	18.8	65.0	65.5	65.9

Table 6. Byllesby Bypass Reach Monitoring Location - Daily Water Quality Data

Bypass Reach	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
6/15/21	8.1	8.3	8.5	23.2	23.4	23.6	73.8	74.0	74.4
6/16/21	7.9	8.3	8.9	21.8	23.0	24.3	71.2	73.4	75.8
6/17/21	7.8	8.3	9.0	21.2	22.5	24.1	70.2	72.5	75.5
6/18/21	7.8	8.4	9.1	21.5	23.0	24.7	70.7	73.3	76.5
6/19/21	7.5	8.3	9.2	22.8	24.0	25.6	73.0	75.1	78.0
6/20/21	7.3	8.0	9.0	23.8	25.2	27.1	74.9	77.3	80.8
6/21/21	7.1	7.8	8.8	24.8	25.9	27.7	76.6	78.6	81.9
6/22/21	7.1	7.7	8.7	23.9	25.3	26.2	75.1	77.5	79.1
6/23/21	7.4	8.2	9.0	22.4	23.4	24.4	72.4	74.1	75.9
6/24/21	7.8	8.4	9.1	21.8	22.9	24.4	71.3	73.2	75.9
6/25/21	7.7	8.3	9.1	21.4	23.1	25.5	70.6	73.6	77.8
6/26/21	7.4	8.0	8.8	22.6	24.1	26.3	72.6	75.4	79.3
6/27/21	7.1	7.7	8.4	23.9	25.2	27.2	75.1	77.3	81.0
6/28/21	7.0	7.6	8.5	24.6	25.7	27.0	76.3	78.3	80.6
6/29/21	7.2	7.6	7.9	25.4	26.1	26.7	77.7	79.0	80.0
6/30/21	6.9	7.5	8.2	25.6	27.0	28.7	78.1	80.6	83.7
7/1/21	6.9	7.3	8.2	25.5	26.5	28.3	77.8	79.7	82.9
7/2/21	6.9	7.6	8.2	24.3	25.0	25.9	75.7	77.0	78.6
7/3/21	8.2	8.6	8.8	21.3	22.0	24.2	70.3	71.6	75.5
7/4/21	8.3	8.7	8.9	20.4	21.2	22.5	68.7	70.1	72.5
7/5/21	7.9	8.3	8.5	22.4	23.1	24.2	72.4	73.6	75.5
7/6/21	7.5	7.8	8.2	24.2	25.0	26.0	75.6	77.0	78.8
7/7/21	7.2	7.6	8.0	25.5	26.0	27.0	77.9	78.9	80.6
7/8/21	7.2	7.6	8.2	25.1	25.7	26.0	77.1	78.3	78.8
7/9/21	7.4	7.7	7.9	24.4	24.8	25.1	76.0	76.6	77.1
7/10/21	7.1	7.8	8.4	24.3	25.0	26.5	75.8	77.1	79.7
7/11/21	6.7	7.5	8.2	24.2	25.7	28.3	75.6	78.3	82.9
7/12/21	6.2	7.1	7.8	24.9	26.2	28.0	76.8	79.2	82.4
7/13/21	6.3	6.9	7.6	25.0	26.1	27.8	77.1	79.0	82.0
7/14/21	6.5	7.5	8.7	25.1	25.8	27.0	77.1	78.5	80.6
7/15/21	7.0	7.8	8.6	25.0	26.3	28.0	77.1	79.4	82.3
7/16/21	7.0	7.6	8.4	25.6	26.7	28.8	78.0	80.0	83.8
7/17/21	6.8	7.5	8.4	25.9	26.6	28.0	78.6	79.9	82.3
7/18/21	6.7	7.4	8.3	25.7	26.6	28.2	78.3	79.8	82.7
7/19/21	7.0	7.7	8.3	24.6	25.4	26.1	76.3	77.8	78.9
7/20/21	7.3	7.9	8.4	24.1	24.8	26.0	75.3	76.7	78.8
7/21/21	7.2	7.7	8.5	24.1	24.9	26.3	75.3	76.8	79.3
7/22/21	6.9	7.6	8.3	24.0	25.0	26.5	75.2	77.1	79.7

Bypass Reach	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
7/23/21	6.6	7.5	8.3	24.4	25.6	27.4	75.9	78.0	81.3
7/24/21	6.3	7.1	7.8	25.3	26.5	28.5	77.5	79.7	83.3
7/25/21	5.9	6.8	7.6	25.8	26.7	28.1	78.4	80.0	82.5
7/26/21	5.3	6.6	7.4	26.2	27.1	28.5	79.2	80.8	83.2
7/27/21	5.3	6.0	6.9	26.4	27.4	28.8	79.6	81.4	83.9
7/28/21	5.4	6.2	7.1	27.0	27.8	28.9	80.6	82.1	84.1
7/29/21	5.6	6.9	8.4	27.0	27.9	29.6	80.5	82.2	85.2
7/30/21	6.9	7.5	8.3	26.9	27.6	28.7	80.4	81.7	83.7
7/31/21	6.9	7.5	8.4	26.2	27.4	29.3	79.2	81.3	84.7
8/1/21	6.8	7.5	8.3	25.9	26.8	28.0	78.6	80.3	82.4
8/2/21	7.0	7.7	8.5	24.9	25.7	27.3	76.8	78.3	81.1
8/3/21	7.2	7.7	8.6	24.0	25.1	25.9	75.3	77.2	78.6
8/4/21	7.3	7.9	8.6	23.4	24.3	26.0	74.1	75.7	78.8
8/5/21	7.1	7.8	8.6	23.2	24.6	26.6	73.8	76.2	79.9
8/6/21	6.9	7.8	8.6	23.4	24.9	27.0	74.2	76.8	80.6
8/7/21	6.7	7.5	8.7	23.3	24.6	26.5	74.0	76.3	79.7
8/8/21	0.0	0.0	0.0	22.6	24.8	28.0	72.7	76.7	82.4
8/9/21	0.0	0.0	0.0	20.0	23.8	27.1	67.9	74.8	80.7
8/10/21	0.0	0.0	0.0	21.4	23.2	26.3	70.5	73.8	79.4
8/11/21	0.0	0.0	0.0	21.7	24.6	29.9	71.0	76.2	85.8
8/12/21	0.0	0.0	0.0	19.3	22.5	27.7	66.8	72.4	81.8
8/13/21	0.0	0.0	0.0	21.5	24.7	27.8	70.7	76.5	82.0
8/14/21	0.0	0.0	0.0	23.8	26.2	29.2	74.8	79.1	84.5
8/15/21	0.0	0.0	0.0	24.2	25.8	27.7	75.6	78.5	81.8
8/16/21	0.0	0.0	0.0	23.6	25.1	27.7	74.5	77.2	81.9
8/17/21	0.0	0.0	0.0	23.2	23.7	24.8	73.8	74.7	76.7
8/18/21	0.0	0.0	0.0	21.4	22.2	23.3	70.5	71.9	74.0
8/19/21	0.0	0.0	0.0	21.3	21.9	22.8	70.3	71.4	73.0
8/20/21	0.0	0.0	0.0	22.5	23.2	25.4	72.5	73.8	77.8
8/21/21	0.0	0.0	0.0	21.7	23.5	25.9	71.0	74.2	78.6
8/22/21	0.0	0.0	0.0	22.9	24.6	27.5	73.2	76.2	81.5
8/23/21	0.0	0.0	0.0	23.1	24.9	28.4	73.7	76.9	83.2
8/24/21	0.0	0.0	0.0	22.7	25.4	28.8	72.9	77.7	83.8
8/25/21	6.9	8.1	8.5	23.7	26.2	29.2	74.7	79.2	84.6
8/26/21	6.8	7.7	8.7	23.5	26.2	29.2	74.3	79.2	84.6
8/27/21	6.7	7.7	9.2	23.9	26.1	29.3	75.1	79.0	84.8
8/28/21	6.7	7.9	9.9	23.2	26.2	29.6	73.8	79.2	85.2
8/29/21	6.7	7.9	9.6	23.4	26.3	29.2	74.1	79.3	84.5
8/30/21	6.6	7.8	9.7	23.7	25.9	28.3	74.7	78.6	82.9

Bypass Reach	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
8/31/21	6.4	7.6	9.3	23.4	24.7	26.2	74.1	76.4	79.2
9/1/21	6.4	7.5	9.3	22.0	23.9	25.7	71.6	75.0	78.3
9/2/21	6.8	7.9	8.6	21.0	22.3	23.3	69.7	72.1	73.9
9/3/21	6.8	7.7	9.1	20.1	21.6	22.8	68.1	70.8	73.0
9/4/21	7.1	8.2	9.4	19.7	22.0	24.3	67.4	71.6	75.8
9/5/21	7.0	8.4	10.9	19.5	22.6	26.2	67.2	72.6	79.2
9/6/21	6.6	8.2	10.0	21.0	23.0	25.4	69.9	73.5	77.8
9/7/21	7.3	8.3	9.8	19.1	22.1	25.1	66.3	71.7	77.1
9/8/21	6.9	8.4	10.2	20.1	22.9	25.7	68.2	73.2	78.2
9/9/21	6.9	7.8	8.2	20.3	22.6	24.1	68.5	72.7	75.4
9/10/21	7.4	8.5	10.2	18.0	20.7	24.1	64.4	69.3	75.3
9/11/21	7.6	8.6	9.9	17.3	20.4	23.2	63.1	68.6	73.8
9/12/21	7.4	8.7	10.9	17.8	21.0	24.1	64.1	69.8	75.3
9/13/21	7.2	8.7	10.7	19.0	21.7	24.4	66.1	71.0	75.9
9/14/21	7.1	8.4	10.4	19.8	22.3	25.2	67.7	72.1	77.4
9/15/21	7.0	8.2	9.6	19.8	22.5	24.9	67.6	72.5	76.9
9/16/21	6.7	8.1	9.6	21.0	22.6	24.0	69.8	72.7	75.2
9/17/21	6.6	8.3	10.7	21.6	22.9	25.0	70.8	73.3	77.1
9/18/21	6.8	8.5	10.7	21.0	22.8	25.3	69.7	73.1	77.5
9/19/21	6.9	8.2	9.5	20.8	22.7	24.9	69.4	72.8	76.9
9/20/21	6.7	8.2	9.8	20.3	22.2	23.7	68.6	72.0	74.6
9/21/21	6.8	8.0	9.2	20.2	20.8	21.8	68.4	69.5	71.3
9/22/21	6.6	7.9	9.1	18.4	20.2	21.6	65.1	68.4	71.0
9/23/21	7.6	8.7	10.3	16.5	18.1	20.4	61.8	64.5	68.7
9/24/21	8.2	9.6	11.9	14.8	17.5	21.0	58.6	63.5	69.7
9/25/21	8.2	9.6	11.5	14.0	17.2	20.6	57.2	63.0	69.1
9/26/21	8.1	9.4	11.3	14.7	17.3	20.5	58.5	63.1	68.8
9/27/21	7.3	8.8	10.4	14.0	17.4	21.6	57.2	63.4	70.9
9/28/21	7.4	8.3	10.4	15.8	17.1	20.6	60.4	62.9	69.0

Table 1. Buck Forebay Bottom Monitoring Location - Daily Water Quality Data

Forebay Bottom	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
8/20/2020	7.58	7.87	8.24	22.66	23.11	23.58	72.79	73.60	74.44
8/21/2020	7.83	7.98	8.20	22.06	22.74	23.28	71.71	72.93	73.90
8/22/2020	7.98	8.13	8.33	21.82	22.23	22.78	71.28	72.02	73.00
8/23/2020	8.20	8.39	8.55	21.54	21.97	22.52	70.77	71.55	72.54
8/24/2020	8.07	8.41	8.57	21.28	21.80	22.60	70.30	71.23	72.68
8/25/2020	7.93	8.15	8.47	22.46	23.03	23.58	72.43	73.45	74.44
8/26/2020	7.76	8.01	8.30	23.28	23.81	24.56	73.90	74.86	76.21
8/27/2020	7.58	7.83	8.12	23.66	24.57	25.48	74.59	76.23	77.86
8/28/2020	7.46	7.69	8.04	24.12	24.81	25.84	75.42	76.65	78.51
8/29/2020	7.46	7.74	8.18	24.04	24.56	25.40	75.27	76.21	77.72
8/30/2020	7.58	7.91	8.39	23.90	24.34	25.28	75.02	75.82	77.50
8/31/2020	7.56	7.77	8.01	23.18	24.13	24.66	73.72	75.43	76.39
9/1/2020	7.74	7.99	8.47	23.12	23.33	24.32	73.62	74.00	75.78
9/2/2020	7.70	8.03	8.56	23.28	23.75	24.36	73.90	74.74	75.85
9/3/2020	7.51	7.83	8.34	23.98	24.57	25.14	75.16	76.22	77.25
9/4/2020	7.38	7.76	8.35	24.40	25.00	25.98	75.92	77.00	78.76
9/5/2020	7.41	7.86	8.51	23.86	24.81	25.76	74.95	76.66	78.37
9/6/2020	7.59	8.05	8.83	22.86	23.67	24.68	73.15	74.60	76.42
9/7/2020	7.72	8.20	8.94	22.04	22.83	24.14	71.67	73.10	75.45
9/8/2020	7.64	8.23	9.13	21.94	22.88	24.36	71.49	73.18	75.85
9/9/2020	7.60	8.09	8.88	22.34	22.92	23.46	72.21	73.26	74.23
9/10/2020	7.45	8.28	9.24	22.48	22.96	23.86	72.46	73.32	74.95
9/11/2020	7.69	8.24	9.11	22.62	23.43	24.60	72.72	74.18	76.28
9/12/2020	7.53	7.85	8.45	23.42	23.78	24.16	74.16	74.81	75.49
9/13/2020	7.83	8.30	8.46	21.82	22.39	23.58	71.28	72.30	74.44
9/14/2020	8.17	8.39	8.61	21.12	21.55	21.98	70.02	70.79	71.56
9/15/2020	8.11	8.32	8.62	20.42	21.26	21.86	68.76	70.26	71.35
9/16/2020	8.29	8.57	9.07	19.44	20.28	20.90	66.99	68.51	69.62
9/17/2020	8.33	8.51	8.62	18.76	19.64	20.18	65.77	67.35	68.32
9/18/2020	8.62	8.83	9.10	18.42	18.74	19.06	65.16	65.73	66.31
9/19/2020	8.74	9.04	9.37	17.60	18.29	19.00	63.68	64.92	66.20
9/20/2020	9.08	9.49	9.98	16.32	16.94	17.56	61.38	62.49	63.61
9/21/2020	9.22	9.56	10.09	15.62	16.61	17.48	60.12	61.90	63.46
9/22/2020	9.10	9.46	9.81	15.58	16.45	17.74	60.04	61.62	63.93
9/23/2020	8.89	9.24	9.56	15.66	16.61	17.58	60.19	61.90	63.64
9/24/2020	8.66	8.99	9.29	16.20	16.86	17.42	61.16	62.35	63.36
9/25/2020	8.62	8.97	9.30	16.02	16.50	16.74	60.84	61.71	62.13
9/26/2020	9.13	9.45	9.79	15.78	16.33	17.30	60.40	61.39	63.14
9/27/2020	8.94	9.13	9.40	17.10	17.43	17.86	62.78	63.38	64.15

Forebay Bottom	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
9/28/2020	8.68	8.90	9.18	17.80	18.38	19.10	64.04	65.08	66.38
9/29/2020	8.38	8.71	9.30	16.98	18.88	19.70	62.56	65.99	67.46
9/30/2020	9.24	9.49	9.70	15.64	16.24	16.96	60.15	61.23	62.53
10/1/2020	9.22	9.47	9.73	15.52	16.06	16.50	59.94	60.91	61.70
10/2/2020	9.14	9.42	9.78	15.32	16.05	16.62	59.58	60.88	61.92
10/3/2020	9.28	9.59	9.95	14.36	15.48	16.38	57.85	59.86	61.48
10/4/2020	9.45	9.75	10.14	14.34	15.01	16.08	57.81	59.01	60.94
10/5/2020	9.43	9.69	9.95	14.20	15.24	16.56	57.56	59.43	61.81
10/6/2020	9.26	9.55	9.84	14.42	15.35	16.70	57.96	59.63	62.06
10/7/2020	9.23	9.41	9.55	14.82	15.28	15.86	58.68	59.51	60.55

Table 2. Buck Forebay Surface Monitoring Location - Daily Water Quality Data

Forebay Surface	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
8/20/2020	7.66	8.02	8.43	22.70	23.23	24.00	72.86	73.82	75.20
8/21/2020	7.96	8.11	8.32	22.10	22.84	23.36	71.78	73.12	74.05
8/22/2020	8.10	8.24	8.49	21.86	22.39	23.54	71.35	72.30	74.37
8/23/2020	8.35	8.54	8.76	21.60	22.06	22.56	70.88	71.71	72.61
8/24/2020	8.25	8.44	8.57	21.38	21.91	22.70	70.48	71.44	72.86
8/25/2020	8.08	8.27	8.52	22.60	23.15	23.82	72.68	73.68	74.88
8/26/2020	7.85	8.13	8.53	23.44	24.05	25.12	74.19	75.29	77.22
8/27/2020	7.69	7.99	8.36	23.72	24.78	25.80	74.70	76.60	78.44
8/28/2020	7.66	7.91	8.47	24.16	25.04	26.38	75.49	77.06	79.48
8/29/2020	7.65	7.91	8.44	24.08	24.69	25.58	75.34	76.44	78.04
8/30/2020	7.67	8.04	8.70	23.92	24.53	25.76	75.06	76.15	78.37
8/31/2020	7.67	7.92	8.22	23.24	24.21	24.70	73.83	75.57	76.46
9/1/2020	7.92	8.14	8.74	23.20	23.49	24.44	73.76	74.29	75.99
9/2/2020	7.81	8.07	8.50	23.36	23.87	24.50	74.05	74.97	76.10
9/3/2020	7.64	7.90	8.39	24.10	24.72	25.56	75.38	76.50	78.01
9/4/2020	7.48	7.89	8.60	24.46	25.23	26.36	76.03	77.41	79.45
9/5/2020	7.60	8.07	8.87	24.00	25.02	26.14	75.20	77.04	79.05
9/6/2020	7.80	8.31	9.14	22.94	23.96	25.18	73.29	75.13	77.32
9/7/2020	7.88	8.50	9.49	22.06	23.35	25.44	71.71	74.02	77.79
9/8/2020	7.92	8.48	9.45	21.98	23.20	24.92	71.56	73.76	76.86
9/9/2020	7.77	8.30	9.14	22.38	23.05	23.66	72.28	73.49	74.59
9/10/2020	7.70	8.50	9.61	22.54	23.22	24.76	72.57	73.79	76.57
9/11/2020	7.89	8.50	9.53	22.68	23.79	25.16	72.82	74.83	77.29
9/12/2020	7.71	8.05	8.77	23.50	23.86	24.22	74.30	74.94	75.60
9/13/2020	7.94	8.49	8.70	21.86	22.45	23.58	71.35	72.42	74.44
9/14/2020	8.34	8.53	8.68	21.20	21.62	22.04	70.16	70.91	71.67
9/15/2020	8.25	8.50	8.93	20.44	21.33	21.90	68.79	70.39	71.42
9/16/2020	8.49	8.76	9.41	19.48	20.44	21.16	67.06	68.79	70.09
9/17/2020	8.47	8.64	8.84	18.80	19.70	20.24	65.84	67.45	68.43
9/18/2020	8.74	8.92	9.23	18.48	18.78	19.12	65.26	65.81	66.42
9/19/2020	8.90	9.19	9.47	17.64	18.34	19.00	63.75	65.02	66.20
9/20/2020	9.22	9.58	9.99	16.34	17.03	17.74	61.41	62.66	63.93
9/21/2020	9.39	9.67	10.15	15.64	16.78	17.80	60.15	62.21	64.04
9/22/2020	9.26	9.61	9.98	15.62	16.69	18.10	60.12	62.04	64.58
9/23/2020	9.14	9.52	9.94	15.70	16.81	18.02	60.26	62.26	64.44
9/24/2020	9.03	9.35	9.80	16.24	16.96	17.48	61.23	62.52	63.46
9/25/2020	9.00	9.26	9.48	16.08	16.56	16.80	60.94	61.81	62.24
9/26/2020	9.24	9.55	9.93	15.82	16.43	17.36	60.48	61.58	63.25
9/27/2020	9.03	9.26	9.56	17.18	17.56	18.18	62.92	63.60	64.72

Forebay Surface	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
9/28/2020	8.78	8.99	9.32	17.86	18.48	19.14	64.15	65.26	66.45
9/29/2020	8.42	8.76	9.43	16.98	18.93	19.78	62.56	66.07	67.60
9/30/2020	9.42	9.63	9.86	15.70	16.30	16.96	60.26	61.34	62.53
10/1/2020	9.34	9.57	9.73	15.60	16.15	16.50	60.08	61.07	61.70
10/2/2020	9.24	9.51	9.95	15.36	16.11	16.68	59.65	60.99	62.02
10/3/2020	9.41	9.69	10.18	14.40	15.65	16.56	57.92	60.17	61.81
10/4/2020	9.58	9.85	10.20	14.38	15.18	16.32	57.88	59.32	61.38
10/5/2020	9.54	9.84	10.16	14.24	15.40	16.80	57.63	59.72	62.24
10/6/2020	9.48	9.79	10.12	14.44	15.54	17.02	57.99	59.98	62.64
10/7/2020	9.43	9.59	9.73	14.90	15.41	16.34	58.82	59.74	61.41

Table 3. Buck Tailrace Monitoring Location - Daily Water Quality Data

Tailrace	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
8/20/2020	8.30	8.39	8.47	22.62	23.09	23.58	72.72	73.55	74.44
8/21/2020	8.28	8.41	8.53	22.00	22.71	23.22	71.60	72.88	73.80
8/22/2020	8.47	8.55	8.61	21.78	22.23	22.92	71.20	72.01	73.26
8/23/2020	8.52	8.67	8.77	21.48	21.95	22.46	70.66	71.50	72.43
8/24/2020	8.49	8.68	8.76	21.26	21.78	22.54	70.27	71.21	72.57
8/25/2020	8.39	8.50	8.61	22.50	23.02	23.62	72.50	73.44	74.52
8/26/2020	8.30	8.40	8.50	23.32	23.86	24.78	73.98	74.94	76.60
8/27/2020	8.15	8.26	8.37	23.60	24.59	25.52	74.48	76.26	77.94
8/28/2020	8.11	8.19	8.28	24.06	24.82	25.82	75.31	76.68	78.48
8/29/2020	8.09	8.20	8.34	24.02	24.55	25.38	75.24	76.18	77.68
8/30/2020	8.15	8.28	8.44	23.80	24.35	25.38	74.84	75.83	77.68
8/31/2020	8.13	8.24	8.38	23.16	24.09	24.58	73.69	75.36	76.24
9/1/2020	8.34	8.42	8.60	23.08	23.32	24.28	73.54	73.98	75.70
9/2/2020	8.20	8.36	8.52	23.22	23.72	24.32	73.80	74.70	75.78
9/3/2020	8.06	8.20	8.36	23.98	24.55	25.18	75.16	76.20	77.32
9/4/2020	7.99	8.16	8.36	24.38	25.03	26.04	75.88	77.05	78.87
9/5/2020	8.12	8.28	8.47	23.92	24.83	25.82	75.06	76.69	78.48
9/6/2020	8.30	8.48	8.68	22.92	23.72	24.76	73.26	74.70	76.57
9/7/2020	8.45	8.60	8.77	21.96	22.95	24.26	71.53	73.31	75.67
9/8/2020	8.45	8.63	8.86	21.86	22.95	24.40	71.35	73.31	75.92
9/9/2020	8.50	8.64	8.87	22.28	22.92	23.48	72.10	73.25	74.26
9/10/2020	8.45	8.68	8.92	22.44	23.00	23.88	72.39	73.40	74.98
9/11/2020	8.44	8.58	8.78	22.58	23.52	24.72	72.64	74.33	76.50
9/12/2020	8.12	8.39	8.63	23.38	23.74	24.10	74.08	74.73	75.38
9/13/2020	8.30	8.62	8.74	21.76	22.36	23.50	71.17	72.24	74.30
9/14/2020	8.64	8.75	8.82	21.08	21.51	21.94	69.94	70.72	71.49
9/15/2020	8.66	8.83	9.00	20.34	21.21	21.78	68.61	70.18	71.20
9/16/2020	8.93	9.05	9.20	19.42	20.27	20.88	66.96	68.48	69.58
9/17/2020	8.93	9.02	9.14	18.72	19.60	20.12	65.70	67.27	68.22
9/18/2020	9.14	9.22	9.31	18.38	18.70	19.02	65.08	65.65	66.24
9/19/2020	9.17	9.41	9.60	17.56	18.25	18.92	63.61	64.85	66.06
9/20/2020	9.52	9.81	9.99	16.24	16.93	17.56	61.23	62.47	63.61
9/21/2020	9.75	9.91	10.06	15.60	16.62	17.50	60.08	61.92	63.50
9/22/2020	9.77	9.86	9.99	15.54	16.50	17.82	59.97	61.70	64.08
9/23/2020	9.66	9.78	9.91	15.60	16.64	17.64	60.08	61.95	63.75
9/24/2020	9.55	9.68	9.77	16.18	16.84	17.38	61.12	62.31	63.28
9/25/2020	9.55	9.67	9.76	16.00	16.48	16.76	60.80	61.66	62.17
9/26/2020	9.48	9.76	9.92	15.74	16.32	17.28	60.33	61.37	63.10

Tailrace	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
9/27/2020	9.40	9.51	9.63	17.10	17.42	17.92	62.78	63.36	64.26
9/28/2020	9.19	9.31	9.42	17.74	18.36	19.04	63.93	65.05	66.27
9/29/2020	8.94	9.12	9.58	16.92	18.83	19.68	62.46	65.90	67.42
9/30/2020	9.57	9.77	9.95	15.60	16.20	16.90	60.08	61.16	62.42
10/1/2020	9.65	9.79	9.90	15.50	16.05	16.42	59.90	60.88	61.56
10/2/2020	9.65	9.83	10.01	15.26	16.02	16.58	59.47	60.83	61.84
10/3/2020	9.88	9.99	10.17	14.34	15.48	16.38	57.81	59.87	61.48
10/4/2020	10.05	10.11	10.20	14.30	15.01	16.08	57.74	59.02	60.94
10/5/2020	10.00	10.07	10.21	14.18	15.26	16.56	57.52	59.46	61.81
10/6/2020	9.89	10.03	10.14	14.36	15.38	16.76	57.85	59.69	62.17
10/7/2020	9.80	9.93	10.06	14.80	15.39	16.62	58.64	59.70	61.92

Table 4. Buck Upstream Bypass Reach Monitoring Location - Daily Water Quality Data

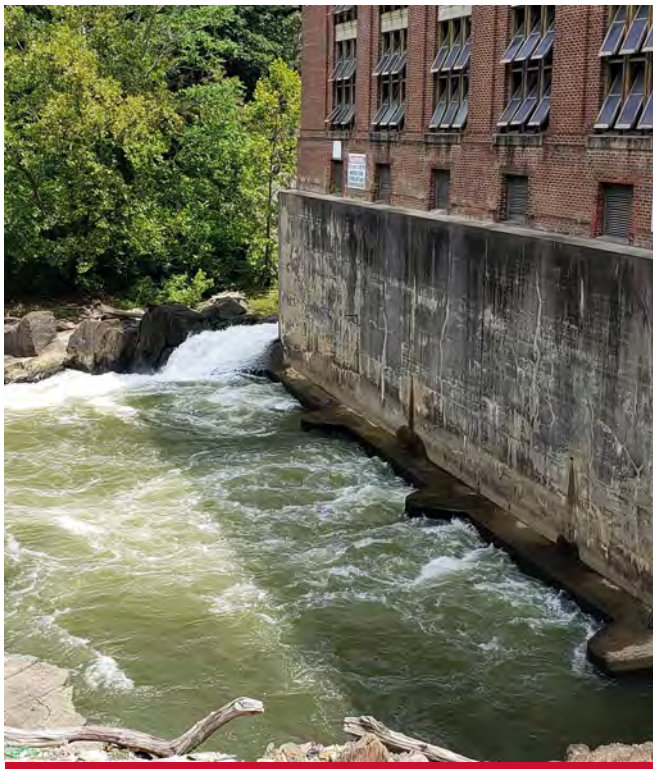
Bypass Reach Upstream	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
8/20/2020	6.62	7.01	7.36	22.10	22.89	24.26	71.78	73.20	75.67
8/21/2020	7.08	7.43	7.68	22.18	22.65	23.16	71.92	72.76	73.69
8/22/2020	7.52	7.77	8.19	21.74	22.32	23.12	71.13	72.18	73.62
8/23/2020	7.77	8.01	8.26	21.60	22.00	23.18	70.88	71.61	73.72
8/24/2020	7.73	8.00	8.28	21.10	21.78	22.62	69.98	71.21	72.72
8/25/2020	7.56	7.90	8.17	21.68	22.75	23.86	71.02	72.96	74.95
8/26/2020	7.38	7.73	8.03	22.58	23.51	24.80	72.64	74.32	76.64
8/27/2020	7.19	7.58	7.85	23.18	24.27	25.40	73.72	75.69	77.72
8/28/2020	7.30	7.56	7.95	23.80	24.63	25.72	74.84	76.33	78.30
8/29/2020	7.35	7.54	7.80	23.82	24.57	25.70	74.88	76.23	78.26
8/30/2020	7.36	7.64	7.89	23.32	24.24	25.32	73.98	75.63	77.58
8/31/2020	7.36	7.59	7.83	23.58	23.91	24.40	74.44	75.04	75.92
9/1/2020	7.32	7.49	7.75	22.96	23.51	24.42	73.33	74.32	75.96
9/2/2020	7.29	7.45	7.67	22.88	23.69	25.04	73.18	74.64	77.07
9/3/2020	6.83	7.32	7.64	23.44	24.26	25.32	74.19	75.67	77.58
9/4/2020	6.59	6.98	7.24	23.86	24.79	25.92	74.95	76.63	78.66
9/5/2020	6.54	7.01	7.34	23.38	24.39	25.56	74.08	75.90	78.01
9/6/2020	6.70	7.08	7.34	22.26	23.41	24.44	72.07	74.13	75.99
9/7/2020	6.67	7.11	7.43	21.38	22.77	23.88	70.48	72.99	74.98
9/8/2020	7.08	7.56	8.25	21.42	22.88	24.34	70.56	73.19	75.81
9/9/2020	8.11	8.33	8.60	22.10	22.88	23.58	71.78	73.18	74.44
9/10/2020	8.03	8.28	8.53	22.52	23.12	23.88	72.54	73.62	74.98
9/11/2020	7.81	8.13	8.43	22.40	23.52	24.70	72.32	74.34	76.46
9/12/2020	7.89	8.03	8.24	23.24	23.61	23.98	73.83	74.50	75.16
9/13/2020	7.91	8.07	8.33	22.02	22.61	23.34	71.64	72.69	74.01
9/14/2020	7.91	8.15	8.40	21.40	21.70	22.00	70.52	71.05	71.60
9/15/2020	8.18	8.35	8.51	20.44	21.13	21.40	68.79	70.03	70.52
9/16/2020	8.28	8.61	8.83	19.52	20.21	21.20	67.14	68.38	70.16
9/17/2020	8.43	8.58	8.74	19.18	19.47	19.82	66.52	67.05	67.68
9/18/2020	8.45	8.64	9.01	18.54	18.93	19.50	65.37	66.08	67.10
9/19/2020	8.41	8.77	8.97	17.62	18.23	18.54	63.72	64.81	65.37
9/20/2020	8.81	9.01	9.25	16.18	17.05	17.94	61.12	62.69	64.29
9/21/2020	8.79	9.10	9.37	15.44	16.39	17.70	59.79	61.51	63.86
9/22/2020	8.47	8.94	9.26	15.12	16.27	17.66	59.22	61.28	63.79
9/23/2020	8.47	8.79	9.00	15.48	16.55	17.54	59.86	61.79	63.57
9/24/2020	8.21	8.64	9.05	16.22	16.83	17.40	61.20	62.30	63.32
9/25/2020	8.34	8.67	8.95	16.24	16.53	17.02	61.23	61.75	62.64
9/26/2020	8.16	8.69	9.32	15.96	16.59	17.46	60.73	61.86	63.43

Bypass Reach Upstream	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
9/27/2020	8.18	8.37	8.64	16.84	17.42	18.10	62.31	63.36	64.58
9/28/2020	8.32	8.62	8.85	17.48	18.34	19.48	63.46	65.01	67.06
9/29/2020	8.16	8.50	8.86	16.58	18.24	19.16	61.84	64.83	66.49
9/30/2020	8.47	8.84	9.26	15.40	16.13	16.98	59.72	61.04	62.56
10/1/2020	8.17	8.47	9.01	15.34	15.98	16.84	59.61	60.77	62.31
10/2/2020	8.70	8.91	9.13	15.16	15.85	16.76	59.29	60.53	62.17
10/3/2020	8.75	9.07	9.36	14.50	15.29	16.48	58.10	59.51	61.66
10/4/2020	8.47	8.94	9.28	13.88	14.84	15.92	56.98	58.71	60.66
10/5/2020	8.35	8.72	9.09	14.00	15.17	16.44	57.20	59.31	61.59
10/6/2020	7.96	8.49	8.88	13.94	15.31	16.72	57.09	59.56	62.10
10/7/2020	8.15	8.62	8.96	14.58	15.58	17.48	58.24	60.04	63.46

Table 5. Buck Downstream Bypass Reach Monitoring Location - Daily Water Quality Data

Bypass Reach Downstream	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
8/20/2020	6.00	6.92	8.78	21.54	23.06	24.92	70.77	73.51	76.86
8/21/2020	6.19	7.22	8.55	21.78	22.88	24.54	71.20	73.19	76.17
8/22/2020	7.34	7.93	8.92	21.56	23.09	25.76	70.81	73.55	78.37
8/23/2020	8.33	8.42	8.53	21.68	22.11	22.78	71.02	71.79	73.00
8/24/2020	7.69	8.34	8.57	21.26	22.56	24.54	70.27	72.62	76.17
8/25/2020	7.34	7.96	8.95	21.50	24.20	27.84	70.70	75.55	82.11
8/26/2020	7.18	8.02	9.36	21.50	24.61	28.10	70.70	76.30	82.58
8/27/2020	6.98	8.12	9.34	22.60	25.10	27.96	72.68	77.18	82.33
8/28/2020	7.04	8.06	9.56	23.30	25.05	27.20	73.94	77.09	80.96
8/29/2020	6.98	7.87	9.41	23.50	25.08	26.98	74.30	77.15	80.56
8/30/2020	7.07	8.02	9.66	22.44	24.84	27.44	72.39	76.71	81.39
8/31/2020	6.99	7.96	9.26	22.88	23.88	25.26	73.18	74.99	77.47
9/1/2020	7.10	7.93	9.59	22.74	24.14	25.88	72.93	75.45	78.58
9/2/2020	6.95	7.94	9.49	22.48	24.74	27.68	72.46	76.54	81.82
9/3/2020	6.59	7.80	9.31	22.86	25.25	28.00	73.15	77.44	82.40
9/4/2020	6.54	7.64	9.34	22.98	25.57	28.38	73.36	78.02	83.08
9/5/2020	6.60	7.78	9.44	22.06	24.49	26.56	71.71	76.09	79.81
9/6/2020	6.96	7.99	9.51	20.70	23.27	25.98	69.26	73.88	78.76
9/7/2020	7.19	8.05	9.47	20.42	23.04	26.04	68.76	73.47	78.87
9/8/2020	7.13	8.19	9.77	20.96	23.27	25.90	69.73	73.89	78.62
9/9/2020	7.38	8.35	9.70	21.80	23.08	24.44	71.24	73.55	75.99
9/10/2020	7.40	8.06	8.75	22.46	23.35	24.18	72.43	74.03	75.52
9/11/2020	7.18	8.05	9.60	22.16	23.97	26.46	71.89	75.15	79.63
9/12/2020	7.06	7.94	9.13	23.04	23.67	24.82	73.47	74.60	76.68
9/13/2020	8.00	8.47	8.59	21.88	22.45	23.48	71.38	72.41	74.26
9/14/2020	7.78	8.39	8.62	21.26	22.13	23.36	70.27	71.83	74.05
9/15/2020	7.55	8.27	8.79	20.12	21.03	22.12	68.22	69.86	71.82
9/16/2020	7.98	8.58	9.01	18.50	20.07	21.10	65.30	68.12	69.98
9/17/2020	7.92	8.47	9.08	18.54	18.96	19.92	65.37	66.13	67.86
9/18/2020	8.07	8.71	9.56	18.60	19.03	19.84	65.48	66.26	67.71
9/19/2020	8.75	9.24	9.54	17.46	18.42	18.80	63.43	65.15	65.84
9/20/2020	8.65	9.22	10.33	14.76	16.91	19.32	58.57	62.44	66.78
9/21/2020	8.89	9.53	10.57	13.90	16.46	18.98	57.02	61.64	66.16
9/22/2020	8.84	9.49	10.47	13.96	16.62	19.46	57.13	61.92	67.03
9/23/2020	8.75	9.50	10.61	15.14	17.10	19.34	59.25	62.79	66.81
9/24/2020	8.69	9.47	10.71	16.28	17.21	18.08	61.30	62.99	64.54
9/25/2020	8.64	9.30	10.10	16.02	16.52	17.20	60.84	61.73	62.96
9/26/2020	8.40	9.21	9.76	15.86	16.69	17.62	60.55	62.04	63.72

Bypass Reach Downstream	Min. DO *mg/L*	Ave. DO *mg/L*	Max. DO *mg/L*	Min. T *°C*	Ave. T *°C*	Max. T *°C*	Min. T *°F*	Ave. T *°F*	Max. T *°F*
9/27/2020	8.54	9.11	10.11	16.58	18.05	20.30	61.84	64.49	68.54
9/28/2020	8.16	8.90	10.01	17.42	18.86	20.50	63.36	65.95	68.90
9/29/2020	7.87	8.65	9.43	17.00	18.32	19.56	62.60	64.98	67.21
9/30/2020	9.42	9.57	9.77	15.70	16.29	16.96	60.26	61.33	62.53
10/1/2020	8.66	9.34	9.85	15.20	16.74	18.78	59.36	62.13	65.80
10/2/2020	8.61	9.30	10.22	14.22	16.07	17.54	57.60	60.93	63.57
10/3/2020	8.88	9.55	10.48	13.22	15.06	17.14	55.80	59.11	62.85
10/4/2020	9.06	9.78	10.73	13.00	14.90	17.06	55.40	58.82	62.71
10/5/2020	8.95	9.66	10.87	13.50	15.48	17.50	56.30	59.86	63.50
10/6/2020	8.98	9.69	11.03	13.22	15.53	17.94	55.80	59.95	64.29
10/7/2020	8.74	9.49	10.80	14.42	15.88	18.56	57.96	60.59	65.41



Appendix C - Aquatic Resources Study Report

To be Filed by April 14, 2022

Byllesby-Buck Hydroelectric Project
(FERC No. 2514)

February 28, 2022

Prepared by:

Prepared for:

Appalachian Power Company

APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY

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Appendix D - Wetlands, Riparian, and Littoral Habitat Study Report

Byllesby-Buck Hydroelectric Project (FERC No. 2514)

February 28, 2022

Prepared by:

Prepared for:
Appalachian Power Company

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Acronyms

AEP	American Electric Power
Appalachian or Licensee	Appalachian Power Company
CFR	Code of Federal Regulations
EAV	emergent aquatic vegetation
FERC or Commission	Federal Energy Regulatory Commission
GIS	Geographic Information System
GPS	Global Positional System
HDR	HDR Engineering, Inc.
ILP	Integrated Licensing Process
ISR	Initial Study Report
m	meter
NWI	National Wetlands Inventory
PAD	Pre-Application Document
PEM	palustrine emergent wetlands
PFO	palustrine forested wetlands
PM&E	Protection, mitigation, and enhancement
PSS	palustrine scrub-shrub
PRB	palustrine rock bottom
Project	Byllesby-Buck Hydroelectric Project
PUB	palustrine unconsolidated bottom
RM	River mile
RSP	Revised Study Plan
SAV	submerged aquatic vegetation
SPD	Study Plan Determination
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USR	Updated Study Report
VDEQ	Virginia Department of Environmental Quality
VDCR	Virginia Department of Conservation and Recreation
WetCAT	Wetland Conditional Assessment Tool

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1 Project Introduction and Background

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 is located about 9 miles north of the city of Galax, and the Buck Development 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 §5.11 of the Commission's regulations, 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 12, 2019, Appalachian filed a clarification letter on the SPD with the Commission. 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. Stakeholders provided written comments in response to Appalachian's filing of the ISR meeting summary; these were addressed in the Updated Study Report (USR), which was filed November 17, 2021. A USR meeting was held on December 1, 2021 and requests from stakeholders made during the meeting are addressed in this revised USR.

In accordance with 18 CFR §5.15, Appalachian has conducted studies as provided in the RSP as subsequently approved and modified by the FERC. This report describes the methods and results of the Wetlands, Riparian, and Littoral Habitat Study conducted in support of preparing an application for new license for the Project.

2 Study Goals and Objectives

The goal of the Wetlands, Riparian, and Littoral Habitat Characterization Study is to identify and characterize the existing wetlands, waterbodies, and riparian and littoral vegetative habitats (including emergent and submerged aquatic vegetation beds) in the study area. Specific study goals and objectives include the following:

- Perform a desktop characterization using the U.S. Fish and Wildlife Service (USFWS) (2019) National Wetlands Inventory (NWI), the Wetland Condition Assessment Tool (WetCAT) (VDEQ 2021), and other resources such as Geographic Information System

(GIS)-based topographic maps, hydrography, aerial imagery, and soil surveys to identify and describe, approximate, and classify wetlands and waterbodies (i.e., streams, creeks, rivers) within the study area (including upland, littoral, and riparian zones);

- Perform a field verification survey to confirm the location, dominant vegetative community, and vegetation classification identified in the previous desktop survey;
- The field verification will include identification of littoral and instream vegetation in the study area to characterize the availability of littoral, submerged, and emergent vegetative habitat;
- Using the results of the desktop characterization and field verification, develop a GIS-based map identifying wetlands, waterbodies, and riparian, littoral, and instream vegetative community composition according to the Cowardin Classification System (Cowardin et al. 1979);
- Riparian communities will be classified according to the Virginia Department of Conservation and Recreation (VDCR) Natural Communities of Virginia of Ecological Groups and Community Types Third Approximation (Version 3.3); and
- Using the results of the desktop and field verification efforts, evaluate the potential for Project effects on wetlands, riparian, and littoral habitat in the study area.

3 Study Area

The 480-acre study area for the Wetlands, Riparian, and Littoral Habitat Characterization Study includes the riparian zone on each bank of the upper New River and lowermost tributary segments of Crooked Creek and Chestnut Creek (Figure 1). The study area extends 3.4 miles upstream of Byllesby Dam and 1.15 miles downstream of Buck Dam and includes 2.7 miles of the New River in between the two dams. The Study Area is located in the easternmost portion of the Mt. Rogers National Recreation area and the New River Trail State Park is also situated within the Study Area (Figure 1).

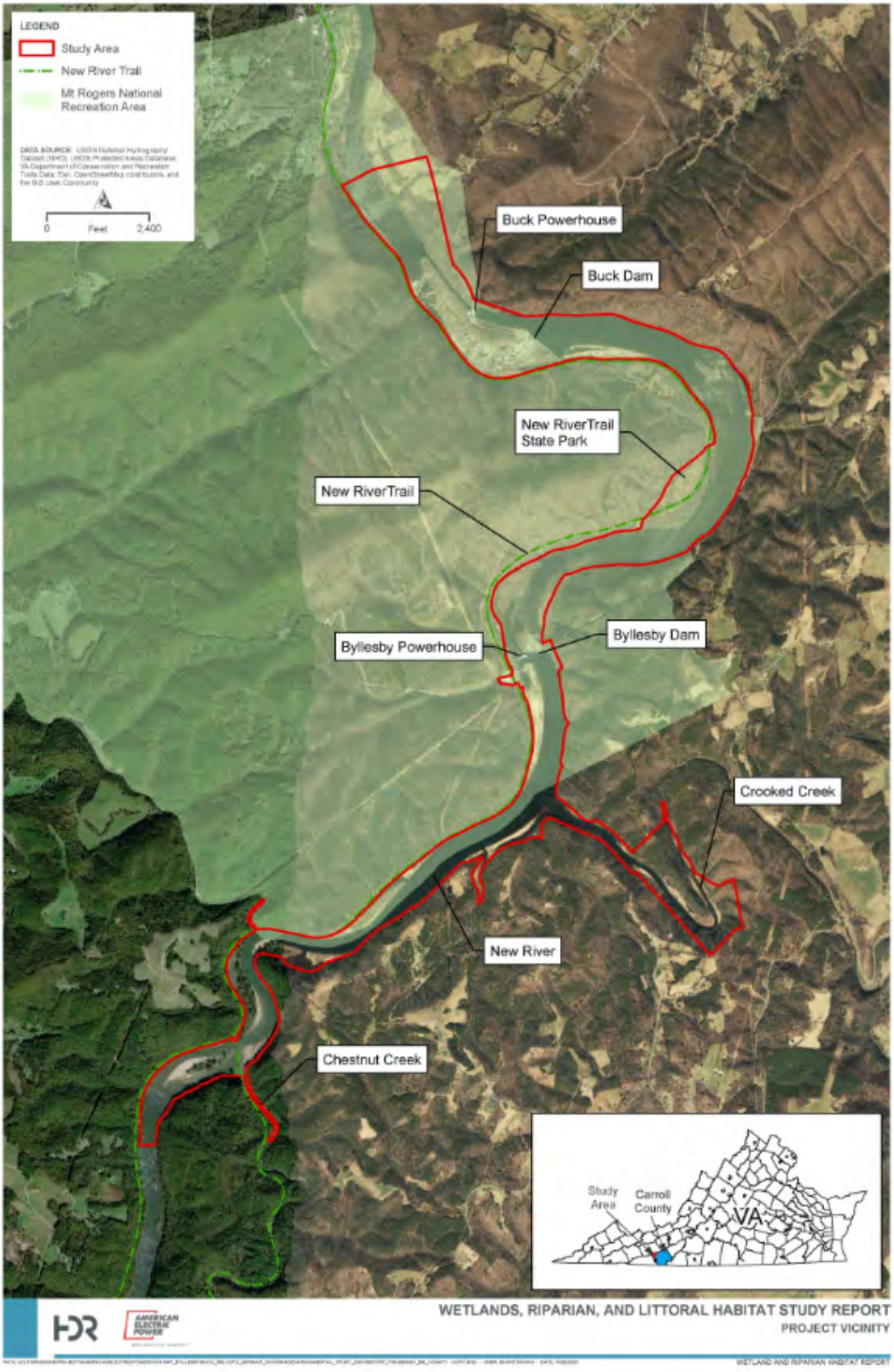

Figure 1. Study Area for Wetlands, Riparian, and Littoral Habitat Study

4 Background and Existing Information

Existing relevant and reasonably available information regarding wetlands in the Project vicinity is presented in Section 5.6 of the Byllesby-Buck Pre-Application Document (PAD) (Appalachian 2019). Wetland, riparian, and littoral habitats within the study area are associated with the near-shore areas of the impoundments. Wetlands are defined as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support…vegetation typically adapted for life in saturate soil conditions" (USACE 1987). The littoral zone, in the context of a large river system, is the habitat between approximately a half-meter of depth and the depth of light penetration (Wetzel 1975). Riparian habitats are areas found along waterways such as lakes, reservoirs, rivers, and streams (NRCS 1996).

According to the NWI and review of digital orthoimagery, potential wetlands, riparian and littoral habitat within the study area exists for palustrine forested wetlands along the New River, palustrine emergent wetlands along the edge of the river channel, and aquatic beds in the impoundments, as defined by Cowardin et al. (1979). Palustrine wetlands are non-tidal wetlands dominated by trees, shrubs, and/or persistent plants/mosses, generally representing marsh, swamp, and small ponds. Sediment deposition in the backwater areas of the Project reservoirs has created sites suitable for wetland vegetation, including about 27 acres of emergent wetland vegetation bordering the Byllesby reservoir and about 15 acres bordering the Buck reservoir (Appalachian 1991). Additional wetlands are also created by sediment deposition in other areas, including a small area approximately 100 yards upstream of the gated spillway dam at the Buck Development. Additional information on existing wetland resources is provided in Section 5.6 of the PAD.

The riparian plant Virginia spiraea (*Spiraea virginiana*), which is listed as federally threatened and state endangered, has been historically reported by the USFWS upstream of the Byllesby Dam; however, there is no documentation or verification of historical presence or exact location. A habitat assessment performed in 2017 identified few areas suitable for this species within the Study Area (ESI 2017). Additional information regarding the previous Virginia spiraea survey and potential habitat within the study area is included in Sections 5.6.2 and 5.7.1.3 of the PAD.

Invasive aquatic plants are known to exist in the New River, including hydrilla (*Hydrilla verticillata*), curly-leaf pondweed (*Potamogeton crispus*), and brittle naiad (*Najas minor*). An aquatic plant community study performed in 2012 between Buck Dam and upper Claytor Lake identified 13 macrophyte species, including curly-leaf pondweed (Weberg et al. 2015). Additional information regarding invasive aquatic plants found in the New River is provided in Section 5.6.2 of the PAD.

5 Methodology

An initial desktop study was carried out to identify areas likely to contain wetlands, riparian, and littoral habitat and estimate the amount of each resource area. Wetland areas and streams identified in the desktop study were field-verified, but not formally delineated (i.e., no flagging or boundary marking). The study methods proposed by Appalachian outlined below provide adequate information to assess potential Project operations-related effects to wetlands, riparian, and littoral habitats in the study area.

5.1 Desktop Characterization of Wetland, and Riparian, and Littoral Habitats

A desktop characterization of existing and potential wetlands and waterbodies, and existing riparian and littoral vegetation was performed. For the purposes of this study, the riparian zone was defined as terrestrial areas 100 feet from the shoreline (VDCR 2006) or to the study area boundary, whichever is 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.

Information sources included the USFWS NWI, the Virginia Department of Environmental Quality (VDEQ) WetCAT (VDEQ 2021), U.S. Geological Survey (USGS) topographic maps and National Hydrography Dataset, elevation data, high-resolution orthoimagery, and Natural Resources Conservation soil surveys. WetCAT query results were used to score wetland types based on the habitat and water quality stressors associated with surrounding land use types; classifications include slightly stressed, somewhat stressed, somewhat severely stressed, and severely stressed.

Data collected during the desktop survey were used to create preliminary habitat characterization maps that was used to facilitate the field verification efforts.

5.2 Field Verification

5.2.1 Wetlands and Waterbodies

Potential streams and wetland areas not confirmed previously (i.e., through prior licensing studies or other sources) were field-verified by HDR Engineering, Inc (HDR) wetland scientists between July 20-22, 2021. HDR performed field verification of wetlands and waterbodies according to the methodologies and guidance described in the U.S. Army Corps of Engineers (USACE) 1987 Wetland Delineation Manual (USACE 1987) and USACE Eastern Mountains and Piedmont Regional Supplement (Version 2.0) (USACE 2012) and USACE Regulatory Guidance Letter 05-05 Ordinary High Water Mark Identification (USACE 2005). 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.

Wetland scientists used hand-held global positional system (GPS) units to estimate the boundaries of wetlands within the Study Area. For wetlands, once the approximate upland boundary of the resource was determined, field personnel identified the edges of the wetland habitat, creating a polygon. In some instances, it was determined that all or a portion of the wetland observed in the field was consistent with boundaries depicted by on the USFWS NWI as well as topography contours. In these instances, the confirmed desktop information including USFWS National Hydrography Dataset, USFWS NWI boundaries and topography contours were used to digitize stream and wetlands boundaries in GIS. USACE Wetland Determination Data Sheets were completed in the field for representative wetland types and are included in Attachment 5.

5.2.2 Littoral Zone

The four main categories of aquatic plants include algae, emergent aquatic vegetation (EAV), submerged aquatic vegetation (SAV), and floating plants. Algae are simple plants without true roots, leaves, or flowers. They are found either free floating in water or attached to other plants, bottom sediments, rocks, or other solid structures. EAV grows along water body edges, with only short portions of their stems and roots are submerged. SAV grows in deeper water and usually are attached to the bottom. They remain underwater until flowers and seeds form out of the water. Floating plants are rooted, with much of their structure, especially leaves, floating on the surface. They can also be unattached, obtaining nutrients through small rootlets that dangle in the water. A visual assessment was performed to characterize the availability of littoral zone aquatic habitats including emergent aquatic vegetation and submerged aquatic vegetation beds occurring within the bypass reach and reservoir. The species and general location of invasive aquatic vegetation and observed during the field assessment were also noted.

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 (shown on Figure 2). 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), 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.

5.2.3 Riparian Zone

Data from the desktop review were 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).

5.3 Virginia Spiraea Review

Field teams performed a review of Virginia spiraea during field activities which was in the blooming window of the species (May-July). The 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. Coordinates of the approximate location of potentially suitable habitat were recorded and representative photographs were taken (Attachment 4).

6 Study Results

6.1 Wetlands and Waterbodies

Wetland cover types were classified according to Cowardin et. al (1979) which included palustrine (emergent, scrub-shrub, forested, and rock bottom) and riverine systems. These wetland and waterbody features were verified in the field (Table 1 and Figure 2). A description of the general Project-related wetland and waterbody information is provided below along with representative photographs in Attachment 1.

A total of 95.43 acres of wetlands were field verified July 20-22, 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. The USFWS NWI estimated approximately 9.8 acres of wetlands (freshwater forested/shrub and emergent). Table 1 provides information of individual wetlands found in the study area. The VDEQ (2021) WetCAT results indicated that there were no stressed areas of wetlands in the study area.

A total of 15,608.42 linear feet of riverine features were field verified along with the wetlands. There were 514.9 linear feet of perennial stream habitat and 501 linear feet of intermittent stream habitat. Table 2 provides information describing streams in the study area.

6.1.1 Palustrine Emergent 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 (Figure 2 and Attachment 1). The largest area of palustrine emergent wetland occurs upstream of the Byllesby Dam near the canoe portage take-out where herbaceous strata is dominant and includes Japanese stilt grass (*Microstegium viminium*), soft rush (*juncus effusus*), canary reed grass (*Phalaris arundinacea*), deer tongue grass (*Dichanthelium clandestinum*), cattails (*Typha sp*.), falsenettle (*Boehmeria cylindrica*), bulrush (*Scirpoides holoschoenus*), and woolgrass (*Scirpus cyperinus*). The percent cover of vegetation throughout these wetlands ranged from 5 to 90 percent with low diversity and relatively uniform cover. Saturation and high water tables were common throughout these wetlands and many had surface water, particularly at the boundary of the wetland and the stream. Substrate consisted mainly of silt and clay with hydric soil indicators such as depleted matrix and redox dark surface.

6.1.2 Palustrine Forested Wetlands

Palustrine forested wetlands within the Study Area occur primarily on the higher floodplains and point bars of the New River (Figure 2 and Attachment 1). The dominant vegetation in these wetlands included American sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), red maple (*Acer rubrum*), black walnut (*Juglans nigra),* and silver maple (*Acer saccharinum*)*.* The majority of understory included Japanese stilt grass, reed canary grass (*Phalaris arundinacea*), falsenettle, highbush blackberry (*Rubus argutus*) and smart weed. Canopy composition was moderately diverse with a cover percentage ranging from 10 to 70 percent. Soil saturation and high water tables were

common throughout these wetlands with some spots of standing water, typically near the toe of slope extent. Flooding of these types of wetlands was less frequent due to higher elevations (i.e., floodplains, bars).

6.1.3 Palustrine Scrub-Shrub Wetlands

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 (Figure 2 and Attachment 1). Most of this cover type occurs adjacent to emergent wetlands. The shrub vegetation consisted of American sycamore, box elder, and silver maple. The herbaceous vegetation included canary reed, grass, deer tongue, falsenettle, and soft rush. Saturation and high water tables were common in most of these wetlands. Substrate consisted mainly of silt and clay.

6.1.4 Palustrine Rock Bottom Wetlands

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 (Figure 2). The dominant tree vegetation in these types of wetlands include American sycamore, alder (*Alnus* sp.), and willow (*Salix* sp.). The dominant herbaceous vegetation includes spike rush (*Eleocharis palustris*), cattails, asters, smart weed (*Persicaria pensylvanica*), and water willow (*Justicia americana*). The substrate of these wetlands consisted of angular bed rock and sand bars with organic material. Pools of surface water were present throughout the wetlands with patchy vegetation.

6.1.5 Riverine

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.

Table 1. Field Verified Wetlands in Study Area

Wetland Number	Coordinates (decimal degrees)	Cowardin et al. (1979) Classification[1]	Estimated Acres
Wetland 1	36.759009 -80.960207	PEM	0.03
Wetland 2	36.759746 -80.960682	PEM	0.02
Wetland 3	36.761681 -80.955008	PEM	0.07
Wetland 4	36.763144 -80.954669	PEM	0.09
Wetland 5	36.764569 -80.956177	PFO	8.57

Wetland Number	Coordinates (decimal degrees)	Cowardin et al. (1979) Classification[1]	Estimated Acres
Wetland 6	36.768343 -80.955143	PEM	0.02
Wetland 7	36.770779 -80.944087	PSS	8.39
Wetland 7	36.770905 -80.943297	PEM	0.42
Wetland 8	36.782522 -80.933081	PEM	17.26
Wetland 9	36.785501 -80.934788	PEM	0.38
Wetland 10	36.785902 -80.93497	PEM	0.19
Wetland 11	36.785897 -80.935283	PEM	0.21
Wetland 12	36.789201 -80.93654	PFO	0.47
Wetland 13	36.790216 -80.934183	PEM	0.15
Wetland 14	36.793727 -80.928082	PEM	0.13
Wetland 15	36.805674 -80.929075	PEM	6.64
Wetland 15	36.805831 -80.926859	PSS	2.94
Wetland 16	36.805453 -80.933384	PRB	1.78
Wetland 17	36.805803 -80.935885	PRB	0.87
Wetland 18	36.804308 -80.937275	PRB	0.79
Wetland 19	36.805006 -80.938208	PRB	1.14
Wetland 20	36.807444 -80.94027	PRB	11.96
Wetland 21	36.807124 -80.935493	PEM	0.51
Wetland 22	36.817095 -80.946182	PEM	0.33
Wetland 23	36.815291 -80.945638	PEM	0.14
Wetland 24	36.81447 -80.943847	PFO	2.3
Wetland 25	36.813258 -80.942915	PFO	0.1
Wetland 26	36.81205 -80.942162	PFO	0.18
Wetland 27	36.811552 -80.94188	PFO	0.05
Wetland 28	36.810265 -80.940278	PFO	0.98
Wetland 29	36.802149 -80.916507	PSS	0.13
Wetland 30	36.793097 -80.921259	PEM	0.05
Wetland 31	36.792198 -80.925934	PEM	0.03

Wetland Number	Coordinates (decimal degrees)	Cowardin et al. (1979) Classification[1]	Estimated Acres
Wetland 32	36.7889 -80.932528	PRB	1.2
Wetland 33	36.789763 -80.932072	PFO	0.74
Wetland 34	36.776203 -80.930155	PEM	1.52
Wetland 35	36.774089 -80.925964	PEM	1.16
Wetland 36	36.771005 -80.921339	PEM	1.68
Wetland 37	36.769382 -80.918157	PEM	0.05
Wetland 38	36.770681 -80.91925	PEM	0.24
Wetland 39	36.772551 -80.920091	PEM	0.09
Wetland 40	36.769917 -80.917954	PEM	0.3
Wetland 41	36.770048 -80.921166	PEM	0.42
Wetland 42	36.772325 -80.92415	PEM	3.16
Wetland 43	36.774715 -80.928032	PEM	1.68
Wetland 44	36.774541 -80.933913	PEM	4.67
Wetland 45	36.772704 -80.93709	PEM	1.8
Wetland 46	36.77106 -80.936989	PSS	0.14
Wetland 47	36.766158 -80.949684	PEM	5.46
Wetland 48	36.766606 -80.951983	PFO	1.98
Wetland 49	36.758734 -80.956248	PEM	1.58
Wetland 50	36.757326 -80.960264	PEM	0.24
		Total	**95.43**

[1] PEM: Palustrine Emergent.
PSS: Palustrine Scrub-Shrub.
PFO: Palustrine Forested.
PRB: Palustrine Rock Bottom

Table 2. Field Verified Streams in Study Area

Stream Number	Coordinates (decimal degrees)	Cowardin et al. (1979) Classification[1]	Linear Feet
Stream 1	36.757351 -80.963421	R5UB	4.99
Stream 2	36.757903 -80.963086	R5UB	18.22
Stream 3	36.785697 -80.935238	R5UB	18.3
Stream 4	36.786761 -80.935575	R5UB	11.84
Stream 5	36.79022 -80.936482	R5UB	147.65
Stream 6	36.805405 -80.923981	R4SB	94.11
Stream 7	36.80526 -80.930796	R4SB	25.25
Stream 8 (Big Branch)	36.809067 -80.943427	R5UB	41.1
Stream 9	36.816282 -80.944068	R5UB	1201.65
Stream 10	36.811017 -80.941006	R4SB	381.97
Stream 11 (Poor Branch)	36.801904 -80.916201	R5UB	24.89
Stream 12 (Rocky Branch)	36.79676 -80.917398	R5UB	27.92
Stream 13	36.771979 -80.93728	R5UB	1428.64
Stream 14	36.764523 -80.956305	R5UB	670.85
Stream 15 (Brush Creek)	36.769003 -80.955318	R5UB	913.21
Stream 16 (Crooked Creek)	36.77046 -80.921317	R5UB	8561.46
Stream 17 (Chestnut Creek)	36.756648 -80.954166	R5UB	2036.37
		Total	**15,608.42**

[1]R4SB: Riverine, Intermittent, streambed.
R5UB: Riverine, Perennial, unconsolidated bottom.

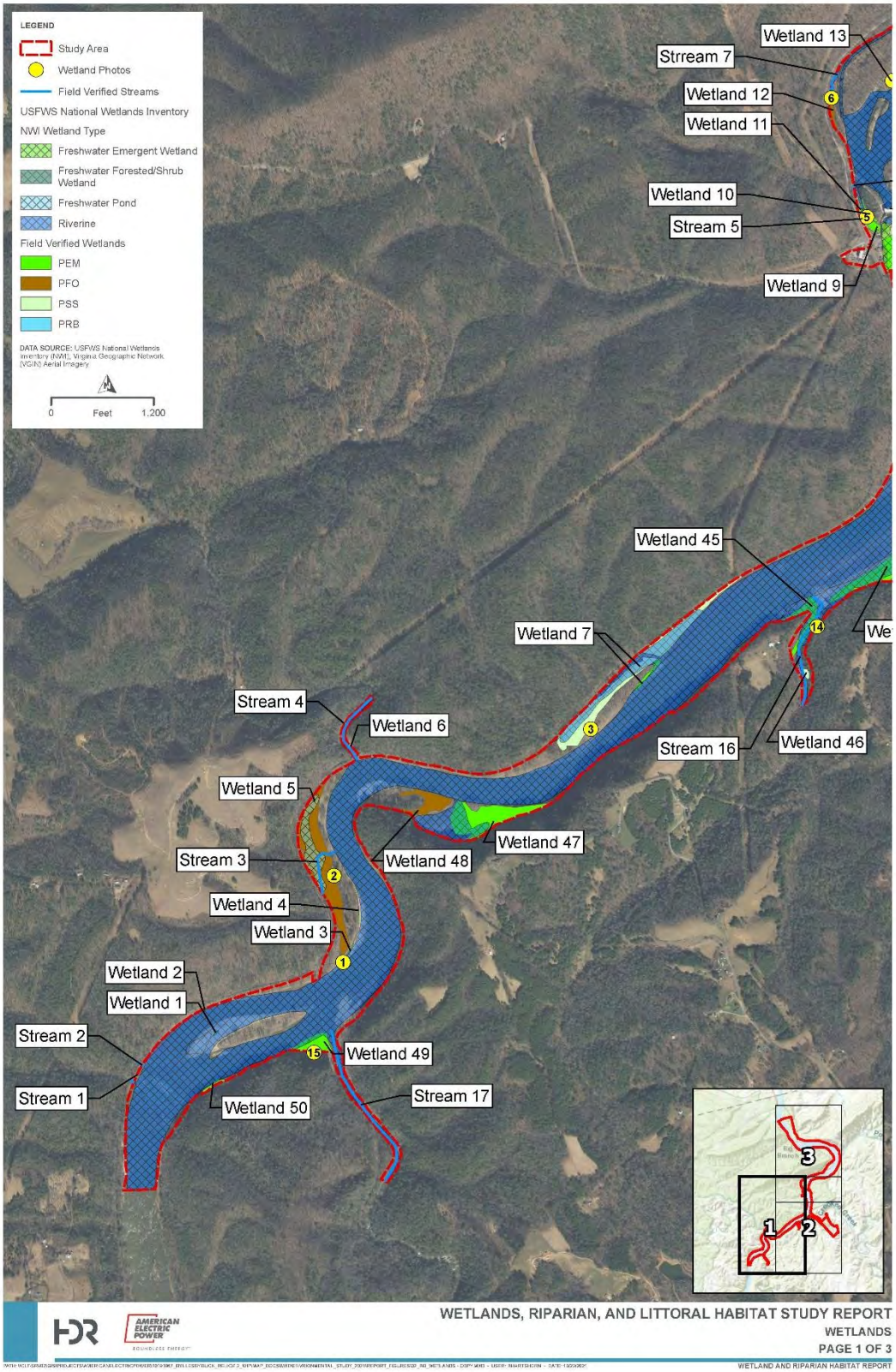

Figure 2a. Wetland and Riparian Habitat in the Study Area

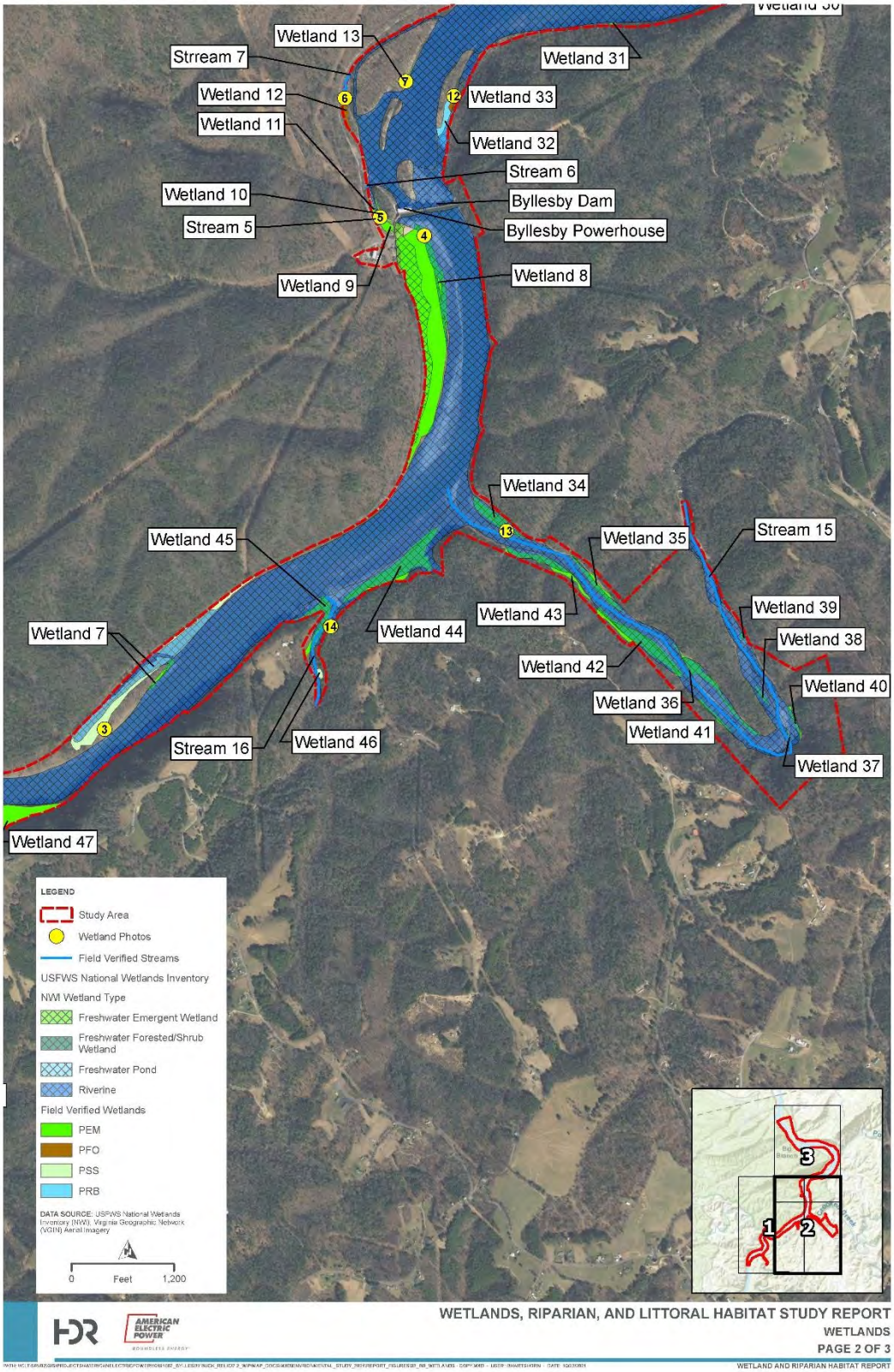

Figure 2b. Wetland and Riparian Habitat in the Study Area

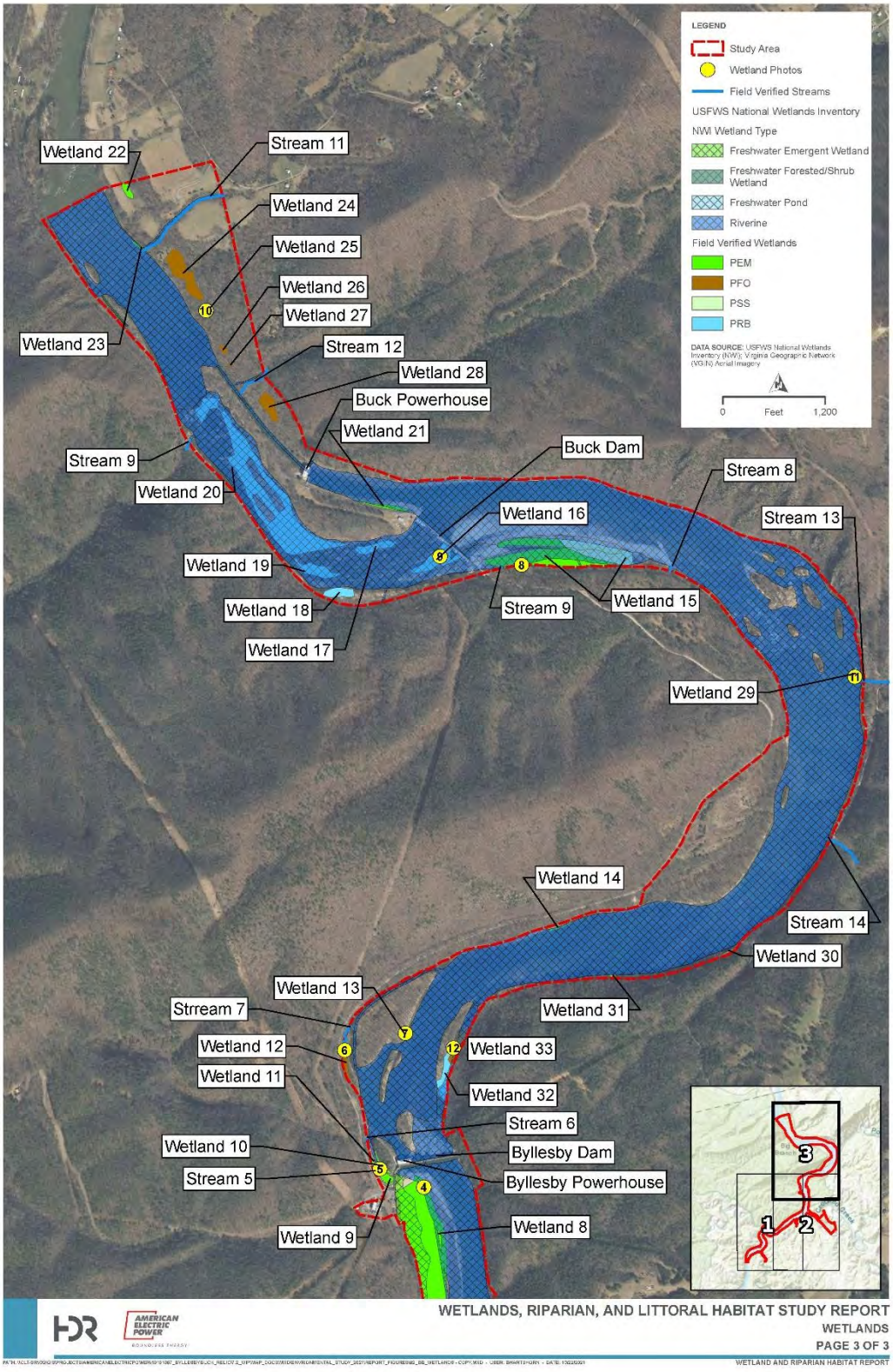

Figure 2c. Wetland and Riparian Habitat in the Study Area

6.2 Littoral Zone

The littoral zone contains 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. Figure 3 shows the location of littoral zone transects. 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.

Table 3 provides results of the 2021 littoral zone survey. 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, bulrush, rice cut grass, soft rush, water willow, shallow sedge (*Carex lurida*), Japanese honeysuckle (*Lonicera japonica*), goldenrod (*Solidago sp*.), Virginia creeper (*Parthenocissus quinquefolia*) and American sycamore. Curly pondweed is considered to be a non-native invasive species. Elodea was the most abundant SAV 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 habitat at littoral zone transects are provided in Attachment 2.

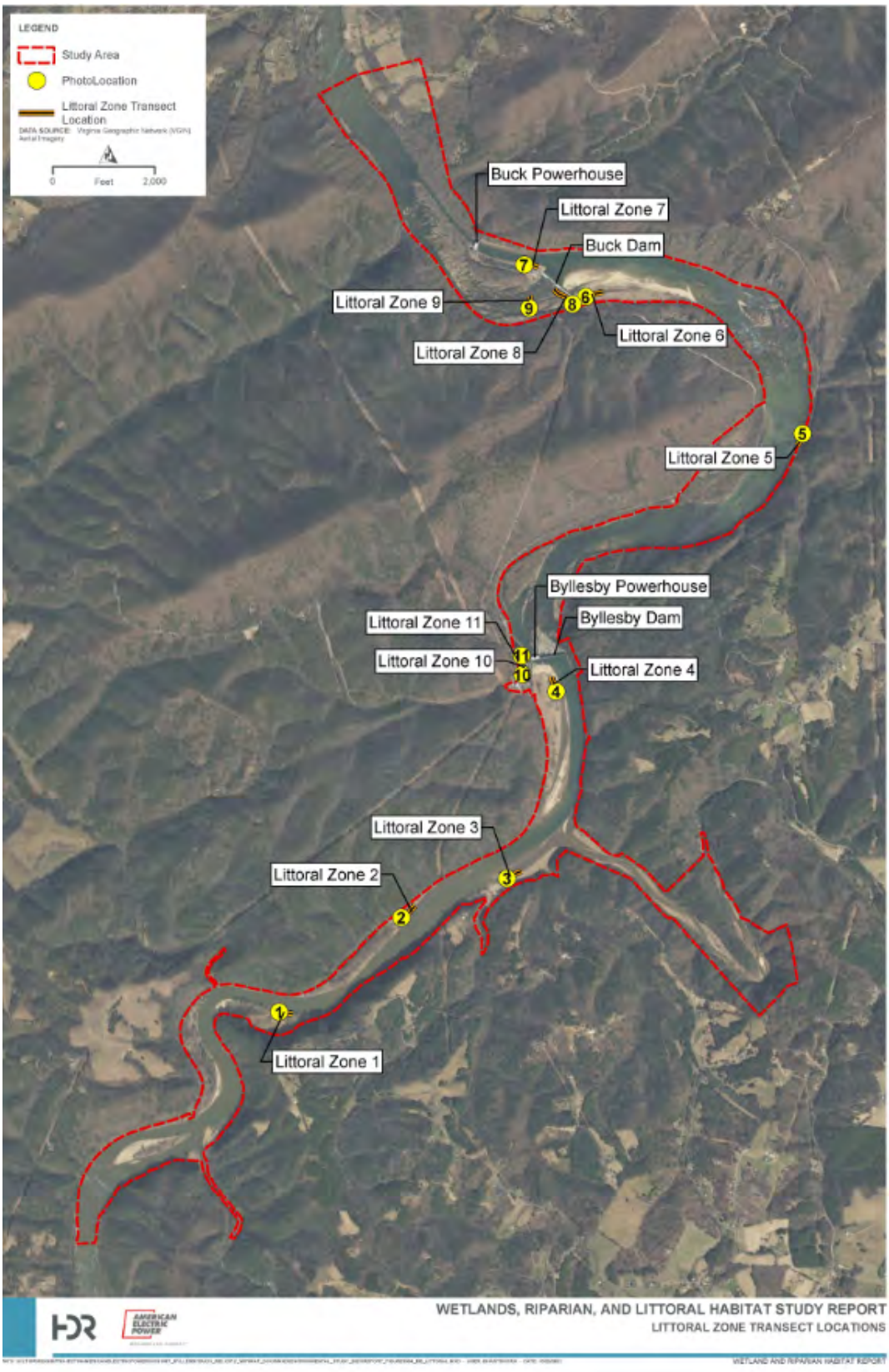

Figure 3. Littoral Zone Transect Locations

Table 3. Littoral Zone Transects and Vegetation Percentage

Littoral Zone 1										
Species	**Quadrant**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Elodea	5	5	10	10	20	20	10	50	15	--
Algae	1	1	1	--	--	--	--	--	--	--
Curly pondweed	--	--	--	--	30	5	--	--	--	--
Total	**6**	**6**	**11**	**10**	**50**	**25**	**10**	**50**	**15**	**0**
Littoral Zone 2										
Species	**Quadrant**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Elodea	5	5	2	20	10	10	30	10	10	30
Curly pondweed	--	--	2	--	--	--	--	--	--	--
Unknown pondweed	--	--	--	--	5	--	5	40	--	2
Total	**5**	**5**	**4**	**20**	**15**	**10**	**35**	**50**	**10**	**32**
Littoral Zone 3										
Species	**Quadrant**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Elodea	60	50	5	5	2	30	15	5	5	--
Unknown pondweed	--	--	--	--	--	--	--	--	2	--
Parrot's feather	10	10	5	5	2	10	--	--	--	2
Total	**70**	**60**	**10**	**10**	**4**	**40**	**15**	**5**	**7**	**2**
Littoral Zone 4										
Species	**Quadrant**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Elodea	--	10	5	5	5	2	5	5	2	--
Algae	40	60	40	40	40	30	40	10	15	15
Unknown pondweed	--	--	2	--	--	--	--	--	--	--
Parrot's feather	20	--	--	--	--	--	5	--	--	--
Ludwigia	10	--	--	--	--	--	--	--	--	--
Spike rush	10	--	--	--	--	--	--	--	--	--
Smartweed	--	--	--	--	--	2	--	--	2	2
Grass	--	--	--	10	30	20	30	--	15	15
Total	**80**	**60**	**47**	**55**	**75**	**54**	**80**	**15**	**34**	**32**
Littoral Zone 5										
Species	**Quadrant**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Elodea	25	60	30	25	5	5	--	--	--	5

Parrot's feather	--	--	--	--	5	10	--	--	--	--
Curly Pondweed					15		5			
Grass	--	--	--	--	--	--	--	60	5	--
Broad Leaf pondweed	5	--	20	5	10	--	15	10	5	2
Total	**30**	**60**	**50**	**30**	**35**	**15**	**20**	**70**	**10**	**7**
Litorral Zone 6										
Species	**Quadrant**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Elodea	5	5	--	5	40	--	70	70	80	80
Algae	--	--	--	--	--	--	--	--	5	5
Parrot's feather	50	80	100	70	40	90	10	30	10	10
Total	**55**	**85**	**100**	**75**	**80**	**90**	**80**	**100**	**95**	**95**
Littoral Zone 7										
Species	**Quadrant**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Elodea	5	20	--	10	20	5	15	15	5	5
Algae	30	--	--	--	--	--	--	--	10	--
Curly pondweed	--	--	2	--	--	--	--	--	--	--
Parrot's feather	--	--	--	--	--	--	--	5	--	5
Smartweed	--	2	--	--	--	--	--	--	--	--
Total	**35**	**22**	**2**	**10**	**20**	**5**	**15**	**20**	**15**	**10**
Littoral Zone 8										
Species	**Quadrant**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Elodea	40	--	--	--	--	--	20	40	5	30
Algae	--	--	--	--	--	--	--	20	--	10
Curly pondweed	--	5	60	--	--	--	--	--	--	--
Parrot's feather	--	5	--	--	--	--	--	--	--	--
Smartweed	--	--	--	--	--	--	--	--	--	5
Spike rush	5	--	--	--	50	--	--	--	--	--
Bulrush	2	--	--	2	--	2	--	--	--	--
Rice cut grass	--	70	--	--	30	30	5	--	70	10
Ludwigia	--	2	--	--	--	60	--	--	--	--
Soft rush	--	--	--	60	--	--	--	--	--	--
Water willow	--	--	--	--	--	--	5	--	--	--
Total	**47**	**82**	**60**	**62**	**80**	**92**	**30**	**60**	**75**	**55**
Littoral Zone 9										
Species	**Quadrant**									

	1	2	3	4	5	6	7	8	9	10
Elodea	--	--	2	--	--	--	5	5	5	--
Algae	--	--	30	--	--	--	--	--	--	--
Parrot's feather	--	--	--	--	--	--	--	--	5	--
Grass	--	--	--	--	--	2	--	--	--	--
Smartweed	--	2	--	5	5	2	--	--	--	--
Broad Leaf pondweed	--	--	--	--	--	--	--	--	--	--
Ludwigia	--	--	--	--	--	--	--	5	--	--
American sycamore	2	2	--	--	--	--	--	--	--	--
water willow	--	2	--	--	--	5	--	--	--	--
Carex sp.	--	--	--	5	5	--	--	10	--	--
Unknown aquatic grass	--	--	--	--	--	--	--	--	--	10
Total	**2**	**6**	**32**	**10**	**10**	**9**	**5**	**20**	**10**	**10**

Littoral Zone 10

Species	**Quadrant**			
	1	**2**	**3**	**4**
Elodea	30	--	60	60
Algae	20	--		20
Ludwigia	--	--	10	--
American sycamore	--	10	--	--
water willow	--	10	--	--
Smartweed	--	10	--	--
Bulrush	--	--	10	--
Rice cut grass	--	--	10	10
Total	**50**	**30**	**90**	**90**

Littoral Zone 9

Species	**Quadrant**			
	1	**2**	**3**	**4**
Elodea	--	20	70	--
Algae	--	--	10	--
Shallow sedge	--	--	--	10
Curly dock	--	--	--	10
Soft rush	--	--	5	--
Japanese honeysuckle	10	--	--	--
Goldenrod	10	--	--	--
Virginia creeper	20	--	--	--
American sycamore	--	--	--	30
Total	**40**	**20**	**85**	**50**

6.3 Riparian Zone

The riparian area consists of approximately 177 acres and is mainly found along the shoreline, on islands, and within the bypass reach (Figure 4). The riparian area varies in width from 5 to 520 feet wide. Dominant vegetation in the over story includes black walnut, black cherry (*Prunus serotina*), red maple, Northern red oak (*Quercus rubra*), Eastern red cedar (*Juniperus virginiana*), Virginia pine (*Pinus virginiana*), black willow (*Salix Nigra*), American sycamore, Sugar Maple (*Acer saccharum*), box elder, chestnut oak (*Quercus montana*), green ash (*Fraxinus pennsylvanica*), and white pine (*Pinus strobus*). The understory typically included blackberry *(Rubus argutus*), mountain laurel (*Kalmia latifolia*), and witch hazel (*Hamamelis sp.*). The herbaceous vegetation consisted of Christmas fern (*Polystichum acrostichoides*), mayapple (*Podophyllum peltatum*), wingstem (*Verbesina alternifolia*), bedstraw (*gallium aparine*), muscadine grape (*Vitis rotundifolia*), Virginia creeper (*Parthenocissus quinquefolia*), cinnamon fern (*Osmunda cinnamomea*) and poison ivy (*Toxicodendron radicans*). Japanese knotweed (*Reynoutria japonica*), multiflora rose (*Rosa multiflora*), oriental bittersweet (*Celastrus orbiculatus*), and Tree of Heaven (Ailanthus altissima) which are all considered a non-native invasive species are present in the riparian habitat. Documented occurrences of these non-native invasive species are noted in Appendix E (Terrestrial Resources Study Report).

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 can be found in Attachment 3.

6.4 Virginia Spiraea Review

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

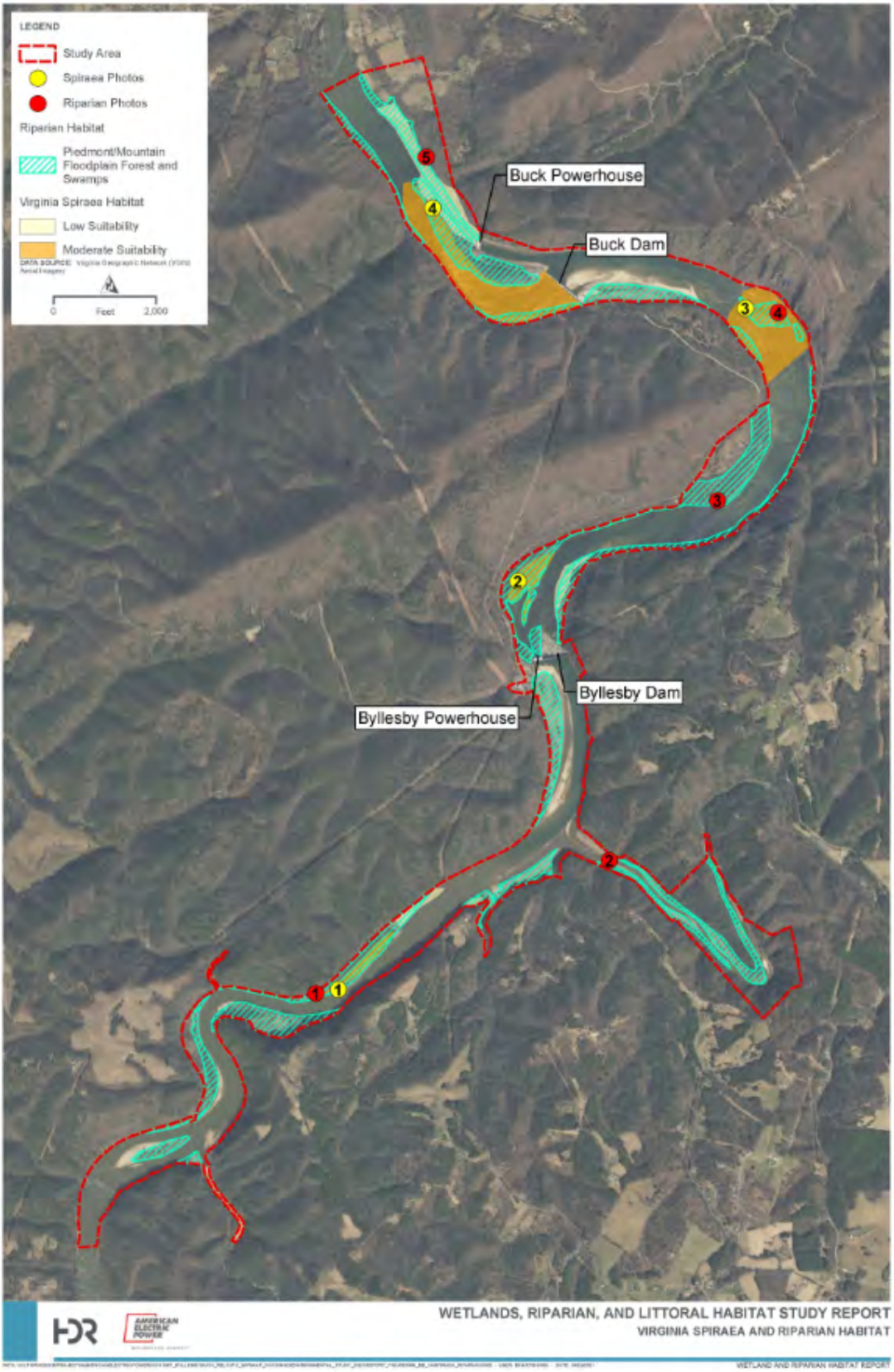

Figure 4. Virginia Spiraea and Riparian Habitat

7 Summary and Discussion

The NWI wetland and waterway boundaries within the study area were ground-truthed and found to generally represent the correct classification and areal extents. During the field verification, 95.43 acres of wetlands and 15,608.42 linear feet of stream were identified and field-verified and are illustrated on Figure 2. The wetland types in the study area appeared to reflect the natural community expectations for this location.

7.1 Wetland Habitat

Four major types of aquatic habitat systems occur in the study area: (1) emergent wetlands dominated by herbaceous vegetation, (2) forested wetlands dominated by trees, (3) scrub-shrub wetlands dominated by shrubs and saplings, and (4) rocky bottom wetlands dominated by bedrock substrate. Most of the banks of the New River and associated tributaries consisted of wetlands. Wetlands, particularly when associated with riverine systems, provide important functions for wildlife and flood storage as well as serving as important recreational resources.

The most commonly observed wetlands within the study area were emergent wetlands. These wetlands were mainly along the banks of the New River and associated tributaries. The largest emergent wetland habitat areas occur upstream of the dams and are subject to regular water level fluctuations; however emergent wetland species are often adapted to changes in water surface elevation. In some cases, increased diversity of emergent species can be attributed to regular changes in inundation, provided the duration, magnitude and seasonality of the water level changes are tolerable by those species.

Forested wetlands and scrub-shrub wetlands were mainly observed on the floodplain of the New River and associated tributaries. Functions of these wetlands are important and are most commonly associated with wildlife habitat, sediment/shoreline stabilization, and flood flow alteration. These wetlands receive hydrologic input during high flow events and then may remain dry for several weeks to months at a time.

Rocky bottom wetlands were mainly observed in the bypass reaches. These wetlands are subject to flow based on release from the Byllesby-Buck developments. The stability of the bottom allows for more diverse plant species to develop and thrive. Typically these wetlands are high energy habitats with well-aerated waters.

7.2 Riverine Habitat

Riverine habitat occurs in the New River and associated tributaries throughout the study area. The principal functions and value associated with riverine habitat include fish habitat, production export, wildlife habitat, recreation, visual quality/aesthetics, and endangered species habitat. The nature of the Project results in the existence of an extensive open-water cover type (i.e., the reservoirs).

7.3 Littoral Habitat

Littoral habitat is an important feature within aquatic systems, particularly for fish and other aquatic wildlife. Observations were undertaken to generally characterize the existence and extent of aquatic

vegetation. SAV in the form of Elodea and pondweeds encompassed the majority of littoral habitat in the study area. Within the bypasses, there was a more diverse occurrence of EAV species.

7.4 Riparian Habitat

Riparian habitat is also present in most of the study area adjacent to the New River. These areas support a wide variety of communities on the small islands, cobble and boulder laden slopes, and floodplains that formed by river flows and riverine processes. The areas contain a mixture of forests, forested wetlands, emergent wetlands, and scrub-shrub wetland habitat.

7.5 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.

8 Project Impacts on Wetlands, Riparian, and Littoral Habitat

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

An additional short-term impact of a long-term reservoir drawdown could include temporary loss of ecological function of the wetlands by reducing the amount of habitat available for aquatic wildlife adapted for these environments. These species may be required to migrate to un-affected adjacent habitats temporarily during drawdown periods.

Sediment accumulation is known to be slowly occurring at locations within and around the impoundments, in some cases leading to the creation of new wetland areas. If such areas interfere with Project operations, there could be a need in the future to dredge such areas, such as was done during 1997 and 2014. Adverse effects of this activity would be addressed through the protections and mitigations required by approvals and permits to be issued by the applicable regulatory agencies and FERC standard license articles.

The Licensee does not anticipate that operation and maintenance of the Project over the new license term will have any long-term, unavoidable, adverse impacts on wetland, riparian, and littoral resources.

9 Variances from FERC-Approved Study Plan

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

10 Correspondence and Consultation

No coordination with state or federal agencies was undertaken for this updated study report.

11 Literature Cited

Appalachian Power Company (Appalachian). 1991. Application for License for Major Project Existing Dam. Byllesby/Buck Hydroelectric Project No. 2514 American Electric Power Service Corporation, Roanoke, VA.

Appalachian Power Company (Appalachian). 2019. Pre-Application Document Byllesby-Buck Hydroelectric Project FERC No. 2514. January 2019.

Cowardin, L.M., V.C. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. United States Fish and Wildlife Service, Washington, D.C. 131 pp.

Environmental Solutions & Innovations, Inc. (ESI). 2017. Field Surveys for Virginia Spiraea and Bald Eagle on the AEP Byllesby/Buck Hydroelectric Project. Prepared for Appalachian Power Company. July 24, 2017.

Federal Energy Regulatory Commission (FERC). 1994. Final Environmental Assessment, Byllesby-Buck Hydroelectric Project, FERC No. 2514-003, Virginia. March 15, 1994.

Natural Resources Conservation Service (NRCS). 1996. Riparian Areas Environmental Uniqueness, Functions, and Values RCA Issue Brief #11. Accessed 05/23/2019. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/?cid=nrcs143_014199#w hat.

U.S. Army Corps of Engineers (USACE). 2005. Regulatory Guidance Letter RGL 05-05 Ordinary High Water Mark (OHWM) Identification. https://www.nap.usace.army.mil/Portals/39/docs/regulatory/rgls/rgl05-05.pdf

_____. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. Vicksburg, MS.

U.S. Fish and Wildlife Service (USFWS). 2019. National Wetland Inventory. Accessed 05/24/2019. [URL]: https://www.fws.gov/wetlands/.

Weberg, M.A., B.R. Murphy, A.L. Rypel, and J.R. Copeland. 2015. A survey of the New River Plant Community in Response to Recent Triploid Grass Carp Introductions into Claytor Lake, Virginia. Southeastern Naturalist 14(2): 308-318.

Wetzel, R.G. 1975. Limnology. W.B. Saunders Co., Philadelphia, PA. 743 pp.

Virginia Department of Conservation and Recreation (VDCR). 2021. The Natural Communities of Virginia Classification of Ecological Groups and Community Types. Virginia Department of Conservation and Recreation, Richmond, VA.

_____2006. Riparian Buffers Modification & Mitigation Guidance Manual. Virginia Department of Conservation and Recreation, Richmond, VA.

Virginia Department of Environmental Quality (VDEQ). 2021. Wetland Condition Assessment Tool (WetCAT). Accessed 06/16/2021. http://cmap2.vims.edu/WetCAT/WetCAT_Viewer/WetCAT_VA_2D.html.

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Attachment 1

Attachment 1 – Representative Photographs of Wetland Habitat

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Photograph 1 – Representative Fringe Wetland (dated July 20, 2021).

Photograph 2 – Representative Forested Wetland (dated July 20, 2021).

Photograph 3 – Representative Scrub-Shrub Wetland (dated July 20, 2021).

Photograph 4 – Representative Emergent Wetland (dated July 20, 2021).

Photograph 5 – Representative Rocky Bottom Wetland near Byllesby Dam (dated July 21, 2021).

Photograph 6 – Representative Forested Wetland (dated July 21, 2021).

Photograph 7 – Representative Fringe Wetland (dated July 21, 2021).

Photograph 8 – Representative Emergent Wetland near Byllesby Dam (dated July 21, 2021).

Photograph 9 – Rocky Bottom Wetland in Buck Bypass (dated July 21, 2021).

Photograph 10 – Representative Forested Wetland (dated July 21, 2021).

Photograph 11 – Rocky Bottom Wetland on Island (dated July 21, 2021).

Photograph 12 – Representative Rocky Bottom Wetland (dated July 21, 2021).

Photograph 13 – Representative Emergent Wetland along Crooked Creek (dated July 22, 2021).

Photograph 14 – Representative Emergent Wetland along Road (dated May 27, 2021).

Photograph 15 – Representative Emergent Wetland along Chesnut Creek (dated July 20, 2021).

Attachment 2

Attachment 2 – Representative Photographs of Littoral Zone Habitat

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Photograph 1 – Littoral Zone 1 (dated July 22, 2021).

Photograph 2 – Littoral Zone 2 (dated July 22, 2021).

Photograph 3 – Littoral Zone 3 (dated July 22, 2021).

Photograph 4 – Littoral Zone 4 (dated July 22, 2021).

Photograph 5 – Littoral Zone 5 (dated July 22, 2021).

Photograph 6 – Littoral Zone 6 (dated July 22, 2021).

Photograph 7 – Littoral Zone 7 (dated July 22, 2021).

Photograph 8 – Littoral Zone 8 (dated July 22, 2021).

Photograph 9 – Littoral Zone 9 (dated July 22, 2021).

Photograph 10 – Littoral Zone 10 (dated July 22, 2021).

Photograph 11 – Littoral Zone 11 (dated July 22, 2021).

Attachment 3

Attachment 3 – Representative Photographs of Riparian Habitat

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Photograph 1 – Representative Riparian Habitat in Southern Portion of Project Area.

Photograph 2 – Representative Flooded Riparian Habitat.

Photograph 3 – Representative Floodplain Riparian Habitat.

Photograph 4 – Riparian Habitat on Islands in middle of New River.

Photograph 5 – Riparian Habitat in Northen Portion of Project Area

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Attachment 4

Attachment 4 – Photographs of Potential Virginia Spiraea Habitat

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Photograph 1 – Potential Virginia Spiraea Habitat on Bank of New River

Photograph 2 – Potential Virginia Spiraea Habitat on Floodplain

Photograph 3 – Potential Virginia Spiraea Habitat on Islands

Photograph 4 – Potential Virginia Spiraea Habitat downstream from Buck Bypass

Attachment 5

Attachment 5 – Wetland Data Forms

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U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region
See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Byllesby-Buck City/County: Carroll Sampling Date: 7/20/2021

Applicant/Owner: Appalachian Electric Power State: NC Sampling Point: DP1_Fringe

Investigator(s): Eric Mularski, Jake Irvin Section, Township, Range:

Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): none Slope (%): 0-1

Subregion (LRR or MLRA): LRR N, MLRA 130B Lat: 36.761681 Long: -80.955008 Datum: NAD83

Soil Map Unit Name: Ha - Hatboro silt loam NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
DP1 is representative of fringe Palustrine Emergent Wetlands in the Study Area. Climatic/hydrologic conditions were normal as determined by the Antecedent Precipitation Tool.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ____ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- X Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ True Aquatic Plants (B14)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 2
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Primary wetland indicators are present.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP1_Fringe

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5)			
1. *Juncus effusus*	60	Yes	FACW
2. *Carex lurida*	40	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 =Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is dominant.

SOIL

Sampling Point: DP1_Fringe

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-20	10YR 4/1	80	10YR 4/6	20	C	PL/M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region
See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Byllesby-Buck City/County: Carroll Sampling Date: 7/20/2021
Applicant/Owner: Appalachian Electric Power State: NC Sampling Point: DP2_PEM
Investigator(s): Eric Mularski, Jake Irvin Section, Township, Range:
Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): concave Slope (%): 0-1
Subregion (LRR or MLRA): LRR N, MLRA 129 Lat: 36.782522 Long: -80.933081 Datum: NAD83
Soil Map Unit Name: W- Water NWI classification: PEM
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
DP2_PEM is representative of Palustrine Emergent Wetlands along the New River. Climatic/hydrologic conditions were normal as determined by the Antecedent Precipitation Tool.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 1
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Primary wetland hydrology indicators are present.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP2_PEM

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5)			
1. *Microstegium vimineum*	40	Yes	FAC
2. *Phalaris arundinacea*	40	Yes	FACW
3. *Boehmeria cylindrica*	10	No	FACW
4. *Leersia oryzoides*	10	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 =Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is present.

SOIL

Sampling Point: DP2_PEM

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/2	80	10YR 5/1	10	D	M	Loamy/Clayey	
			7.5YR 5/8	10	C	PL/M		Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soils are present.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region
See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Byllesby-Buck City/County: Carroll Sampling Date: 7/20/2021
Applicant/Owner: Appalachian Electric Power State: NC Sampling Point: DP3_PFO
Investigator(s): Josh Mace, Blake Hartshorn Section, Township, Range:
Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 0-1
Subregion (LRR or MLRA): LRR N, MLRA 129 Lat: 36.81447 Long: -80.943847 Datum: NAD83
Soil Map Unit Name: Cu - Comus fine sandy loam NWI classification: PFO
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
DP2_PFO is representative of Palustrine Forested Wetlands on the floodplain of the New River. Climatic/hydrologic conditions were normal as determined by the Antecedent Precipitation Tool.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 2

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Primary wetland hydrology indicators are present.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP3_PFO

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Platanus occidentalis*	40	Yes	FACW
2. *Pinus taeda*	10	No	FAC
3. *Ulmus americana*	5	No	FACW
4.			
5.			
6.			
7.			
	55	=Total Cover	
50% of total cover: 28		20% of total cover:	11
Sapling/Shrub Stratum (Plot size: 15)			
1. *Rubus argutus*	40	Yes	FACU
2. *Lindera benzoin*	10	No	FAC
3. *Green ash*	5	No	
4.			
5.			
6.			
7.			
8.			
9.			
	55	=Total Cover	
50% of total cover: 28		20% of total cover:	11
Herb Stratum (Plot size: 5)			
1. *Juncus tenuis*	40	Yes	FAC
2. *Carex striata*	30	Yes	OBL
3. *Microstegium vimineum*	10	No	FAC
4. *Toxicodendron radicans*	5	No	FAC
5. *Fragaria vesca*	5	No	FACU
6. *Juncus effusus*	5	No	FACW
7.			
8.			
9.			
10.			
11.			
	95	=Total Cover	
50% of total cover: 48		20% of total cover:	19
Woody Vine Stratum (Plot size: 5)			
1. *Smilax rotundifolia*	10	Yes	FAC
2. *Lonicera japonica*	10	Yes	FACU
3. *Toxicodendron radicans*	10	Yes	FAC
4.			
5.			
	30	=Total Cover	
50% of total cover: 15		20% of total cover:	6

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 71.4% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	30	x 1 =	30
FACW species	50	x 2 =	100
FAC species	95	x 3 =	285
FACU species	55	x 4 =	220
UPL species	0	x 5 =	0
Column Totals:	230 (A)		635 (B)

Prevalence Index = B/A = 2.76

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP3_PFO

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-20	7.5YR 4/2	60	10YR 5/6	40	C	PL	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soil indicators are present.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region
See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Byllesby-Buck City/County: Carroll Sampling Date: 7/20/2021
Applicant/Owner: Appalachian Electric Power State: NC Sampling Point: DP4_PSS
Investigator(s): Eric Mularski, Jake Irvin Section, Township, Range:
Landform (hillside, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 0-1
Subregion (LRR or MLRA): LRR N, MLRA 129 Lat: 36.805831 Long: -80.926859 Datum: NAD83
Soil Map Unit Name: Ha - Hatboro silt loam NWI classification: PSS
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
P3_PSS is representative of Palustrin Scrub-Shrub Wetlands. Climatic/hydrologic conditions were normal as determined by the Antecedent Precipitation Tool.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ____ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ True Aquatic Plants (B14)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Primary weltand hydrology indicators are present.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP4_PSS

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Platanus occidentalis*	60	Yes	FACW
2. *Acer negundo*	30	Yes	FAC
3. *Acer saccharinum*	20	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
	110 =Total Cover		
50% of total cover: 55	20% of total cover: 22		
Herb Stratum (Plot size: 5)			
1. *Phalaris arundinacea*	70	Yes	FACW
2. *Dichanthelium clandestinum*	40	Yes	FAC
3. *Boehmeria cylindrica*	30	No	FACW
4. *Juncus effusus*	30	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	170 =Total Cover		
50% of total cover: 85	20% of total cover: 34		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetation is dominant.

SOIL

Sampling Point: DP4_PSS

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-20	10YR 3/1	90	10YR 4/6	10	C	PL/M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Hydric soil indicators are present.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region
See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Byllesby-Buck City/County: Carroll Sampling Date: 7/20/2021
Applicant/Owner: Appalachian Electric Power State: NC Sampling Point: DP5_PRB
Investigator(s): Eric Mularski, Jake Irvin Section, Township, Range:
Landform (hillside, terrace, etc.): Floodplain/riverine Local relief (concave, convex, none): Concave Slope (%): 0-1
Subregion (LRR or MLRA): LRR N, MLRA 129 Lat: 36.80744 Long: -80.94027 Datum: NAD83
Soil Map Unit Name: W - Water NWI classification: PRB
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
DP4_PRB is representative of Palustrine Rocky Bottom wetlands. Climatic/hydrologic conditions were normal as determined by the Antecedent Precipitation Tool.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches): 6
Water Table Present?	Yes X	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Primary and secondary wetland hydrology indicators are present.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP5_PRB

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15)			
1. *Platanus occidentalis*	40	Yes	FACW
2. *Quercus phellos*	20	Yes	FAC
3. *Acer negundo*	10	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
	70 =Total Cover		
50% of total cover: 35	20% of total cover: 14		
Herb Stratum (Plot size: 5)			
1. *Eleocharis palustris*	20	Yes	OBL
2. *Persicaria pensylvanica*	20	Yes	FACW
3. *Carex lurida*	10	No	OBL
4. *Impatiens capensis*	10	No	FACW
5. *Typha sp.*	5	No	
6. *Justicia americana*	5	No	OBL
7.			
8.			
9.			
10.			
11.			
	70 =Total Cover		
50% of total cover: 35	20% of total cover: 14		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)
Hydrophytic vegetaton is dominant.

SOIL

Sampling Point: DP5_PRB

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Bed Rock

Depth (inches): 1

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Soils are assumed hydric. Substrate consist of bed rock.

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Appendix E - Terrestrial Resources Study Report

Byllesby-Buck Hydroelectric Project (FERC No. 2514)

February 28, 2022

Prepared by:

Prepared for:

Appalachian Power Company

APPALACHIAN POWER

An AEP Company

BOUNDLESS ENERGY

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Acronyms

AEP	American Electric Power
Appalachian or Licensee	Appalachian Power Company
CFR	Code of Federal Regulations
FERC or Commission	Federal Energy Regulatory Commission
ILP	Integrated Licensing Process
ISR	Initial Study Report
PAD	Pre-Application Document
PM&E	protection, mitigation, and enhancement
Project	Byllesby-Buck Hydroelectric Project
RM	river miles
RSP	Revised Study Plan
SPD	Study Plan Determination
TNC	The Nature Conservancy
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USR	Updated Study Report
VDCR	Virginia Department of Conservation and Recreation
VDGIF	Virginia Department of Game and Inland Fisheries

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1 Project Introduction and Background

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 is located about 9 miles north of the city of Galax, and the Buck development 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. 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 §5.11, 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. 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. Appalachian conducted a virtual ISR Meeting on January 28, 2021 and filed the ISR Meeting summary with the Commission on February 12, 2021. Stakeholders provided written comments in response the Appalachian's filling of the ISR meeting summary; these comments were addressed in the Updated Study Report (USR), which was filed November 17th, 2021. A USR meeting was held on December 1, 2021 and requests from stakeholders made during the meeting are addressed in this revised USR.

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

2 Study Goals and Objectives

The goals and objectives of the Terrestrial Resources Study are to:

- Perform a desktop characterization of the upland vegetation types within the study area boundary utilizing the Nature Conservancy's (TNC) Guide to the Freshwater and Terrestrial Habitats of the Northeast (Virginia Geographic Subset) (TNC 2018a) and Terrestrial Habitat Map (TNC 2018b), and classify plant communities according to the

Virginia Department of Conservation and Recreation (VDCR) Natural Communities of Virginia Classification of Ecological Groups and Community Types (VDCR 2021a) in the field;

- Perform a characterization of the upland habitat types in relation to wildlife species that are known to inhabit or that were directly observed during the field visit; and
- Develop a map of the vegetative community within the upland portions of the study area, identifying general location and community type. The map will also identify the location of any invasive terrestrial species identified in the study area based on the literature review or observed during the field verification efforts.

3 Study Area

The study area for this Terrestrial Resources Study includes the upland vegetative communities on each bank of the upper New River and lowermost tributary segments of Crooked Creek and Chestnut Creek and extends 3.4 miles upstream of Byllesby Dam and 1.15 miles downstream of Buck Dam, including 2.7 miles of the New River in between the two dams. The study area is located in the easternmost portion of the Mt. Rogers National Recreation area and the New River Trail State Park is also situated within the study area along the western streambank (Figure 1).

4 Background and Existing Information

Existing relevant and reasonably available information regarding upland vegetative communities in the Project vicinity was presented in Section 5.5 of the PAD (Appalachian 2019). Most of the land adjacent to the Project is steep and forested in mixed a chestnut oak type community, although there are many bare rock exposures in the rugged terrain. The western side of the project is bounded by the Jefferson National Forest and the east side consists of similarly forested terrain (Appalachian 1991). According to the environmental assessment prepared by FERC for the existing license (FERC 1994), upland forests in the vicinity of the Project are characterized by silver maple (*Acer saccharinum*), black willow (*Salix nigra*), and American sycamore (*Platanus occidentalis*) as the primary species.

Up to 100 invasive plant species have been documented within Virginia (VDCR 2014). Invasive aquatic plants are known to exist in the New River, including hydrilla (*Hydrilla verticillata*), curly-leaf pondweed (*Potamogeton crispus*), and brittle naiad (*Naja minor*). An aquatic plant community study performed in 2012 between Buck Dam and upper Claytor Lake identified 13 macrophyte species, including curly-leaf pondweed (Weberg et al. 2015). Terrestrial invasive plant species including Chinese lespedeza (*Lespedeza cuneata*), mutilfora rose (*Rosa multiflora*), and Japanese stiltgrass (*Microstegium vimineum*) have been documented in the study area in previous studies (ESI 2017a). Additional general information regarding invasive aquatic plants in the New River basin is provided in Section 5.6.2 of the PAD.

The study area supports many small mammals, avifauna, reptiles, and amphibians. Over 511 animal species (including both terrestrial and aquatic species) were identified as potentially occurring within a 3.0-mile radius of the Project per a geographic search on the Virginia Department of Wildlife Resources (formerly the Department of Game and Inland Fisheries [VDGIF]) Fish and Wildlife Information Service (VDGIF 2021). Of these 511 species, 342 were terrestrial species.

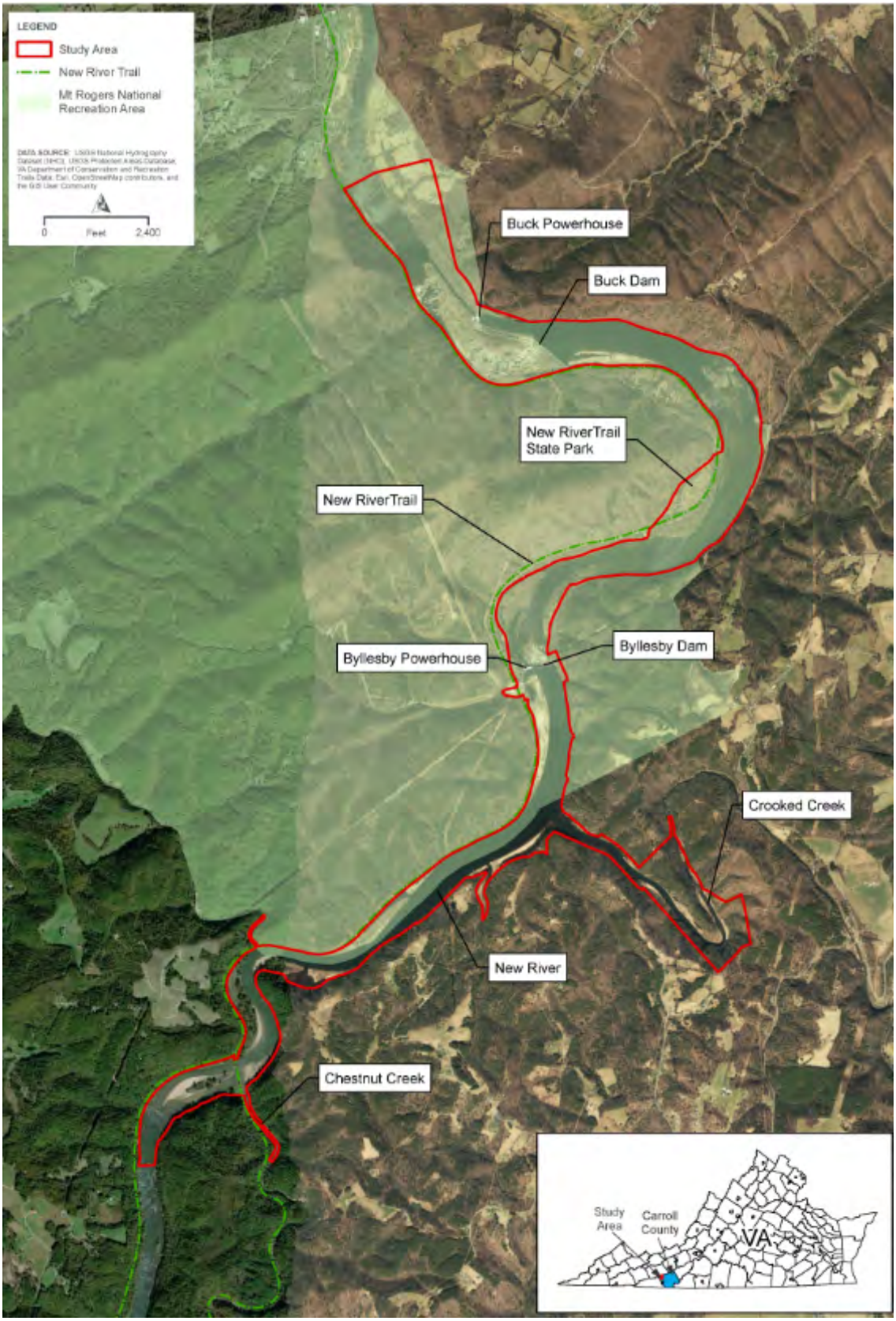

Figure 1. Study Area for the Terrestrial Resources Study

Habitat for several federal protected species including Indiana bat (*Myotis sodalist*), northern long-eared bat (*Myotis septentrionalis*), and Virginia spirea (*Spiraea virginiana*) are located within the study area. A recent (2021) review of the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation database indicates the monarch butterfly (*Danaus plexippus*), which was listed as a candidate species in December of 2020, has potential to occur in the study area. A candidate species listing indicates that the USFWS has sufficient information on a species' biological status and threats to propose it as endangered or threatened, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. Candidate species receive no statutory protection under the Endangered Species Act.

Surveys for protected bat species have not been conducted as part of this relicensing effort since proposed improvement plans and Project activities are not expected to involve clearing of trees in upland forested communities that provide habitat for roosting or maternity colonies for these species.

Virginia spirea, which is federally listed as threatened, has been historically reported by the USFWS upstream of Byllesby Dam; however, there is no documentation or verification of any historically presence or exact location. Environmental Solutions & Innovations, Inc (ESI) performed a habitat assessment in 2017 for this species within the Project boundary (ESI 2017b) and no individual species were observed within the identified suitable habitats for Virginia spirea. HDR performed follow up surveys at these location during the summer of 2021. No individual species were identified. The methods and results of HDR's survey is included in the Byllesby-Buck Hydroelectric Project Wetlands, Riparian, and Littoral Habitat Characterization Study Report (Appendix D of the USR).

Bald eagle (*Haliaeetus leucocephalus*) nesting and roosting habitat occurs in the vicinity of the Project. The bald eagle was removed from the Federal Endangered Species List on August 8, 2007 and is no longer protected under the Endangered Species Act; however, bald eagles are protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. An aerial transect helicopter survey for nesting bald eagles was conducted in the vicinity of the Project in March 2021 by ESI in support of a project not associated with Project relicensing) (ESI 2021). The survey area included approximately 2.5 miles of line crossing the Jefferson National Forest and approximately 1.6 miles on private lands immediately adjacent to the Jefferson National Forest, comprising 90.7 miles of flight across the survey area. One active bald eagle nest observed in the survey area on the New River; the nest is approximately 0.52 miles from the transmission line corridor and approximately 0.27 miles south of the Buck Dam. An unoccupied nest was identified along the New River approximately 1.1 mile north of Buck Dam at the top of a transmission tower; however, after several fly-by attempts over two days, no birds were observed attending and the nest could potentially be an osprey nest. A third smaller stick nest was observed 2.4 river miles upstream of Byllesby Dam; however, it is not consistent with a bald eagle nest. Additionally, three individual eagles were observed within the survey area over two survey events. Anticipated continuation of routine Project-related activities will not adversely affect this species. Coordination with the USFWS would be required should future operations, modifications, or developments have the potential to affect bald eagles.

5 Methodology

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. The desktop study used several data resources and GIS databases to identify high-level plant communities. Plant species were identified in the field by qualified biologists with regional experience with assistance using appropriate regional field guides and plant identification mobile applications. The continuation of Project operations is not expected to adversely impact terrestrial resources; however, local improvements to recreational facilities could have the potential to disturb botanical and wildlife resources. The study methods proposed by Appalachian outlined below provide adequate information to assess potential Project operations-related effects to upland terrestrial resources in the study area.

5.1 Desktop Mapping

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 TNC Terrestrial Habitat Map (TNC 2018b) and Virginia Natural Heritage Data Explorer (VDCR 2021b).

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.

5.2 Field Verification

The onsite 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 2021). 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.

6 Study Results

6.1 Desktop Mapping

Table 1 provides a summary of the terrestrial habitats within the study area and a base map depicting these major upland vegetation cover types present within the study area is shown on Figure 2. This base map was used to verify and characterize terrestrial communities that best represent ecological groups described in accordance with VDCR (2021a).

Table 1. The Nature Conservancy (2018b) Terrestrial Habitats within the Study Area

Habitat	Description	Percent within Study Area
Acidic Cliff and Talus	A sparsely vegetated cliff or talus slope formed on granitic, sandstone, or other acidic bedrock. The lack of soil, high acidic bedrock, and constant erosion limits vegetation to mosses, lichens, and herbs growing on bare rock or crevices, and to sparse trees and shrubs rooted in deeper soil pockets.	0.30
Agricultural	No habitat description available.	4.25
Allegheny-Cumberland Dry Oak Forest and Woodland	A dry hardwood forest dominated by white oak (*Quercus alba*), southern red oak (*Quercus falcata*), chestnut oak (*Quercus montana*), scarlet oak (*Quercus coccinea*), and black oak (*Quercus velutina*), with lesser amounts of red maple (*Acer rubrum*), pignut hickory (*Carya glabra*), mockernut hickory (*Carya tomentosa*), and sometimes sprouts of American chestnut (*Castanea dentata*). Scattered and small inclusions of shortleaf pine (*Pinus echinata*) or Virginia pine (*Pinus virginiana)* may occur.	0.32
Developed	No habitat description available.	1.73
Open Water	New River and tributaries including Crooked Creek and Chestnut Creek. No habitat description available.	61.63
Northern-Central Interior Large River Floodplain	A complex of wetland and upland vegetation on floodplains of medium to large rivers. Vegetation is variable, dominant types often include silver maple (*Acer saccharinum*), sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), sweet gum (*Liquidambar styraciflua*), pin oak (*Quercus palustris*), and swamp white oak (*Quercus bicolor*). Understory species are mixed but include sedges and shrubs such as buttonbush. A single occurrence may extend from river's edge across the outermost extent of the floodplain or to where it meets a wet meadow or upland system.	2.60
Shrubland/grassland; mostly ruderal shrublands, regenerating clear-cuts	No habitat description available.	0.85
Southern Appalachian and Central Appalachian Cove Forest	A hardwood or mixed forest with a high diversity of mesophytic (moisture loving but non-wetland) trees. Canopy species commonly include yellow buckeye (*Aesculus flava*), sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), basswood (*Tilia americana*), tulip polar (*Liriodendron tulipifera*), cucumber tree (*Magnolia acuminata*), and American beech (*Fagus grandifolia*), sometimes in a single stand. Hemlock (*Tsuga* sp.) is sometimes present, mostly in acidic coves. Shrub and herb layers are similarly rich, and calcium-bearing and circumneutral bedrock tends to support the richest examples	8.75
Southern Appalachian Low Elevation Pine Forest	An open forest or woodland of acidic substrates at low elevations in southwest Virginia. Vegetation is dominated by Virginia and shortleaf pine; occasionally with pitch pine (*Pinus rigida*). Hardwoods may be abundance, especially dry-site oaks such as southern red oak,	3.61

Habitat	Description	Percent within Study Area
	chestnut oak, and scarlet oak, but also pignut hickory, red maple, and others. A heath shrub layer may be well developed. Herbs are usually sparse, though communities of this system may have been grassy when fires were more frequent.	
Southern Appalachian Oak Forests	An oak forest of low to mid-elevations and low to moderate moisture dominated by white, red, black, chestnut, and scarlet oaks, with varying amounts of hickory, black gum (*Nyssa sylvatica*) and red maple. Some areas have dense evergreen heath shrubs of mountain laurel (*Kalmia latifolia*) or great rhododendron (*Rhododendron maximum*); others have deciduous heath layers of blueberry and/or huckleberry (*Vaccinium* sp). Successional communities with heavy tuliptree, pine, and black locust (*Robinia pseudoacacia*) are also included in this system	15.96

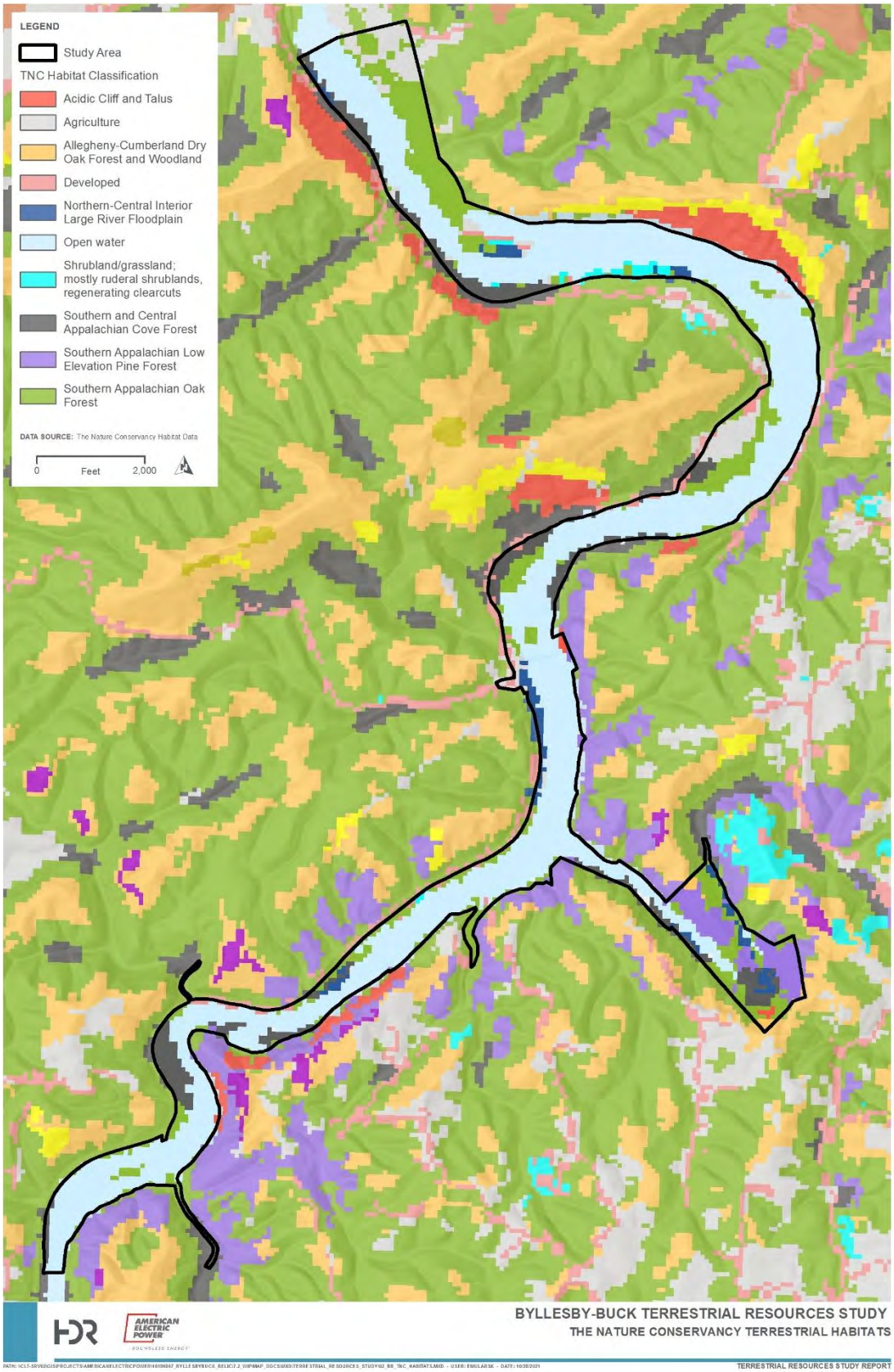

Figure 2. Study Area for the Terrestrial Resources Study

6.2 Field Verification

6.2.1 Ecological Groups and Community Types

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 (2021). 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 (Figure 3).

Open maintained area and agricultural fields were also documented. Photographs of terrestrial habitats are located in Attachment 1. Detailed descriptions of ecological groups and community types and observed vegetation are described below.

6.2.1.1 Acidic Cove Forests

This group contains mixed hardwoods and hard-wood hemlock forests of infertile, mesic, montane habitats. These forests occur extensively throughout the mountains, occupying moist lower slopes, ravines, and coves underlain by sandstone, quartzite, granite, and other acidic bedrock (VDCR 2021). Overstory species observed included tulip poplar (*Liriodendron tulipifera*), eastern hemlock (*Tsuga canadensis*), American basswood, sweet birch (*Betula lenta*), chestnut oak, shagbark hickory (*Carya ovata*), and white pine. Understory species included flowering dogwood (*Cornus florida*), witch hazel (*Hamamelis virginiana*), striped maple (*Acer pensylvanicum*), spicebush (*Lindera benzoin*), wineberry (*Rubus phoenicolasius*) with areas of dense, evergreen shrub layers including great rhododendron and mountain laurel. Herbaceous species included galax (*Galax urceolata*), trillium (*Trillium* sp.), black cohosh (*Actaea racemosa*), jewelweed (*Impatiens capensis*), spotted lady's thumb (*Persicaria maculosa*), mayapple (*Podophyllum peltatum*), wood-nettle (*Laportea canadensis*), Virginia strawberry (*Fragaria virginiana*), violets (*Viola* sp.), polypody ferns (*Polypodium* sp.), and Christmas fern (*Polystichum acrostichoides*).

6.2.1.2 Montane Mixed Oak and Oak Hickory Forests

This group contains relatively diverse, mixed oak and oak-hickory forest of submesic to subxeric mountain slopes and crests located mostly between 2,000 feet and 4,000 feet elevation (VDCR 2021). Overstory species observed included Chestnut oak, northern red oak (*Quercus rubra*), white oak, shagbark hickory, mockernut hickory, sourwood (*Oxydendrum arboretum*), tulip poplar, white pine, silver maple, black locust, and yellow buckeye. Understory species included witch hazel, striped maple, and maple-leaved viburnum (*Viburnum acerifolium*). Herbaceous species included galax, Jack in the pulpit (*Arisaema triphyllum*), spotted ladys' thumb, wood nettle, fire pink (*Silene virginica*), violets (*Viola* sp.), New York fern (*Parathelypteris noveboracensis*) and wood ferns (*Dryopteris* sp.).

6.2.1.3 Mountain/Piedmont Basic Woodlands

This group is represented by deciduous and mixed woodlands of xeric, rocky habitats over mafic substrate such as diabase, gabbro, metabasalt (greenstone), and amphibolite. A few examples occur in habitats underlain by base-rich granite, calcareous shale, and calcareous sandstone. Occurrences in Virginia are widely and locally scattered throughout the mountains and Piedmont foothills, often occurring in patch-mosaics with exposed outcrop barrens (VDCR 20218a). Overstory species observed included Chestnut oak, northern red oak, shagbark hickory, mockernut hickory, silver maple, black cherry (*Prunus serotina*), white ash, and Virginia pine. Understory species included eastern redcedar (*Juniperus virginiana*), eastern redbud (*Cercis canadensis*), eastern hophornbeam (*Ostrya virginiana*), slippery elm (*Ulmus rubra*), witch hazel, blueberry (*Vaccinium* sp.) with localized patches of evergreen shrubs including great rhododendron and mountain laurel. Herbaceous species consisted of smooth solomon's seal (*Polygonatum biflorum*), rattlesnake weed (*Hieracium venosum*), common mullein (*Verbascum Thapsus*), licorice fern (*Polypodium glycryrrhiza*), polypody ferns, wood ferns, reindeer moss (*Cladonia* sp.), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Toxicodendron radicans*).

6.2.1.4 Piedmont/Mountain Floodplain Forests and Swamps

These temporarily to seasonally flooded forests encompass most river floodplain habitats of the northern and western Piedmont and major mountain valleys, except those that are cleared (VDCR 2021). Overstory species observed included American sycamore), boxelder (*Acer negundo*), northern red oak, white oak, willow oak (*Quercus phellos*), American basswood, honey locust (*Gleditsia triacanthos*), black walnut (*Juglans nigra*), black gum, black cherry, tulip polar, red maple, silver maple, and green ash (*Fraxinus pennsylvanica*). Understory species included black willow (*Salix nigra*), persimmon (*Diospyros virginiana*), silky dogwood (*Cornus amomum*), redbud (*Cercis canadensis*), alders (*Alnus* sp.), elderberry (*Sambucus canadensis*), and spicebush. Herbaceous species consisted of black cohosh, beggar-ticks (*Bidens* sp.), mayapple, bedstraw (*Galium* sp.), arrow-arum (*Peltandra virginica*), arrowheads (*Sagittaria* sp.), marsh dayflower (*Murdannia keisak*), false nettle (*Boehmeria cylindrica*), clearweed (*Pilea pumila*), marsh seedbox (*Ludwigia palustris*), lizards's tail (*Saururus cernuus*), soft rush (*Juncus effusus*), blunt spikerush (*Eleocharis obtuse*), winged monkey flower (*Mimulus alatus*), Virginia spiderwort (*Tradescantia virginiana*), American bur-reed (*Sparganium americanum*), broadleaf cattail (*Typha latifolia*), reed canary grass (*Phalaris arundinacea*), rice cutgrass (*Leersia oryzoides*), deertongue (*Dichanthelium clandestinum*), woolgrass (*Scirpus cyperinus*), cinnamon fern (*Osmundastrum cinnamomeum*), Christmas fern, Virginia creeper, and poison ivy.

Open maintained areas were observed and several locations around the existing hydropower infrastructure and transmission right of way. One agricultural area was observed in the furthest western extent of the study area north of the New River and south of Loafers Rest Road. Plant species observed within these areas include American sycamore, tulip polar, eastern redcedar, black cherry, black locust, green ash, Virginia pine, blackberry (*Rubus* sp.), Chinese lespedeza (*Lespedeza cuneata*), Japanese clover (*Kummerowia striata*), wingstem (*Verbesina alternifolia*), goldenrods (*Solidago* sp.), deertongue, common dandelion (*Taraxacum officinale*), wild mint (Mentha canadensis), red clover (*Trifolium pratense*), partridge pea (*Chamaecrista fasciculata*), plantain (*Plantago* sp.), ground ivy (*Glechoma hederacea*), Cherokee sedge (*Carex cherokeensis*) and Japanese honeysuckle (*Lonicera japonica*).

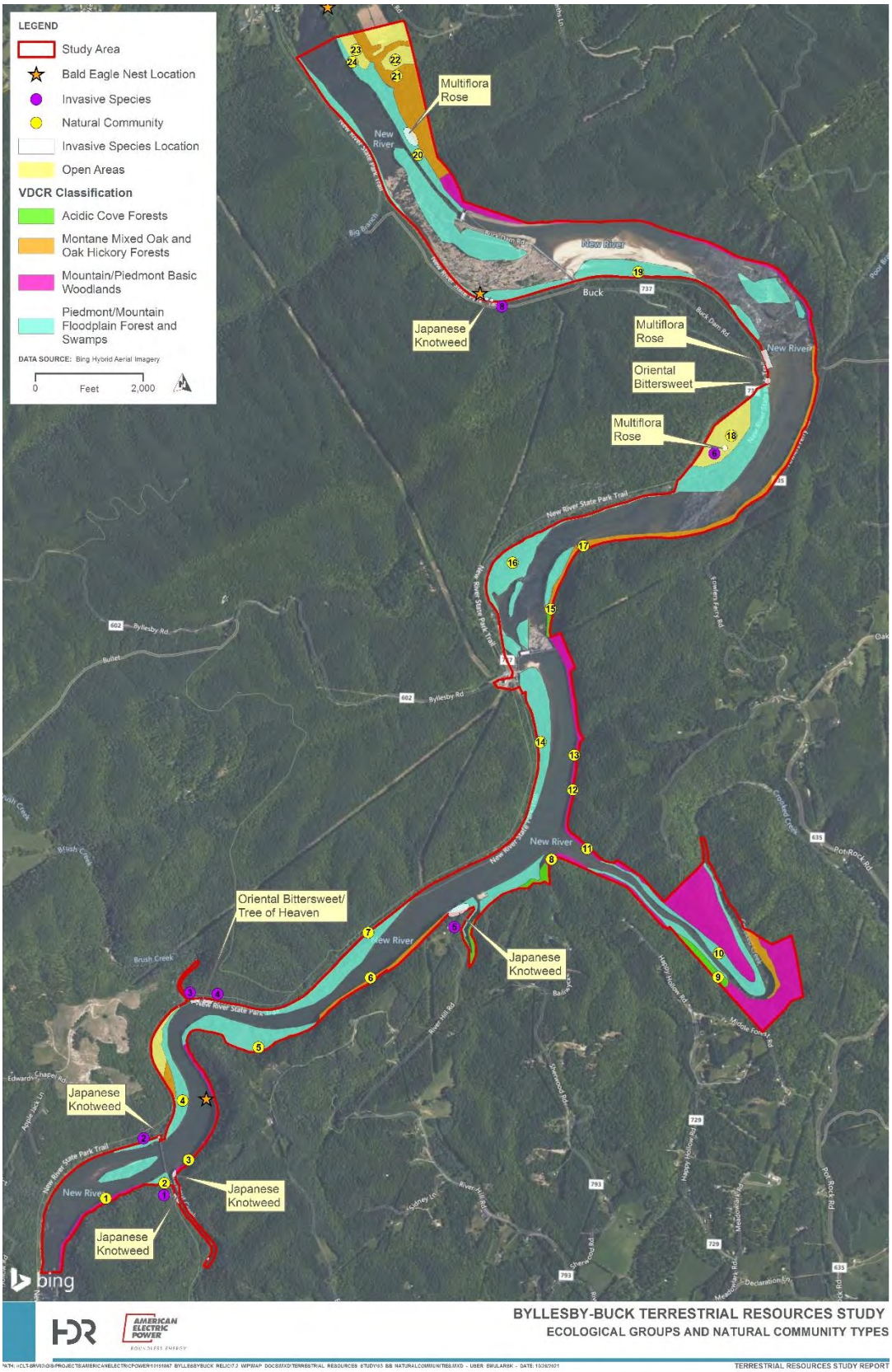

Figure 3. Ecological Groups and Natural Communities

The most prevalent natural community was Piedmont/Mountain Floodplain Forests and Swamps, encompassing 227 acres. Table 2 provides a summary of ecological groups and community types mapped within the study area.

Table 2. Ecological Groups and Community Types Observed During 2021 Surveys

VDCR Ecological Group and Community Type	Acres within Study Area	Percent within Study Area
Acidic Cove Forests	8.85	2.22
Montane Mixed Oak and Oak Hickory Forests	51.38	12.80
Open Areas	32.82	8.17
Mountain/Piedmont Basic Woodlands	80.52	20.06
Piedmont/Mountain Floodplain Forests and Swamps	227.77	56.75

6.2.2 Wildlife

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 lists wildlife species directly observed or signs of their presence evident during the field visit and corresponding community type in which each species was observed.

Table 3. Terrestrial Wildlife Species Observed During 2021 Surveys

Scientific Name	Common Name	Community Type
HERPETOFAUNA		
Chelydra serpentina	Common snapping turtle	Piedmont/Mountain Floodplain Forest & Swamps
Pantherophis alleghaniensis	Eastern ratsnake	Piedmont/Mountain Floodplain Forest & Swamps
Pantherophis guttatus	Red cornsnake	Piedmont/Mountain Floodplain Forest & Swamps
Pseudacris crucifer	Spring peeper	Piedmont/Mountain Floodplain Forest & Swamps
Thamnophis sirtalis	Eastern gartersnake	Montane Mixed Oak and Oak Hickory Forests
BIRDS		
Agelaius phoeniceus	Red-winged blackbird	Piedmont/Mountain Floodplain Forest & Swamps
Aix sponsa	Wood duck	Piedmont/Mountain Floodplain Forest & Swamps
Branta canadensis	Canada goose	Piedmont/Mountain Floodplain Forest & Swamps
Butoe jamaicensis	Red-tailed hawk	Open Areas
Cathartes aura	Turkey vulture	Open Areas
Cardinalis cardinalis	Northern cardinal	Piedmont/Mountain Floodplain Forest & Swamps
Colinus virginianus	Northern bobwhite	Open Areas
Dumetella carolinensis	Gray catbird	Mountain/Piedmont Basic Woodlands
Haliaeetus leucocephalus	Bald eagle	Piedmont/Mountain Floodplain Forest & Swamps
Meleagris gallopavo	Eastern wild turkey	Piedmont/Mountain Floodplain Forest & Swamps Mountain/Piedmont Basic Woodlands
Spizella pusilla	Field sparrow	Open Areas
Pandion haliaetus	Osprey	Piedmont/Mountain Floodplain Forest & Swamps
Zenaida macroura carolinensis	Mourning dove	Open Areas
MAMMALS		
Canis latrans	Coyote	Open Areas

Scientific Name	Common Name	Community Type
Castor canadensis	Beaver	Piedmont/Mountain Floodplain Forest & Swamps
Lontra canadensis	North American river otter	Piedmont/Mountain Floodplain Forest & Swamps
Sylvilagus floridanus mallurus	Eastern cottontail	Open Areas
Odocoileus virginianus	White-tailed deer	All Communities
Ondatra zibethicus	Common muskrat	Piedmont/Mountain Floodplain Forest & Swamps
Sciurus niger vulpinus	Eastern fox squirrel	Piedmont/Mountain Floodplain Forest & Swamps
Sciurus carolinensis pennsylvanicus	Northern gray squirrel	Montane Mixed Oak and Oak Hickory Forests Mountain/Piedmont Basic Woodlands
Tamias striatus	Common eastern Chipmunk	Piedmont/Mountain Floodplain Forest & Swamps
Ursus americanus	Black bear	Mountain/Piedmont Basic Woodlands

6.2.3 Invasive Species Documentation

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 noticed at low densities scattered throughout the study area and not feasible to map each individual location. Significant infestations were mapped in the field and are highlighted on Figure 3. Photographs of invasive species are provided in Attachment 2. Table 4 lists the invasive species identified along its' Virginia Invasiveness Ranking and natural community type.

Table 4. Invasive Species and Ranking (VDCR 2014) Observed During 2021 Surveys

Scientific Name	Common Name	Virginia Invasiveness Rank[1]	Natural Community Location
Ailanthus altissima	Tree-of-Heaven	High	Piedmont/Mountain Floodplain Forest & Swamps
Berberis thunbergii	Japanese Barberry	Medium	Montane Mixed Oak and Oak Hickory Forests
Celastrus orbiculatus	Oriental Bittersweet	High	Piedmont/Mountain Floodplain Forest & Swamps Open Lands
Elaeagnus pungens	Thorny Olive	Low	Piedmont/Mountain Floodplain Forest & Swamps
Lespedeza cuneata	Sericea Lespedeza	High	Piedmont/Mountain Floodplain Forest & Swamps Open Lands
Lonicera japonica	Japanese Honeysuckle	High	Piedmont/Mountain Floodplain Forest & Swamps
Ligustrum sinense	Chinese Privet	High	Montane Mixed Oak and Oak Hickory Forests Mountain/Piedmont Basic Woodlands
Murdannia keisak	Marsh dewflower	High	Piedmont/Mountain Floodplain Forest & Swamps
Microstigium viminium	Japanese stiltgrass	High	Piedmont/Mountain Floodplain Forest & Swamps
Reynoutria japonica	Japanese knotweed	High	Piedmont/Mountain Floodplain Forest & Swamps
Rosa multiflora	Multiflora Rose	High	Piedmont/Mountain Floodplain Forest & Swamps Open Lands Montane Mixed Oak and Oak Hickory Forests
Rubus phoenicolasius	Wineberry	High	Acid Cove Forests

Scientific Name	Common Name	Virginia Invasiveness Rank[1]	Natural Community Location
Sorghum halepense	Johnson Grass	High	Open Areas
Urtica dioica	European Stinging Nettle	High	Montane Mixed Oak and Oak Hickory Forests Mountain/Piedmont Basic Woodlands

[1]VCDR ranked species as exhibiting high, medium or low levels of invasiveness based on their threat to natural communities and native species. Invasiveness rank is high for species that:

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

7 Summary and Discussion

HDR identified and mapped four upland terrestrial ecological groups and community types including Acidic Cove Forests, Montane Mixed Oak and Oak Hickory Forests, Mountain/Piedmont Basic Woodlands, and Piedmont/Mountain Floodplain Forests and Swamp as well as open maintained areas and agricultural fields within the study area. The boundaries were consistent with similar habitat classification descriptions that are depicted on the TNC Terrestrial Habitat Map (TNC 2018b). Many invasive species were noticed at low densities scattered throughout upland areas. Significant infestations of Japanese knotweed (most abundant), oriental bittersweet, and mutliflora rose were noticed primarily in riparian areas along the reservoirs. Five herpetofauna, 15 bird species, and 10 mammal species were observed during the field surveys. Several bald eagle nests are located in the vicinity of the Project and two were observed within the study area (ESI 2021). No other federally protected plant or animal species were observed during the field efforts.

8 Project Impacts on Terrestrial Resources

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 other than vegetation management activities using mostly mechanical removal techniques (e.g. mowing) on an as-needed basis. 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. In the event such activities were proposed to be undertaken in the future in support of Project operation, modifications, or development of new recreational facilities within the Project Boundary, Appalachian would consult or coordinate with USFWS regarding impacts to bald eagles and migratory birds federally protected under the Migratory Bird Treaty Act and the Bald and Golden Protection Act in advance of the proposed activities. Similar consultation would be expected to occur if activities were proposed that could potentially affect other protected species.

9 Variances from FERC-Approved Study Plan

Due to the remote nature of the Project area and lack of cell phone service, HDR was unable to utilize the Early Detection and Distribution Mapping System (EDDMapS [UGA 2021]) mobile application to record and report invasive species locations, as recommended by the VDCR Division of Natural Heritage in the approved RSP.

10 Germane Correspondence and Consultation

No consultation with state or federal agencies was undertaken for this USR.

11 References

Appalachian Power Company (Appalachian). 1991. Application for License for Major Project Existing Dam, Byllesby/Buck Hydroelectric Project No. 2514. American Electric Power Services Corporation, Roanoke, VA.

_____. 2019. Pre-Application Document Byllesby-Buck Hydroelectric Project FERC No. 2514. January 2019.

Environmental Solutions & Innovations, Inc (ESI). 2017a. Field Surveys for Rare Plans for the AEP Buck Hydro Distribution Line Project. Prepared for Appalachian Power Company. July 27, 2017.

_____. 2017b. Field Surveys for Virginia Spiraea and Bald Eagle on the AEP Byllesby/Buck Hydroelectric Project. Prepared for Appalachian Power Company. July 24, 2017.

_____. 2021. Aerial Transect Surveys for Nesting Bald Eagles along the AEP Byllesby-Ivanhoe 88kV Transmission Line Retirement Project Carroll county, Virginia. Prepared for American Electric Power. April 20, 2021.

Federal Energy Regulatory Commission (FERC). 1994. Final Environmental Assessment, Byllesby-Buck Hydroelectric Project, FERC No. 2514-003, Virginia. March 15, 1994.

The Nature Conservancy (TNC). 2018a. A Guide to the Freshwater and Terrestrial Habitats of the Northeast (Virginia Geographic Subset). Boston, Mass. [URL]: terrestrialhabitats_VA.pdf (conservationgateway.org)

_____. 2018b. Terrestrial habitat map for the Northeast U.S. and Atlantic Canada. [URL]: http://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/terrestrial/habitatmap/Pages/default.aspx. (accessed October 2021).

University of Georgia (UGA). 2021. Early Detection and Distribution Mapping System. Center of Invasive Species and Ecosystem Health. [URL]: EDDMapS (Accessed May 2021).

Virginia Department of Conservation and Recreation (VDCR). 2021a. The Natural Communities of Virginia Classification of Ecological Groups and Community Types, Third Approximation

(Version 3.3). March 2021. [URL]: Natural Communities of Virginia. (Accessed May 2021).

_____. 2021b. Natural Heritage Data Explorer. Division of Natural Heritage. [URL]: Natural Heritage Data Explorer (virginia.gov).(Accessed May 2021).

_____. 2014. Virginia Invasive Plant Species List. Department of conservation and Recreation Division of natural Heritage. Natural Heritage Technical Document 14-11. Richmond, VA. [URL]: NH_invasivePlantList_2014.indd (virginia.gov) (Accessed May 2021).

Virginia Department of Game and Inland Fisheries (VDGIF). 2021. Fish and Wildlife Information Services Search Report. [URL] VaFWIS Home Page (virginia.gov) (report compiled on May 18, 2021).

Weberg, M.A., B.R. Murphy, A.L. Rypel, and J.R. Copeland. 2015. A survey of the New River Plant Community in Response to Recent Triploid Grass Carp Introductions into Claytor Lake, Virginia. Southeastern Naturalist 14(2): 308-318.

Attachment 1

Attachment 1 – Terrestrial Habitat Photographs

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Photograph 1 – Mountain/Piedmont Basic Woodland

Photograph 2 – Piedmont/Mountain Floodplain

Photograph 3 – Mountain/Piedmont Basic Woodland

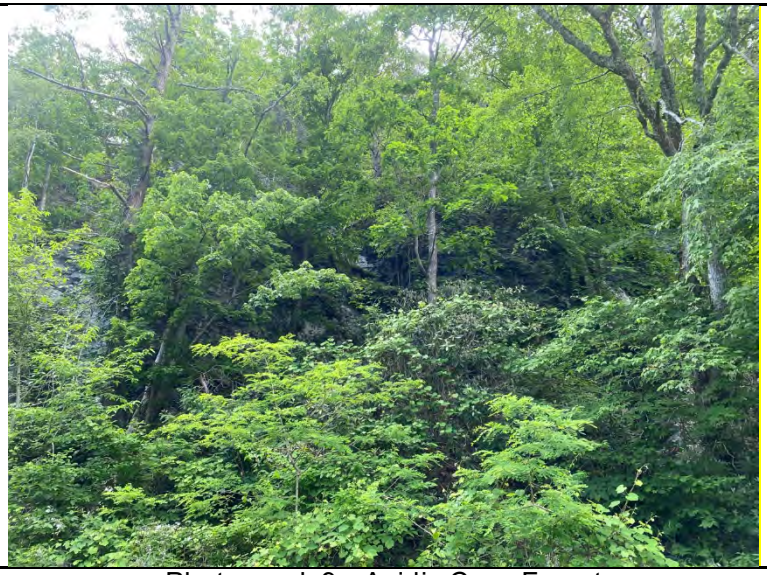
Photograph 4 – Piedmont/Mountain Floodplain

Photograph 5 – Piedmont/Mountain Floodplain

Photograph 6 – Montane Mixed Oak and Oak Hickory Forest

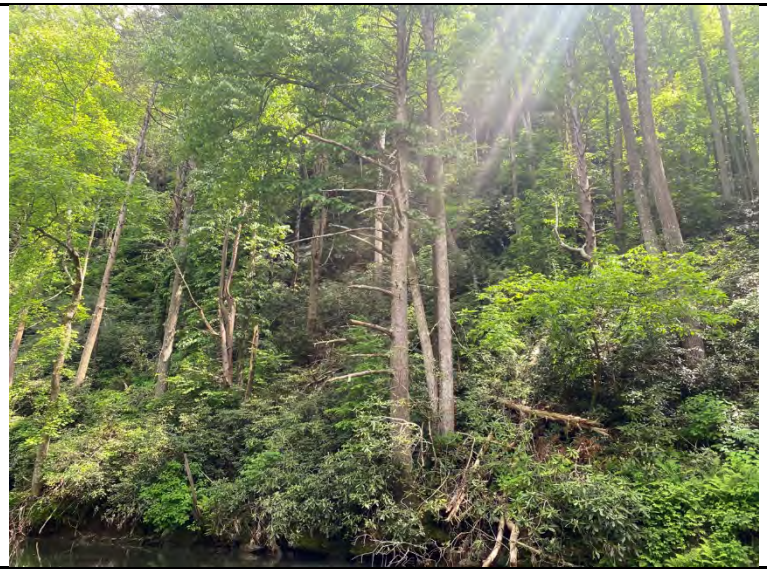
Photograph 7 – Piedmont/Mountain Floodplain

Photograph 8 – Mountain/Piedmont Basic Woodland



Photograph 9 – Acidic Cove Forest

Photograph 10 – Piedmont/Mountain Floodplain



Photograph 11 – Mountain/Piedmont Basic Woodland

Photograph 12 – Mountain/Piedmont Basic Woodland

Photograph 13 – Mountain/Piedmont Basic Woodland

Photograph 14 – Piedmont/Mountain Floodplain

Photograph 15 – Acidic Cove Forest

Photograph 16 – Piedmont/Mountain Floodplain

Photograph 17 – Montane Mixed Oak and Oak Hickory Forest

Photograph 18 – Old Fields

Photograph 19 – Piedmont/Mountain Floodplain

Photograph 20 – Piedmont/Mountain Floodplain

Photograph 21 – Montane Mixed Oak and Oak Hickory Forest

Photograph 22 – Open Area

Photograph 23 – Open Area

Photograph 24 – Piedmont/Mountain Floodplain

Attachment 2

Attachment 2 – Invasive Species Photographs

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Photograph 1 – Japanese Knotweed

Photograph 2 – Japanese Knotweed

Photograph 3 – Oriental Bittersweet

Photograph 4 – Oriental Bittersweet & Tree of Heaven

Photograph 5 – Japanese Knotweed

Photograph 6 – Multiflora Rose

Photograph 7 – Multiflora Rose

Photograph 8 - Japanese Knotweed

Attachment 3

Attachment 3 – Virginia Department of Game and Inland Fisheries – Species Search Report

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Virginia Department of Game and Inland Fisheries

5/18/2021 9:03:49 AM

Fish and Wildlife Information Service

VaFWIS Search Report Compiled on 5/18/2021, 9:03:49 AM

Help

Known or likely to occur within a **3 mile radius around point 36.8148056 -80.9684167** in **035 Carroll County, 197 Wythe County, VA**

View Map of Site Location

511 Known or Likely Species ordered by Status Concern for Conservation

BOVA Code	Status*	Tier**	Common Name	Scientific Name
010199	FESE	Ib	Darter, candy	Etheostoma osburni
050021	FESE	IIa	Bat, gray	Myotis grisescens
030061	FTSE	Ia	Turtle, bog (= Muhlenberg)	Clemmys muhlenbergii
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis
050020	SE	Ia	Bat, little brown	Myotis lucifugus
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus
060080	SE	IIa	Heelsplitter, Tennessee	Lasmigona holstonia
040096	ST	Ia	Falcon, peregrine	Falco peregrinus
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus
060081	ST	IIa	Floater, green	Lasmigona subviridis
060140	ST	IIIb	Pistolgrip	Tritogonia verrucosa
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans
020020	CC	Ia	Hellbender, eastern	Cryptobranchus alleganiensis alleganiensis
020030	CC	IIb	Salamander, green	Aneides aeneus
030012	CC	IVa	Rattlesnake, timber	Crotalus horridus
040092		Ia	Eagle, golden	Aquila chrysaetos
040306		Ia	Warbler, golden-winged	Vermivora chrysoptera
050024		Ia	Myotis, eastern small-footed	Myotis leibii
100248		Ia	Fritillary, regal	Speyeria idalia idalia
040213		Ic	Owl, northern saw-whet	Aegolius acadicus
020011		IIa	Frog, mountain chorus	Pseudacris brachyphona
040052		IIa	Duck, American black	Anas rubripes
040320		IIa	Warbler, cerulean	Setophaga cerulea
040140		IIa	Woodcock, American	Scolopax minor
040203		IIb	Cuckoo, black-billed	Coccyzus erythropthalmus
040304		IIc	Warbler, Swainson's	Limnothlypis swainsonii

080003		IIc	Snaketail, pygmy	Ophiogomphus howei
020056		IIIa	Salamander, Blue Ridge two-lined	Eurycea wilderae
030068		IIIa	Turtle, woodland box	Terrapene carolina carolina
040100		IIIa	Bobwhite, northern	Colinus virginianus
040202		IIIa	Cuckoo, yellow-billed	Coccyzus americanus
040099		IIIa	Grouse, ruffed	Bonasa umbellus
040094		IIIa	Harrier, northern	Circus hudsonius
040204		IIIa	Owl, barn	Tyto alba pratincola
040333		IIIa	Warbler, Kentucky	Geothlypis formosa
040215		IIIa	Whip-poor-will, Eastern	Antrostomus vociferus
070124		IIIa	Crayfish, Longclaw	Cambarus buntingi
100079		IIIa	Butterfly, monarch	Danaus plexippus
010215		IIIb	Sauger	Sander canadensis
040220		IIIb	Kingfisher, belted	Megaceryle alcyon
010195		IIIc	Darter, Kanawha	Etheostoma kanawhae
010097		IIIc	Minnow, Kanawha	Phenacobius teretulus
040372		IIIc	Crossbill, red	Loxia curvirostra
040247		IIIc	Swallow, bank	Riparia riparia
100150		IIIc	Butterfly, mottled duskywing	Erynnis martialis
010052		IVa	Trout, brook	Salvelinus fontinalis
020031		IVa	Salamander, Jefferson	Ambystoma jeffersonianum
030045		IVa	Ribbonsnake, common	Thamnophis saurita saurita
030033		IVa	Snake, queen	Regina septemvittata
040272		IVa	Catbird, gray	Dumetella carolinensis
040337		IVa	Chat, yellow-breasted	Icteria virens virens
040142		IVa	Dowitcher, short-billed	Limnodromus griseus
040229		IVa	Kingbird, eastern	Tyrannus tyrannus
040344		IVa	Meadowlark, eastern	Sturnella magna
040391		IVa	Sparrow, field	Spizella pusilla
040378		IVa	Sparrow, grasshopper	Ammodramus savannarum pratensis
040273		IVa	Thrasher, brown	Toxostoma rufum
040375		IVa	Towhee, eastern	Pipilo erythrophthalmus
040302		IVa	Warbler, black-and-white	Mniotilta varia
050029		IVa	Bat, eastern red	Lasiurus borealis
050030		IVa	Bat, hoary	Lasiurus cinereus
050025		IVa	Bat, silver-haired	Lasionycteris noctivagans
050106		IVa	Cottontail, Appalachian	Sylvilagus obscurus
050081		IVa	Woodrat, Allegheny	Neotoma magister
060075		IVa	Mussel, pocketbook	Lampsilis ovata
010184		IVb	Sunfish, longear	Lepomis megalotis

030050		IVb	Turtle, snapping	Chelydra serpentina
040221		IVb	Flicker, northern	Colaptes auratus
040028		IVb	Heron, green	Butorides virescens
040217		IVb	Swift, chimney	Chaetura pelagica
040277		IVb	Thrush, wood	Hylocichla mustelina
040340		IVb	Warbler, Canada	Cardellina canadensis
040243		IVb	Wood-Pewee, Eastern	Contopus virens
010348		IVc	Chub, highback	Hybopsis hypsinotus
010363		IVc	Darter, Appalachia	Percina gymnocephala
010210		IVc	Darter, blackside	Percina maculata
010212		IVc	Darter, sharpnose	Percina oxyrhynchus
010350		IVc	Jumprock, brassy	Moxostoma sp
010207		IVc	Logperch	Percina caprodes
010096		IVc	Minnow, tonguetied	Exoglossum laurae
010089		IVc	Shiner, New River	Notropis scabriceps
010376		IVc	Shiner, redlip	Notropis chiliticus
010126		IVc	Stonecat	Noturus flavus
020085		IVc	Salamander, Blue Ridge dusky	Desmognathus orestes
020057		IVc	Salamander, Yonahlossee	Plethodon yonahlossee
030024		IVc	Snake, eastern hog-nosed	Heterodon platirhinos
040248		IVc	Swallow, northern rough-winged	Stelgidopteryx serripennis
050006		IVc	Shrew, long-tailed (= rock)	Sorex dispar
050046		IVc	Skunk, eastern spotted	Spilogale putorius putorius
060135		IVc	Snail, seep mudalia	Leptoxis dilatata
100001		IVc	fritillary, Diana	Speyeria diana
010188			Bass, largemouth	Micropterus salmoides
010175			Bass, rock	Ambloplites rupestris
010186			Bass, smallmouth	Micropterus dolomieu
010187			Bass, spotted	Micropterus punctulatus
010167			Bass, white	Morone chrysops
010183			Bluegill	Lepomis macrochirus
010121			Bullhead, black	Ameiurus melas
010123			Bullhead, brown	Ameiurus nebulosus
010124			Bullhead, flat	Ameiurus platycephalus
010122			Bullhead, yellow	Ameiurus natalis
010062			Carp, common	Cyprinus carpio
010125			Catfish, channel	Ictalurus punctatus
010130			Catfish, flathead	Pylodictis olivaris
010372			Chub, bigmouth	Nocomis platyrhynchus
010066			Chub, bluehead	Nocomis leptocephalus
010103			Chub, creek	Semotilus atromaculatus

010455			Chub, Genus = Nocomis	Nocomis spp.
010190			Crappie, black	Pomoxis nigromaculatus
010189			Crappie, white	Pomoxis annularis
010101			Dace, blacknose	Rhinichthys atratulus
010102			Dace, longnose	Rhinichthys cataractae
010060			Dace, mountain redbelly	Chrosomus oreas
010366			Dace, rosyside	Clinostomus funduloides
010464			Dace, western blacknose	Rhinichthys obtusus
010193			Darter, fantail	Etheostoma flabellare
010402			Darter, gilt	Percina evides
010191			Darter, greenside	Etheostoma blennioides
010198			Darter, johnny	Etheostoma nigrum
010061			Darter, Roanoke	Percina roanoka
010202			Darter, Snubnose	Etheostoma simoterum
010397			Darter, tessellated	Etheostoma olmstedi
010129			Madtom, margined	Noturus insignis
010099			Minnow, bluntnose	Pimephales notatus
010063			Minnow, cutlips	Exoglossum maxillingua
010100			Minnow, fathead	Pimephales promelas
010365			Muskellunge	Esox masquinongy
010206			Perch, yellow	Perca flavescens
010182			Pumpkinseed	Lepomis gibbosus
010284			Sculpin, banded	Cottus carolinae
010417			Sculpin, Genus = Cottus	Cottus spp.
010283			Sculpin, mottled	Cottus bairdii
010041			Shad, gizzard	Dorosoma cepedianum
010078			Shiner, crescent	Luxilus cerasinus
010453			Shiner, Genus = Cyprinella	Cyprinella sp.
010068			Shiner, golden	Notemigonus crysoleucas
010094			Shiner, mimic	Notropis volucellus
010074			Shiner, rosefin	Lythrurus ardens
010466			shiner, rosyface	Notropis rubellus
010088			Shiner, saffron	Notropis rubricroceus
010085			Shiner, silver	Notropis photogenis
010091			Shiner, spotfin	Cyprinella spiloptera
010082			Shiner, spottail	Notropis hudsonius
010086			Shiner, swallowtail	Notropis procne
010383			Shiner, telescope	Notropis telescopus
010069			Shiner, white	Luxilus albeolus
010081			Shiner, whitetail	Cyprinella galactura

010058			Stoneroller, central	Campostoma anomalum
010108			Sucker, northern hog	Hypentelium nigricans
010105			Sucker, white	Catostomus commersonii
010181			Sunfish, green	Lepomis cyanellus
010180			Sunfish, redbreast	Lepomis auritus
010185			Sunfish, redear	Lepomis microlophus
010051			Trout, brown	Salmo trutta
010050			Trout, rainbow	Oncorhynchus mykiss
010216			Walleye	Sander vitreus vitreus
020004			Bullfrog, American	Lithobates catesbeianus
020008			Frog, green	Lithobates clamitans
020013			Frog, pickerel	Lithobates palustris
020018			Frog, upland chorus	Pseudacris feriarum
020019			Frog, wood	Lithobates sylvaticus
020065			Newt, red-spotted	Notophthalmus viridescens viridescens
020071			Peeper, spring	Pseudacris crucifer
020036			Salamander, Allegheny mountain dusky	Desmognathus ochrophaeus
020084			Salamander, Atlantic Coast Slimy	Plethodon chlorobryonis
020025			Salamander, black-bellied	Desmognathus quadramaculatus
020066			Salamander, Blue Ridge red	Pseudotriton ruber nitidus
020043			Salamander, eastern red-backed	Plethodon cinereus
020029			Salamander, four-toed	Hemidactylium scutatum
020033			Salamander, long-tailed	Eurycea longicauda longicauda
020079			Salamander, midland mud	Pseudotriton montanus diastictus
020038			Salamander, northern dusky	Desmognathus fuscus
020070			Salamander, northern red	Pseudotriton ruber ruber
020047			Salamander, northern slimy	Plethodon glutinosus
020077			Salamander, northern spring	Gyrinophilus porphyriticus porphyriticus
020075			Salamander, seal	Desmognathus monticola
020041			Salamander, southern ravine	Plethodon richmondi
020050			Salamander, southern two-lined	Eurycea cirrigera
020049			Salamander, spotted	Ambystoma maculatum
020055			Salamander, Wehrle's	Plethodon wehrlei
020080			Salamander, white-spotted slimy	Plethodon cylindraceus
020059			Toad, eastern American	Anaxyrus americanus americanus
020062			Toad, Fowler's	Anaxyrus fowleri
020006			Treefrog, Cope's gray	Hyla chrysoscelis
030016			Copperhead, eastern	Agkistrodon contortrix

030022			Cornsnake, red	Pantherophis guttatus
030044			Gartersnake, eastern	Thamnophis sirtalis sirtalis
030038			Greensnake, northern rough	Opheodrys aestivus aestivus
030002			Lizard, eastern fence	Sceloporus undulatus
030029			Milksnake, eastern	Lampropeltis triangulum
030018			Racer, northern black	Coluber constrictor constrictor
030023			Ratsnake, eastern	Pantherophis alleghaniensis
030006			Skink, broad-headed	Plestiodon laticeps
030004			Skink, common five-lined	Plestiodon fasciatus
030020			Snake, northern ring-necked	Diadophis punctatus edwardsii
030052			Turtle, eastern musk	Sternotherus odoratus
030060			Turtle, eastern painted	Chrysemys picta picta
030034			Watersnake, northern	Nerodia sipedon sipedon
030019			Wormsnake, eastern	Carphophis amoenus amoenus
040346			Blackbird, red-winged	Agelaius phoeniceus
040282			Bluebird, eastern	Sialia sialis
040343			Bobolink	Dolichonyx oryzivorus
040068			Bufflehead	Bucephala albeola
040361			Bunting, indigo	Passerina cyanea
040064			Canvasback	Aythya valisineria
040357			Cardinal, northern	Cardinalis cardinalis
040257			Chickadee, black-capped	Poecile atricapillus
040258			Chickadee, Carolina	Poecile carolinensis
040113			Coot, American	Fulica americana
040024			Cormorant, double-crested	Phalacrocorax auritus
040353			Cowbird, brown-headed	Molothrus ater
040264			Creeper, brown	Certhia americana
040373			Crossbill, white-winged	Loxia leucoptera
040255			Crow, American	Corvus brachyrhynchos
040364			Dickcissel	Spiza americana
040198			Dove, mourning	Zenaida macroura carolinensis
040076			Duck, ruddy	Oxyura jamaicensis
040061			Duck, wood	Aix sponsa
040093			Eagle, bald	Haliaeetus leucocephalus
040367			Finch, house	Haemorhous mexicanus
040366			Finch, purple	Haemorhous purpureus
040239			Flycatcher, Acadian	Empidonax virescens
040241			Flycatcher, alder	Empidonax alnorum
040234			Flycatcher, great crested	Myiarchus crinitus
040242			Flycatcher, least	Empidonax minimus

040240			Flycatcher, willow	Empidonax traillii
040238			Flycatcher, yellow-bellied	Empidonax flaviventris
040284			Gnatcatcher, blue-gray	Polioptila caerulea
040371			Goldfinch, American	Spinus tristis
040045			Goose, Canada	Branta canadensis
040352			Grackle, common	Quiscalus quiscula
040005			Grebe, horned	Podiceps auritus
040008			Grebe, pied-billed	Podilymbus podiceps
040360			Grosbeak, blue	Passerina caerulea
040365			Grosbeak, evening	Coccothraustes vespertinus
040358			Grosbeak, rose-breasted	Pheucticus ludovicianus
040167			Gull, herring	Larus argentatus
040089			Hawk, broad-winged	Buteo platypterus
040086			Hawk, Cooper's	Accipiter cooperii
040088			Hawk, red-shouldered	Buteo lineatus lineatus
040087			Hawk, red-tailed	Buteo jamaicensis
040090			Hawk, rough-legged	Buteo lagopus johannis
040085			Hawk, sharp-shinned	Accipiter striatus velox
040027			Heron, great blue	Ardea herodias herodias
040218			Hummingbird, ruby-throated	Archilochus colubris
040252			Jay, blue	Cyanocitta cristata
040387			Junco, dark-eyed	Junco hyemalis
040098			Kestrel, American	Falco sparverius sparverius
040119			Killdeer	Charadrius vociferus
040285			Kinglet, golden-crowned	Regulus satrapa
040286			Kinglet, ruby-crowned	Regulus calendula
040245			Lark, horned	Eremophila alpestris
040001			Loon, common	Gavia immer
040051			Mallard	Anas platyrhynchos
040251			Martin, purple	Progne subis
040079			Merganser, red-breasted	Mergus serrator serrator
040271			Mockingbird, northern	Mimus polyglottos
040112			Moorhen, common	Gallinula chloropus cachinnans
040216			Nighthawk, common	Chordeiles minor
040262			Nuthatch, red-breasted	Sitta canadensis
040261			Nuthatch, white-breasted	Sitta carolinensis
040348			Oriole, Baltimore	Icterus galbula
040347			Oriole, orchard	Icterus spurius
040095			Osprey	Pandion haliaetus carolinensis
040330			Ovenbird	Seiurus aurocapilla
040209			Owl, barred	Strix varia

040206			Owl, great horned	Bubo virginianus
040211			Owl, short-eared	Asio flammeus
040312			Parula, northern	Setophaga americana
040101			Pheasant, ring-necked	Phasianus colchicus
040236			Phoebe, eastern	Sayornis phoebe
040197			Pigeon, rock	Columba livia
040254			Raven, common	Corvus corax
040341			Redstart, American	Setophaga ruticilla
040275			Robin, American	Turdus migratorius
040132			Sandpiper, solitary	Tringa solitaria
040134			Sandpiper, spotted	Actitis macularia
040225			Sapsucker, yellow-bellied	Sphyrapicus varius
040205			Screech-owl, eastern	Megascops asio
040370			Siskin, pine	Spinus pinus
040141			Snipe, Wilson's	Gallinago delicata
040108			Sora	Porzana carolina
040389			Sparrow, chipping	Spizella passerina
040395			Sparrow, fox	Passerella iliaca
040342			Sparrow, house	Passer domesticus
040377			Sparrow, savannah	Passerculus sandwichensis
040398			Sparrow, song	Melospiza melodia
040397			Sparrow, swamp	Melospiza georgiana
040383			Sparrow, vesper	Pooecetes gramineus
040393			Sparrow, white-crowned	Zonotrichia leucophrys
040394			Sparrow, white-throated	Zonotrichia albicollis
040294			Starling, European	Sturnus vulgaris
040249			Swallow, barn	Hirundo rustica
040250			Swallow, cliff	Petrochelidon pyrrhonota pyrrhonota
040246			Swallow, tree	Tachycineta bicolor
040044			Swan, tundra	Cygnus columbianus columbianus
040355			Tanager, scarlet	Piranga olivacea
040356			Tanager, summer	Piranga rubra
040056			Teal, green-winged	Anas crecca carolinensis
040278			Thrush, hermit	Catharus guttatus
040260			Titmouse, tufted	Baeolophus bicolor
040102			Turkey, wild	Meleagris gallopavo silvestris
040281			Veery	Catharus fuscescens
040298			Vireo, blue-headed	Vireo solitarius
040299			Vireo, red-eyed	Vireo olivaceus
040301			Vireo, warbling	Vireo gilvus gilvus

040295			Vireo, white-eyed	Vireo griseus
040297			Vireo, yellow-throated	Vireo flavifrons
040081			Vulture, black	Coragyps atratus
040080			Vulture, turkey	Cathartes aura
040316			Warbler, black-throated blue	Setophaga caerulescens
040319			Warbler, black-throated green	Setophaga virens
040321			Warbler, blackburnian	Setophaga fusca
040325			Warbler, blackpoll	Setophaga striata
040307			Warbler, blue-winged	Vermivora cyanoptera
040315			Warbler, Cape May	Setophaga tigrina
040323			Warbler, chestnut-sided	Setophaga pensylvanica
040338			Warbler, hooded	Setophaga citrina
040314			Warbler, magnolia	Setophaga magnolia
040311			Warbler, Nashville	Leiothlypis ruficapilla
040329			Warbler, palm	Setophaga palmarum
040326			Warbler, pine	Setophaga pinus
040328			Warbler, prairie	Setophaga discolor
040303			Warbler, prothonotary	Protonotaria citrea
040309			Warbler, Tennessee	Oreothlypis peregrina
040305			Warbler, worm-eating	Helmitheros vermivorus
040313			Warbler, yellow	Setophaga petechia
040317			Warbler, yellow-rumped	Setophaga coronata
040332			Waterthrush, Louisiana	Parkesia motacilla
040331			Waterthrush, northern	Parkesia noveboracensis
040290			Waxwing, cedar	Bombycilla cedrorum
040227			Woodpecker, downy	Dryobates pubescens
040226			Woodpecker, hairy	Dryobates villosus
040222			Woodpecker, pileated	Dryocopus pileatus
040223			Woodpecker, red-bellied	Melanerpes carolinus
040224			Woodpecker, red-headed	Melanerpes erythrocephalus
040268			Wren, Carolina	Thryothorus ludovicianus
040265			Wren, house	Troglodytes aedon
040266			Wren, winter	Troglodytes troglodytes
040130			Yellowlegs, greater	Tringa melanoleuca
040336			Yellowthroat, common	Geothlypis trichas
050028			Bat, big brown	Eptesicus fuscus
050037			Bear, American black	Ursus americanus
050069			Beaver, American	Castor canadensis
050051			Bobcat	Lynx rufus rufus
050056			Chipmunk, common eastern	Tamias striatus striatus
050055			Chipmunk, Fisher's eastern	Tamias striatus fisheri

050103			Cottontail, eastern	Sylvilagus floridanus mallurus
050105			Cottontail, Mearn's eastern	Sylvilagus floridanus mearnsii
050125			Coyote	Canis latrans
050108			Deer, white-tailed	Odocoileus virginianus
050050			Fox, common gray	Urocyon cinereoargenteus cinereoargenteus
050049			Fox, red	Vulpes vulpes fulva
050085			Lemming, Stone's southern bog	Synaptomys cooperi stonei
050043			Mink, southwestern	Neovison vison vison
050017			Mole, eastern	Scalopus aquaticus aquaticus
050016			Mole, hairy-tailed	Parascalops breweri
050110			Mole, star-nosed	Condylura cristata parva
050077			Mouse, common golden	Ochrotomys nuttalli aureolus
050074			Mouse, common white-footed	Peromyscus leucopus leucopus
050072			Mouse, deer	Peromyscus maniculatus nubiterrae
050070			Mouse, eastern harvest	Reithrodontomys humulis humulis
050098			Mouse, house	Mus musculus musculus
050076			Mouse, Lewis' golden	Ochrotomys nuttalli nuttalli
050099			Mouse, meadow jumping	Zapus hudsonius americanus
050073			Mouse, northern white-footed	Peromyscus leucopus noveboracensis
050100			Mouse, woodland jumping	Napaeozapus insignis roanensis
050092			Muskrat, common	Ondatra zibethicus zibethicus
050001			Opossum, Virginia	Didelphis virginiana virginiana
050045			Otter, northern river	Lontra canadensis lataxina
050038			Raccoon	Procyon lotor lotor
050079			Rat, hispid cotton	Sigmodon hispidus virginianus
050095			Rat, Norway	Rattus norvegicus norvegicus
050010			Shrew, American pygmy	Sorex hoyi
050015			Shrew, least	Cryptotis parva
050002			Shrew, masked	Sorex cinereus cinereus
050013			Shrew, northern short-tailed	Blarina brevicauda kirtlandi
050004			Shrew, smoky	Sorex fumeus
050007			Shrew, southeastern	Sorex longirostris longirostris
050048			Skunk, striped	Mephitis mephitis mephitis
050063			Squirrel, eastern fox	Sciurus niger vulpinus
050058			Squirrel, northern gray	Sciurus carolinensis pennsylvanicus
050060			Squirrel, red	Tamiasciurus hudsonicus abieticola
050065			Squirrel, southern flying	Glaucomys volans volans
050088			Vole, Carolina red-backed	Myodes gapperi carolinensis
050082			Vole, meadow	Microtus pennsylvanicus

				pennsylvanicus
050091			Vole, pine	Microtus pinetorum scalopsoides
050087			Vole, southern red-backed	Myodes gapperi
050040			Weasel, least	Mustela nivalis allegheniensis
050041			Weasel, long-tailed	Mustela frenata noveboracensis
050054			Woodchuck	Marmota monax monax
060177			Clam, Asian	Corbicula fluminea
060046			Fossaria, Golden	Galba obrussa
060039			Limpet, creeping ancylid	Ferrissia rivularis
060025			Mussel, eastern elliptio	Elliptio complanata
060022			Mussel, purple wartyback	Cyclonaias tuberculata
060028			Mussel, spike	Eurynia dilatata
060206			SNAIL, bayou physa	Physella hendersoni hendersoni
060134			Snail, crested mudalia	Leptoxis carinata
060095			Snail, European physa	Physella acuta
060198			Snail, sprite elimia	Elimia proxima
060200			Snail, symmetrical elimia	Elimia symmetrica
060064			Snail, two-ridge rams-horn	Helisoma anceps
070010			Amphipod, James Cave	Stygobromus abditus
070103			Crayfish	Orconectes spinosus
070130			CRAYFISH	Orconectes c. f. spinosus
070101			Crayfish, Appalachian brook	Cambarus bartonii cavatus
070088			Crayfish, Big Water	Cambarus robustus
070158			Crayfish, Cambarus	Cambarus sp.
070115			Crayfish, Chattahoochee	Cambarus howardi
070116			Crayfish, Clinch River	Cambarus angularis
070102			Crayfish, Common	Cambarus bartonii bartonii
070100			Crayfish, Conhaway	Cambarus appalachiensis
070091			Crayfish, Longnose	Cambarus longirostris
070090			Crayfish, New River	Cambarus chasmodactylus
070093			Crayfish, no common name	Cambarus longulus
070094			Crayfish, no common name	Cambarus acuminatus
070159			Crayfish, Orconectes	Orconectes sp.
070128			Crayfish, Spiny Stream	Faxonius cristavarius
070092			Crayfish, Upland Burrowing	Cambarus dubius
100043			Armyworm	Pseudaletia unipuncta
100041			Borer, European corn	Ostrinia nubilatis
100220			Butterfly, American copper	Lycaena phlaeas
100262			Butterfly, American lady	Vanessa virginiensis
100245			Butterfly, American snout	Libytheana carinenta
100274			Butterfly, Appalachian brown	Satyrodes appalachia

100250			Butterfly, Aprhodite fritillary	Speyeria aphrodite
100254			Butterfly, Baltimore checkerspot	Euphydryas phaeton
100232			Butterfly, banded hairstreak	Satyrium calanus
100092			Butterfly, black swallowtail	Papilio polyxenes asterius
100137			Butterfly, brown elfin	Callophrys augustinus
100205			Butterfly, cabbage white	Pieris rapae
100167			Butterfly, carus skipper	Polites carus
100206			Butterfly, checkered white	Pontia protodice
100159			Butterfly, clouded skipper	Lerema accius
100094			Butterfly, clouded sulphur	Colias philodice
100165			Butterfly, cobweb skipper	Hesperia metea
100265			Butterfly, common buckeye	Junonia coenia
100156			Butterfly, common checkered-skipper	Pyrgus communis
100157			Butterfly, common sootywing	Pholisora catullus
100277			Butterfly, common wood-nymph	Cercyonis pegala
100144			Butterfly, confused cloudywing	Thorybes confusis
100230			Butterfly, coral hairstreak	Satyrium titus
100168			Butterfly, crossline skipper	Polites origenes
100147			Butterfly, dreamy duskywing	Erynnis icelus
100258			Butterfly, eastern comma	Polygonia comma
100225			Butterfly, eastern pine elfin	Callophrys niphon
100238			Butterfly, eastern tailed-blue	Everes comyntas
100093			Butterfly, eastern tiger swallowtail	Papilio glaucus
100161			Butterfly, European skipper	Thymelicus lineola
100209			Butterfly, falcate orangetip	Anthocharis midea
100162			Butterfly, fiery skipper	Hylephila phyleus
100139			Butterfly, golden-banded skipper	Autochton cellus
100228			Butterfly, gray hairstreak	Strymon melinus
100249			Butterfly, great spangled fritillary	Speyeria cybele
100270			Butterfly, hackberry emperor	Asterocampa celtis
100219			Butterfly, harvester	Feniseca tarquinius
100224			Butterfly, Henry's elfin	Callophrys henrici
100141			Butterfly, hoary edge	Achalarus lyciades
100178			Butterfly, Hobomok skipper	Poanes hobomok
100149			Butterfly, Horace's duskywing	Erynnis horatius
100164			Butterfly, Indian skipper	Hesperia sassacus
100148			Butterfly, Juvenal's duskywing	Erynnis juvenalis
100160			Butterfly, least skipper	Ancyloxypha numitor
100175			Butterfly, little glassywing	Pompeius verna

100279			Butterfly, little wood-satyr	Megisto cymela
100217			Butterfly, little yellow	Eurema lisa
100252			Butterfly, meadow fritillary	Boloria bellona
100090			Butterfly, mourning cloak	Nymphalis antiopa
100173			Butterfly, northern broken dash	Wallengrenia egeremet
100143			Butterfly, northern cloudywing	Thorybes pylades
100272			Butterfly, northern pearly-eye	Enodia anthedon
100197			Butterfly, Ocola skipper	Panoquina ocola
100236			Butterfly, olive juniper hairstreak	Callophrys gryneus gryneus
100211			Butterfly, orange sulphur	Colias eurytheme
100263			Butterfly, painted lady	Vanessa cardui
100257			Butterfly, pearl crescent	Phyciodes tharos
100359			Butterfly, Peck's skipper	Polites peckius
100200			Butterfly, pipevine swallowtail	Battus philenor
100259			Butterfly, question mark	Polygonia interrogationis
100264			Butterfly, red admiral	Vanessa atalanta
100235			Butterfly, red-banded hairstreak	Calycopis cecrops
100268			Butterfly, red-spotted purple	Limenitis arthemis astyanax
100174			Butterfly, sachem	Atalopedes campestris
100082			Butterfly, silver-spotted skipper	Epargyreus clarus
100255			Butterfly, silvery checkerspot	Chlosyne nycteis
100146			Butterfly, sleepy duskywing	Erynnis brizo
100216			Butterfly, sleepy orange	Eurema nicippe
100142			Butterfly, southern cloudywing	Thorybes bathyllus
100202			Butterfly, spicebush swallowtail	Papilio troilus
100239			Butterfly, spring azure	Celastrina ladon
100234			Butterfly, striped hairstreak	Satyrium liparops
100158			Butterfly, swarthy skipper	Nastra lherminier
100269			Butterfly, tawny emperor	Asterocampa clyton
100266			Butterfly, viceroy	Limenitis archippus
100207			Butterfly, West Virginia white	Pieris virginiensis
100227			Butterfly, white M hairstreak	Parrhasius m-album
100153			Butterfly, wild indigo duskywing	Erynnis baptisiae
100204			Butterfly, zebra swallowtail	Eurytides marcellus
100012			Dipluran	Plusiocampa c
100042			Earworm, corn	Heliathis zea
100015			Gnat	Culicoides villosipennis
100016			Gnat	Culicoides stellifer
100030			Gnat	Culicoides arboricola
100032			Gnat	Culicoides guttipennis
100040			Moth, codling	Cydia pomonella

110243			Roundworm, raccoon	Baylisascaris procyonis
110230			Tick, American dog	Dermacentor variabilis
110232			Tick, brown dog	Rhipicephalus sanguineus
110231			Tick, rabbit	Haemaphysalis leporispalustris
110229			Tick, winter	Dermacentor albipictus

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

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need;
II=VA Wildlife Action Plan - Tier II - Very High Conservation Need;
III=VA Wildlife Action Plan - Tier III - High Conservation Need;
IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need
Virginia Widlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented.;
b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.;
c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

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Appendix F - Shoreline Stability Assessment Study Report

Byllesby-Buck Hydroelectric Project (FERC No. 2514)

November 17, 2021

Prepared by:

Prepared for:

Appalachian Power Company

APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY

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Acronyms

AEP	American Electric Power
Appalachian or Licensee	Appalachian Power Company
CFR	Code of Federal Regulations
FERC or Commission	Federal Energy Regulatory Commission
ft	foot/feet
ILP	Integrated Licensing Process
ISR	Initial Study Report
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
PAD	Pre-Application Document
PM&E	protection, mitigation, and enhancement
Project	Byllesby-Buck Hydroelectric Project
RM	river miles
RSP	Revised Study Plan
SPD	Study Plan Determination
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USR	Updated Study Report
WVDEP	West Virginia Department of Environmental Protection

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1 Project Introduction and Background

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 is located about 9 miles north of the city of Galax, and the Buck Development 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. 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 §5.11, 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. 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. Appalachian conducted a virtual ISR Meeting on January 28, 2021 and filed the ISR Meeting summary with the Commission on February 12, 2021. Stakeholders provided written comments in response to Appalachian's filing of the ISR meeting summary, which are addressed in this Updated Study Report (USR) along with study methods and results.

Appalachian has conducted studies in accordance with 18 CFR §5.15, as provided in the RSP and as subsequently modified by FERC. This USR describes the methods and results of the Shoreline Stability Assessment conducted in support of preparing an application for new license for the Project.

2 Study Goals and Objectives

The goals and objectives of the Shoreline Stability Assessment are to:

- Survey the Project's reservoirs, bypass reaches, and tailrace areas to characterize the shoreline, with the focus on erosion or shoreline instability using the Bank Erosion Hazard Index (BEHI) (Rosgen 2001; WVDEP 2015);
- Inventory, map, and document any areas of erosion or shoreline instability; and
- Prioritize any areas where remedial action or further assessment may be needed.

3 Study Area

The study area for the Shoreline Stability Assessment includes the riparian zone on each bank of the upper New River and lowermost tributary segments of Crooked Creek and Chestnut Creek and extends 3.4 miles upstream of Byllesby Dam and 1.15 miles downstream of Buck Dam, including 2.7 miles of the New River in between the two dams. The study area is located in the easternmost portion of the Mt. Rogers National Recreation area and the New River Trail State Park is also situated within the study area on the western streambank (Figure 1).

4 Background and Existing Information

Existing relevant and reasonably available information regarding geology and soils in the Project vicinity is presented in Section 5.2 of the Pre-Application Document (PAD) (Appalachian 2019). The New River within the vicinity of the Project has carved moderately steep valley walls, ranging in heights of 50 to several hundred feet (FERC 1994). Soils along the Project shoreline largely consist of steep, stony Ramsey soil or quartzite rock. Established vegetative cover is extensive along the shorelines of the Project reservoirs, which helps limit the extent and severity of erosion and movement of soils in the study area. Common causes of normal bank/shoreline erosion include wave action, significant changes in water levels, rill/gullies, bank rotation, and seepage/frost wedge.

Accumulation of sediment along some portions of the Project shoreline has formed permanent riparian wetland communities, providing additional protection against shoreline erosion. Areas of shoreline erosion are mainly concentrated in areas absent of vegetation or in areas susceptible to high flows during run-off events, such as the transition areas between riverine and reservoir at the upper limits of the study area, the rapids between the dams and the tailrace below Buck Dam, and in the larger tributaries such as Crooked Creek and Chestnut Creek.

Remediation options for areas of localized erosion commonly include adding protection in the form of new or additional rip rap, encouraging vegetation growth in areas where vegetation is sparse or absent, and reducing the angle of existing bank slopes in areas where additional space is available. Banks lacking vegetation may be planted with native species, which provides stability over time at a relatively low cost. This can be achieved with live-staking, brush-layering, and/or brush matting. Erosion control matting and seeding may also be used. In areas where the stream is heavily incised or undercut, regrading may be required to create gentler slopes and/or hard armoring. If hard armoring is necessary, ideally it will be used in conjunction with vegetative methods such as vegetated rip rap (joint planting), vegetated gabion walls, vegetated gabion mattresses, and/or live cribbing (NRPC 2004). Preferred methods to remediate sections of the Project shoreline, if needed, would ideally mimic natural conditions, if possible (USDA-NRCS 1996; NRPC 2004).

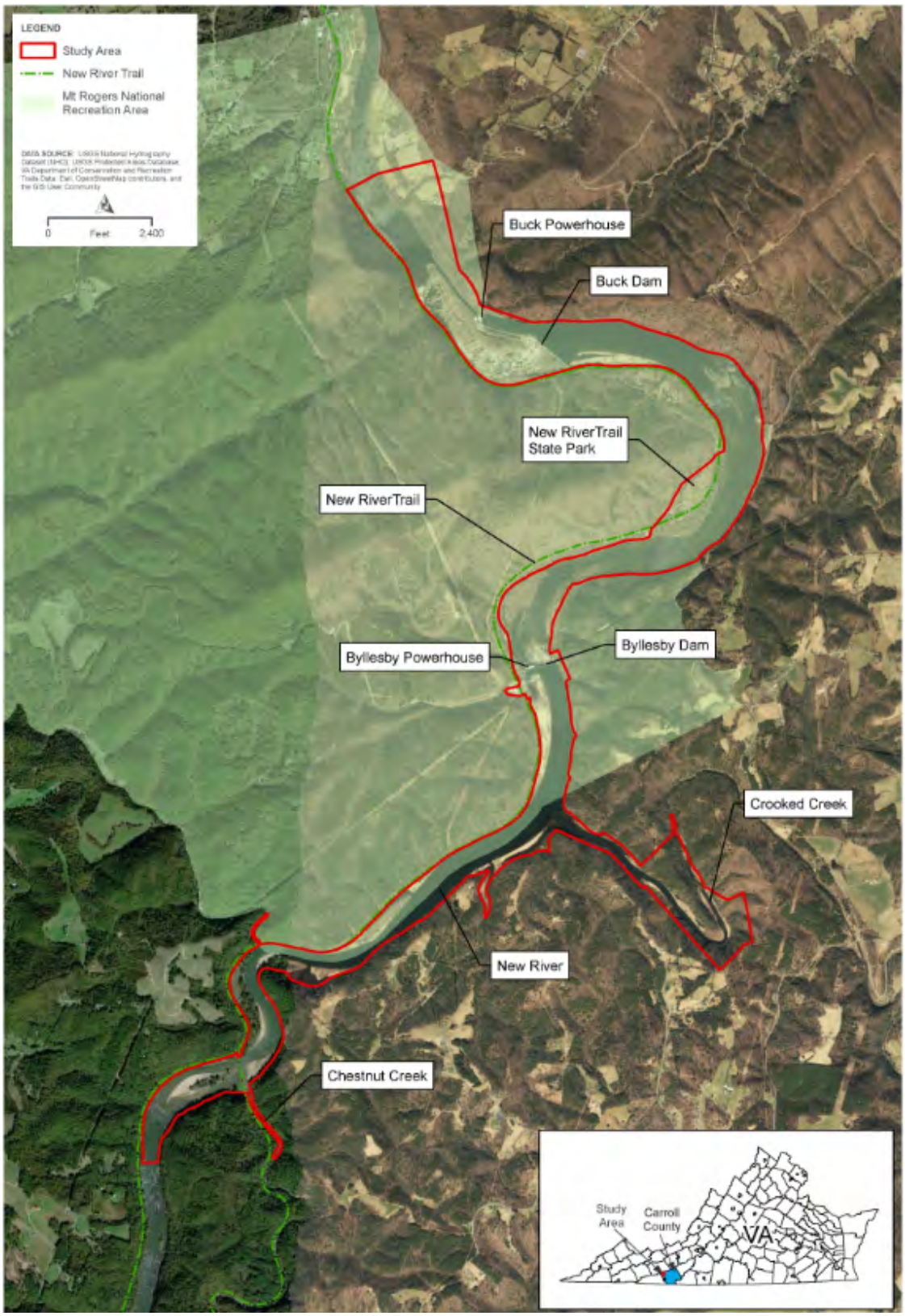

Figure 1. Byllesby-Buck Shoreline Stability Assessment Study Area

5 Methodology

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. The shoreline was assessed in the field for susceptibility to erosion and the need and potential for remediation. The study methods provide adequate information to assess shoreline-erosion effects by Project operations.

5.1 Literature Review

Relevant literature and data were reviewed including ESRI Geographic Information System data, Virginia Geographic Information Network aerial photos, U.S. Geological Survey (USGS) topographic maps, and Natural Resources Conservation Service (NRCS) soil surveys to assess bank composition and erosion potential in the study area.

5.2 Shoreline Survey

The field surveys for the Shoreline Stability Assessment were conducted on July 20-22, 2021. Streambanks were assessed based on visual observations 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.

Rivers are dynamic systems and streambank erosion is a natural function of flow, streambank character (i.e., erodibility), and hydraulic/gravitational forces (Rosgen 2001). Some streambank erosion is normal and necessary to maintain habitat and the dynamic equilibrium of a river system; however, excessive streambank erosion can negatively impact the function of a river and the complexity of predicting streambank erosion rates has limited the application of available models. Bank stability and erosion potential for this study effort was analyzed using the Rosgen (2001) BEHI method and the West Virginia Department of Environmental Protection (WVDEP) complete BEHI procedure (WVDEP 2015). The BEHI method assesses 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 (BH), ratio of root depth to bank height (RDH), root density percentage (RD), surface protection percentage (SP), and bank angle in degrees (BA) (WVDEP 2015) (see Table 1). These metrics are associated with scores and are totaled to categorize the overall condition of the stream reach assessed. The scores and corresponding categories are shown in Table 2. Note that the BEHI total score is calculated using scores assigned to five separate physical processes/conditions determined in the field. Field assessments were carried out by HDR field scientists with Rosgen-based training; however, certain criteria in the field (e.g., location of bankfull elevation) may vary slightly between field assessors and results can be subject to user bias. The assignment of streambanks into Rosgen categories is a quantitative process, however, the category assigned to a specific reach (i.e., “high”, “moderate”) should be considered in the context of all other factors that contributed to that score. For example, four out of the five factors for an assessed streambank may yield a favorable score/category (i.e., “low”), however, because that particular stream bank had a type of vegetation prone to shallow root depth, that one variable alone could drive the score up into the higher category. Therefore, nomencla

ture such as “high” or “very high” can be misleading; it is important to consider all of the variables that yielded a specific score.

Table 1. Description of Rosgen (2001) Metrics for BEHI Evaluation

Metric	Description
Ratio of bank height to bankfull height	Requires accurate identification of bankfull indicators.
Ratio of root depth to bank height	Root depth (RDH) is the ratio of the average plant root depth to the bank height, expressed as a percent (e.g. roots extending 2 feet into a 4 foot tall bank = 0.50).
Root density	Root density (RD), expressed as a percent, is the proportion of the streambank surface covered (and protected) by plant roots (e.g. a bank whose slope is half covered with roots = 50 percent).
Surface Protection	Surface protection (SP) is the percentage of the stream bank covered (and therefore protected) by plant roots, downed logs, branches, rocks, etc. In many streams surface protection and root density are synonymous.
Bank Angle	Bank angle (BA) is the angle of the lower bank – the bank from the waterline at base flow to the top of the bank, as opposed to benches that are higher on the floodplain. Bank angles great than 90 percent occur on undercut banks. Bank angle can be measured with an inclinometer, though given the broad bank angle categories, visual estimates are generally sufficient. Bank angle is perhaps the metric most often estimated incorrectly.

Table 2. Streambank Characteristics used to develop BEHI (Rosgen 2001)

BEHI Category	Bank height	BH Score	Root Depth	RDH Score	Root Density	RD Score	Surface Protection	SP Score	Bank Angle	BA Score	Total Score
V. low	1.0-1.1	1.45	90-100	1.45	80-100	1.45	80-100	1.45	0-20	1.45	≤7.25
Low	1.1-1.2	2.95	50-89	2.95	55-79	2.95	55-79	2.95	21-60	2.95	7.26-14.75
Moderate	1.3-1.5	4.95	30-49	4.95	30-54	4.95	30-54	4.95	61-80	4.95	14.76-24.75
High	1.6-2.0	6.95	15-29	6.95	15-29	6.95	15-29	6.95	81-90	6.95	24.76-34.75
V. high	2.1-2.8	8.5	5-14	8.5	5-14	8.5	10-14	8.5	91-119	8.5	34.76-42.50
Extreme	>2.8	10	<5	10	<5	10	<14	10	>119	10	42.51-50

6 Study Results

6.1 Literature Review

According to the NRCS soil survey, soils along the banks of the upper New River consist primarily of quartzite (Rr); Ramsey very stony loam, steep and very steep (RmE and RmF); Hatboro silt loam (Ha); and Buncombe loamy fine sand (Bu) (Figure 2). The streambanks are generally steep wherever bedrock or Ramsey very stony loam occur. Hatboro silt loam ad Buncombe loamy fine sand are located on relatively flat surfaces adjacent to the New River. Shoreline consisting of bedrock has a low susceptibility to erosion; however, loose material found on steeper slopes or loose fine material in floodplains are likely to exhibit some degree of erosion.

A study was carried out for the Claytor Project relicensing (Appalachian 2008) which evaluated shoreline erosion along the banks of the Claytor reservoir (Appalachian 2008). Results of this study indicated that the run-of river Byllesby-Buck reservoirs have little retention capacity and suspended sediments are carried downstream to the Claytor Project. Further, upon examination of the Claytor reservoir shorelines, which are similar in soil/rock character and vegetation to the shorelines of the Byllesby and Buck development reservoirs, shoreline erosion was not found to be significant.

The entire western streambank of the New River within the study area is bordered by New River Trail and Buck Dam Road. Additionally, approximately a half mile of the east bank is abutted by Fowlers Ferry Road. The portions of shoreline in close proximity to the road may be impacted by human activity.

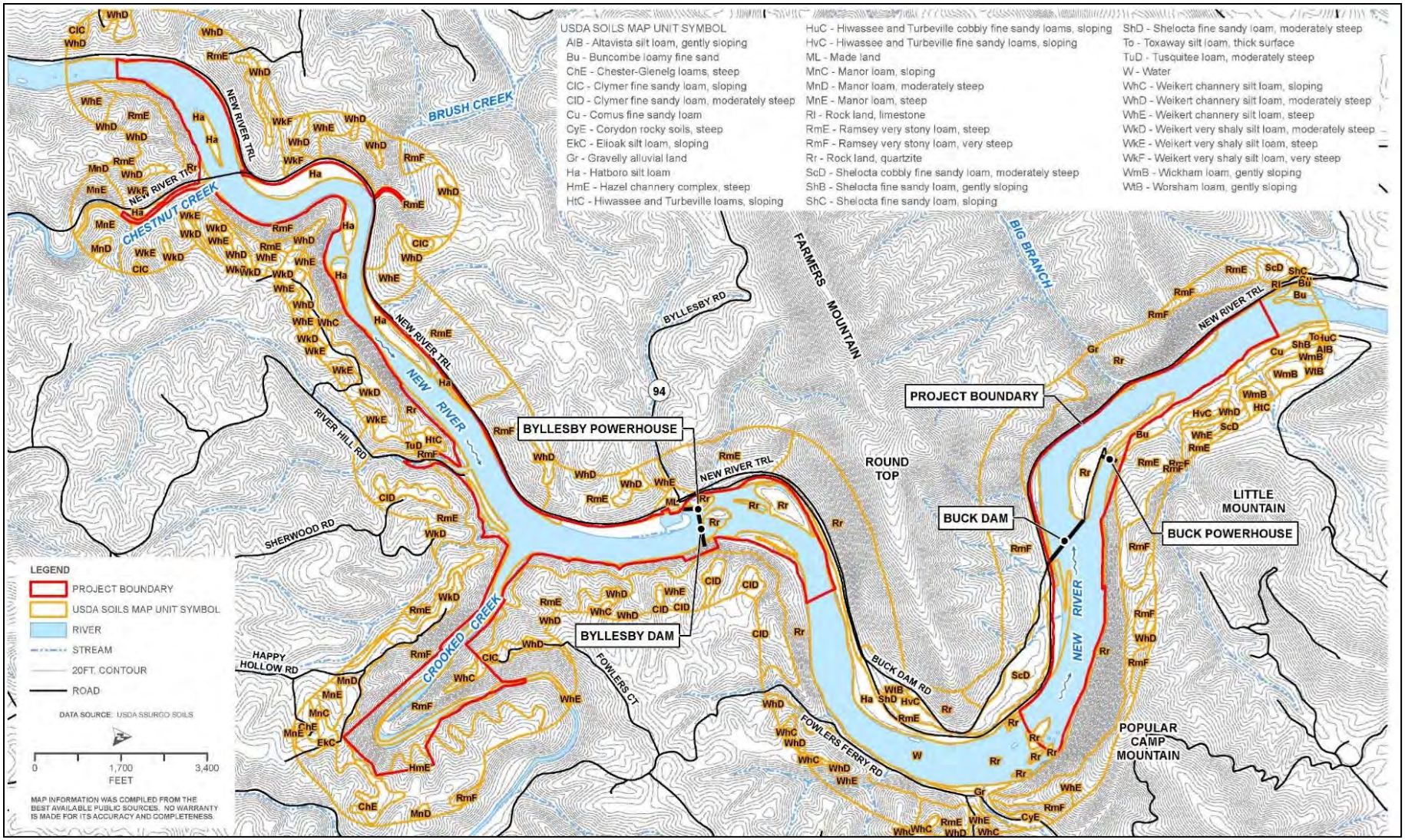

Figure 2. Byllesby-Buck Shoreline Stability Assessment Soil Map

6.2 Shoreline Survey

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. The areas identified as having some degree of shoreline erosion had average BEHI scores ranging from 11.75 (low) to 33.85 (high). There were no areas categorized as having very high or extreme erosion potential. Where erosion was noted, coordinates were recorded on the upstream and downstream extent of the erosion area, and in between, if necessary. Individual points within each area of erosion fell into the same total category (i.e., extreme, very high, high, moderate, low, very low). The average scores for each area of erosion are provided in Table 3. Figure 3 shows the locations of the erosion areas assessed within the study area.

The majority 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 (Figure 3). 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.

Bank conditions were documented and representative photographs from each erosion area are provided in Attachment 1.

Table 3. BEHI Scores for Erosion Areas of Shoreline Stability Assessment

Erosion Area	Length (linear ft)	Average of BH Score	Average of RDH Score	Average of RD Score	Average of SP Score	Average of BA Score	Average of Total Score by Category	Category
Erosion Area 1	286	2.95	6.95	6.95	6.95	4.95	28.75	High
Erosion Area 2	92	4.95	8.50	8.50	6.95	4.95	33.85	High
Erosion Area 3	199	4.95	2.95	4.95	4.95	4.95	22.75	Moderate
Erosion Area 4	3,006	4.95	6.95	4.95	1.45	6.95	25.25	High
Erosion Area 5	423	6.95	4.95	6.95	2.95	4.95	26.75	High
Erosion Area 6	508	6.95	4.95	6.95	2.95	4.95	26.75	High
Erosion Area 7	190	4.95	4.95	4.95	2.95	6.95	24.75	Moderate
Erosion Area 8	141	4.95	4.95	4.95	2.95	6.95	24.75	Moderate
Erosion Area 9	92	6.95	4.95	4.95	4.95	6.95	28.75	High
Erosion Area 10	107	4.95	4.95	2.95	4.95	6.95	24.75	Moderate
Erosion Area 11	295	4.95	4.95	2.95	4.95	6.95	24.75	Moderate
Erosion Area 12	261	1.45	4.95	2.95	4.95	6.95	21.25	Moderate
Erosion Area 13	215	4.95	4.95	2.95	4.95	6.95	24.75	Moderate
Erosion Area 14	1,587	1.45	4.95	2.95	4.95	6.95	21.25	Moderate
Erosion Area 15	1,550	1.45	2.95	1.45	2.95	2.95	11.75	Low

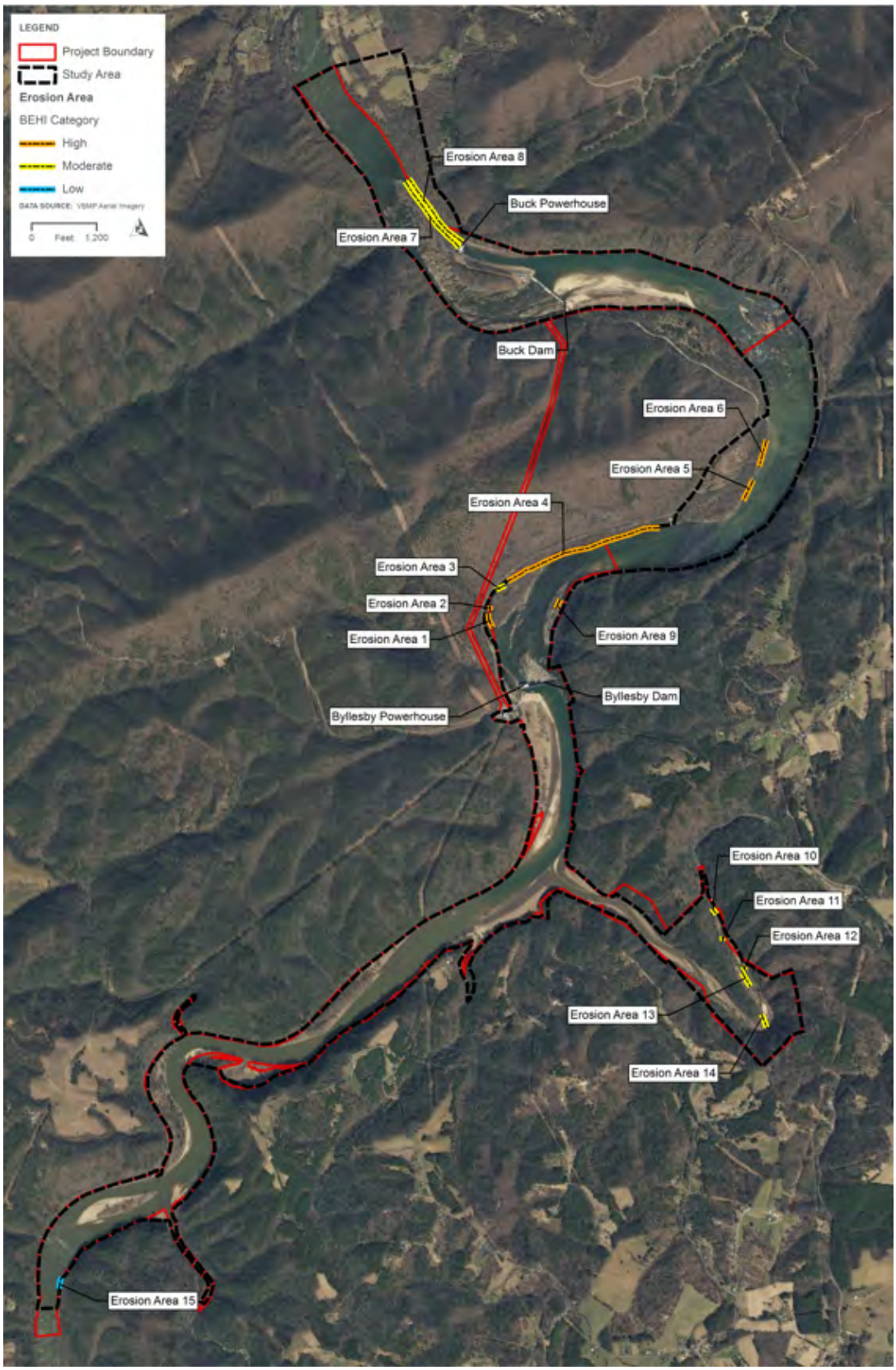

Figure 3. Erosion Areas in the Study Area Categorized by BEHI

7 Summary and Discussion

The Shoreline Stability Assessment provides an evaluation of the relative erosion hazard of 7.25 miles of New River shoreline based on the observed bank conditions. Study results indicated that approximately 80 percent of the shoreline within the study area exhibited no signs of erosion, with remaining areas ranging from “low” to “high” BEHI scores based on Rosgen’s (2001) methods (refer to categories listed in Table 2) under present conditions. Erosion Areas 1,2,4 and 9, downstream of Byllesby Dam, are the most susceptible to erosion. Erosion Areas 1 and 2, which scored “high”, are adjacent to the New River Trail State Park. Erosion Area 4 comprises one large area that was classified as “high” erosion potential; this area is also adjacent to New River Trail State Park, but the multi-use trail and road are farther from the river at these locations. Just downstream of Area 4, Areas 5 and 6 also scored “high”; these areas are farther away from the New River Trail State Park.

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.

It is important to note that streambank erosion is often a symptom of larger, more complex problems in the watershed and long-term solutions often involve much more than bank stabilization. Streambank erosion is a normal physical process in a river system and drivers of erosion are often difficult to determine because they are integrated with other natural and anthropogenic variables and responses within the watershed. Streambed aggradation or degradation is typically a noticeable indicator of system-wide stream channel instability. 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.

8 Variances from FERC-Approved Study Plan

This study was performed in accordance with the FERC-approved Study Plan.

9 Germane Correspondence and Consultation

No consultation with state or federal agencies was undertaken for this USR.

10 References

Appalachian Power Company (Appalachian). 2019. Pre-Application Document Byllesby-Buck Hydroelectric Project FERC No. 2514. January 2019.

Federal Energy Regulatory Commission (FERC). 1994. Final Environmental Assessment, Byllesby-Buck Hydroelectric Project, FERC No. 2514-003, Virginia. March 15, 1994.

Northwest Regional Planning Commission (NRPC). 2004. The Shoreline Stabilization Handbook. St. Albans, Vermont. Available at https://6eade072-06b3-4cb0-b552-9093f98282cd.filesusr.com/ugd/cf375c_3e5165613c4c4c7f9588ad6d4636f06f.pdf

Rosgen, David L. 2001. A Practical Method of Computing Streambank Erosion Rate. 7th Federal Interagency Sediment Conference, March 25-29, Reno, Nevada.

United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS).1996. Engineering Field Handbook Chapter 16 Streambank and Shoreline Protection. Available at https://efotg.sc.egov.usda.gov/references/public/IA/Chapter-16_Streambank_and_Shoreline_Protection.pdf

West Virginia Department of Environmental Protection (WVDEP). 2015. Assessing Bank Erosion Potential Using Rosgen's Bank Erosion Hazard Index (BEHI) Available at https://dep.wv.gov/WWE/getinvolved/sos/Documents/SOPs/BEHI-Overview.pdf

Attachment 1

Attachment 1 – Erosion Area Photographs

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Erosion Area 1; Category “High”

Erosion Area 2; Category “High”

Erosion Area 3; Category “Moderate”

Erosion Area 4; Category “High”

Erosion Area 5; Category “High”

Erosion Area 6; Category “High”

Erosion Area 7; Category “Moderate”

Erosion Area 8; Category “Moderate”

Erosion Area 9; Category “High”

Erosion Area 10; Category “Moderate”

Erosion Area 11; Category “Moderate”

Erosion Area 12; Category “Moderate”

Erosion Area 13; Category “Moderate”

Erosion Area 14; Category “Moderate”

Erosion Area 15; Category “Low”

Appendix G - Recreation Study Report

Byllesby-Buck Hydroelectric Project (FERC No. 2514)

February 28, 2022

Prepared by:

Prepared for:

Appalachian Power Company

APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY

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Contents

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Attachments

Acronyms

ADA	Americans with Disabilities Act
AEP	American Electric Power
Appalachian or Licensee	Appalachian Power Company
CFR	Code of Federal Regulations
FERC or Commission	Federal Energy Regulatory Commission
Ft	foot
HDR	HDR Engineering, Inc.
ILP	Integrated Licensing Process
ISR	Initial Study Report
LPDA	Land Planning Design Associates
MOU	Memorandum of Agreement
NOI	Notice of Intent
PAD	Pre-Application Document
PM&E	protection, mitigation, and enhancement
PSP	Proposed Study Plan
Project	Byllesby-Buck Hydroelectric Project
RM	river miles
RSP	Revised Study Plan
SPD	Study Plan Determination
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VDEQ	Virginia Department of Environmental Quality
VDWR	Virginia Department of Wildlife Resources
VDCR	Virginia Department of Conservation and Recreation

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1 Project Introduction and Background

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 is located about 9 miles north of the city of Galax, and the Buck Development 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. 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 §5.11, 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. 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. Appalachian conducted a virtual ISR Meeting on January 28, 2021 and filed the ISR Meeting summary with the Commission on February 12, 2021. Stakeholders provided written comments in response the Appalachian's filling of the ISR meeting summary; these comments were addressed in the Updated Study Report (USR), which was filed November 17, 2021. A USR meeting was held on December 1, 2021 and requests from stakeholders made during the meeting are addressed in this revised USR.

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

2 Study Goals and Objectives

The goals of this study are to determine the need for enhancement to existing recreation facilities, or to provide additional recreational facilities, and to support the current and future demand for public recreation in the Project area. The objectives of this study are to:

- Gather information on the condition of the six Project-related public recreation facilities and identify any need for improvement;
- Characterize current recreational use of the study area;
- Estimate future demand for public recreation at the Project;
- Solicit comments from stakeholders on potential enhancements or new facilities; and
- Analyze effects of continued Project operation on Project-related recreation facilities.

3 Study Area

The five Project-related recreational facilities within and adjacent to the Project boundary are shown on Figure 3-1. The study area encompasses the Project boundary and at the request of stakeholders during the study planning phase of the ILP, was extended to include the shoreline and river reach upstream of the Buck reservoir, the previous U.S. Forest Service (USFS) Thompson campground, and the Loafer's Rest access area downstream of Buck Dam. The study area is appropriate as it includes lands and recreation facilities managed by Appalachian under the existing license and other recreational opportunities that may potentially be affected by Project operations.

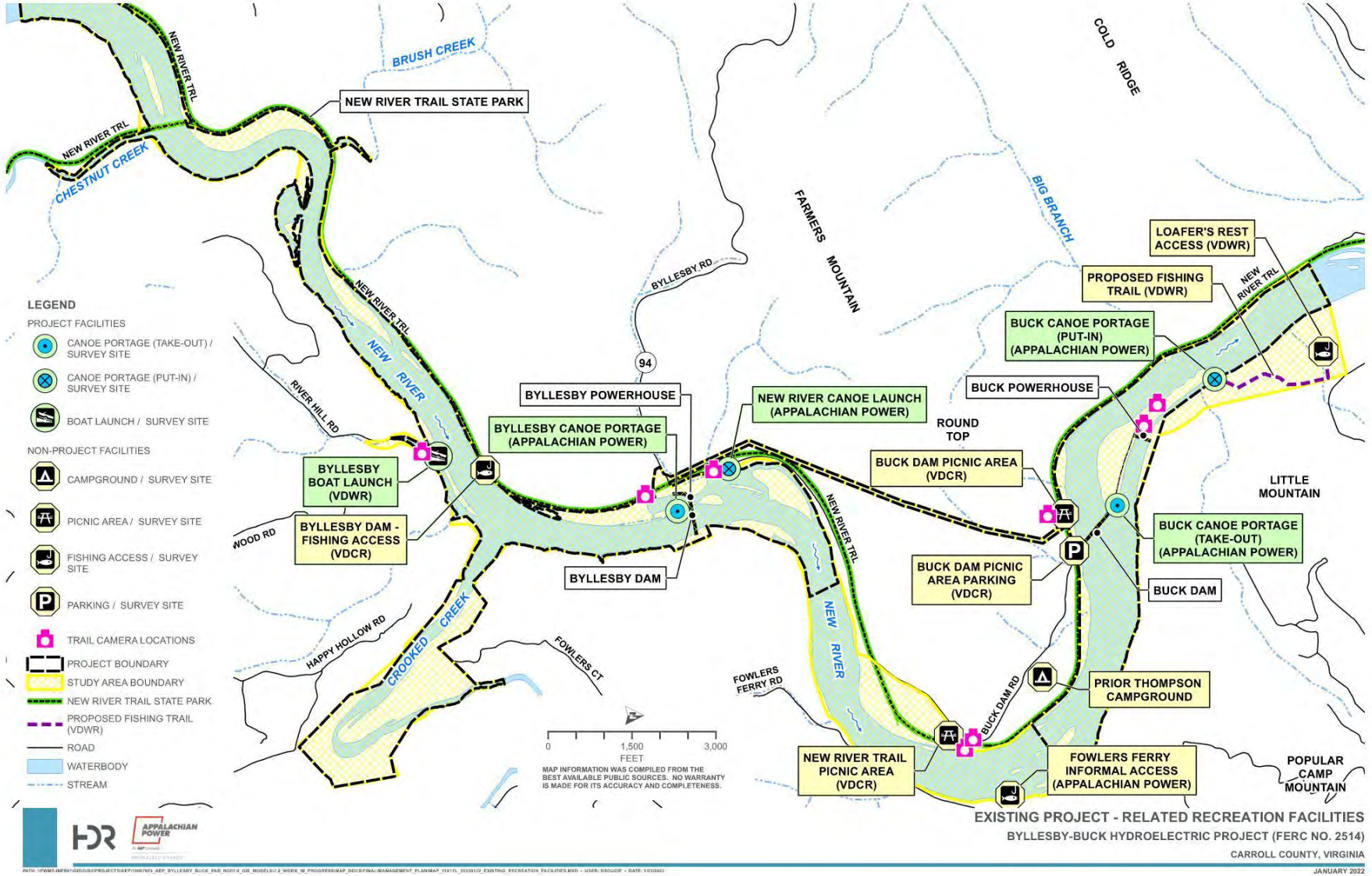

Figure 3-1. Recreational Facilities at the Byllesby-Buck Project

4 Background and Existing Information

The Project is accessible by a remote secondary road and is located in a rural setting. The lands on both sides of the Project are steep, but there are some flat parcels along the river suitable for recreation. The former Norfolk & Western Railroad right-of-way extends along the western shore of the Project and has been converted to the New River Trail State Park, which is typically used for hiking, walking, biking and horseback riding. Most of the land to the west of the Project is owned by the USFS and consists of the George Washington and Jefferson National Forest. Recreation activities at the Project mostly consist of fishing, biking, hiking, and small craft boating. Section 5.8 of the Pre-Application Document (PAD) describes additional existing information about recreation facilities and opportunities in the study area.

In association with the previous relicensing effort, Appalachian, the Virginia Department of Wildlife Resources (VDWR) and the Virginia Department of Conservation and Recreation (VDCR) entered into a Memorandum of Understanding (MOU) signed on June 7, 1994 to provide public recreational access to various points along the New River (Appalachian 1994a). As documented in the Recreation Plan (Appalachian 1994b) required by Article 411 of the existing license, the Project supports five FERC-approved ("Project") public recreation facilities owned by Appalachian (Table 4-1). Two of these Project-related recreation facilities are solely operated by Appalachian and the remaining three sites are operated by VDCR or VDWR under the MOU and Revised Recreation Plan.

Additional ("Non-Project") public recreation facilities or informal access areas exist within the study area. Project and Non-Project recreation facilities and access areas within the study area that were identified as areas of interest by relicensing participants during the study planning phase of the ILP are listed and described in Table 4-1.

Table 4-1. Existing Recreation Facilities at Byllesby-Buck Project

Recreation Facility	Project or Non-Project Facility	Owner/Operator	Amenities	Relationship to Project Boundary
Byllesby Development				
Byllesby Boat Launch	Project Facility	Leased to and Operated by VDWR	Provides single-lane boat concrete boat launch with gravel parking area.	Within
Byllesby Canoe Portage	Project Facility	Owned and operated by Appalachian	Provides approximate 1,500-foot (ft) portage trail. Site consists of a hand-carry canoe take-out and an information trailhead kiosk for the New River Trail State Park.	Within
New River Canoe Launch	Project Facility	Leased to and Operated by VDCR	Provides small, gravel parking area with short trail leading to a hand-carry boat launch (also serves as put-in for the Byllesby Canoe Portage).	Adjacent to

Recreation Facility	Project or Non-Project Facility	Owner/Operator	Amenities	Relationship to Project Boundary
VDWR Fishing Site	Project Facility	Leased to and Operated by VDWR	Provides a stone embankment cleared for bank fishing and reservoir viewing. Approximately ¾ mile upstream of the Byllesby dam on the western shore.	Adjacent to
Buck Development				
Buck Dam Canoe Portage	Project Facility	Owned and operated by Appalachian	Provides crushed stone hand-carry take out and a hand-carry put in.	Within
Buck Dam Picnic Area	Non-Project Facility	Owned and operated by VDCR	Provides gravel parking for vehicles, information kiosk, and access to New River Trail. Also provides a picnic area with picnic table, trash can, portable restroom facility, and a hitching post for equestrian trail users.	Adjacent to
New River Trail Picnic Area	Non-Project Facility	Owned and operated by VDCR	Provides upper and lower recreation areas that include benches, picnic tables, bike rack, trash can, grill, and informal angling access to the Buck reservoir.	Adjacent to
Loafer's Rest	Non-Project Facility	Leased to and Operated by VDWR	Provides a parking area and walking trail to access the New River. Stakeholders are interested in angler access from the Loafer's Rest recreation area to the tailrace of Buck Dam.	Adjacent to
Other				
Fowlers Ferry	Non-Project Facility	Land is owned by Appalachian	No formal recreation activities. Informal activities include picnicking, camping, ATV, fishing, wading, and canoe/kayaking	Outside of

5 Methodology

In support of the FERC-approved Recreation Study, Appalachian and their consultants implemented a range of data collection techniques, including a Recreation Facility Inventory and Condition Assessment, a virtual meeting and in-person site visit with stakeholders, a recreation visitor use online survey, and trail camera installations. Data gathered from these methods collectively illustrate general trends of the Project.

The prevailing conditions from the COVID-19 pandemic throughout most of the study period and during the primary recreation season resulted in variations in recreation usage and ranged from periods of lockdown and relatively little non-essential travel to more typical summer recreation usage. Therefore, the recreation usage patterns of 2020 may be different from past years at the

Project. Based on Appalachian's direct observations and anecdotal observations of recreation stakeholders in meetings, Appalachian believes that the 2020 study season represented high usage of the recreation facilities, as many nearby residents sought out recreation opportunities provided by the Project.

Table 5-1 provides an overview of the Project and Non-Project Recreation facilities studied in accordance with the FERC-approved Recreation Study plan.

Table 5-1. 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 Boat Launch	X	X	X	X
Byllesby Canoe Portage	X	X	X	X
New River Canoe Launch	X	X	X	X
VDCR 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[1]	X (Buck tailrace)

5.1 Recreation Facility Inventory and Condition Assessment

Appalachian's sub-consultant (Land Planning Design Associates [LPDA]), conducted a Recreation Facility Inventory and Condition Assessment of seven sites, five of which are FERC-approved Project facilities (Table 4-1). LPDA staff conducted the site assessments on November 13, 2019 in association with a team Appalachian's consultant (HDR Engineering, Inc. [HDR]). LPDA recorded the following information for each recreational facility including:

- A description of the type and location of existing recreation facilities;
- The type of recreation provided (boat access, angler access, picnicking, etc.);
- Length and footing materials of any trails;

[1] While Loafer's rest was not specifically identified in the list of recreation sites in the online survey, many stakeholder comments included discussion of this area; therefore, it was studied as part of the Visitor Use Online Survey.

- Existing facilities, signage, and sanitation;
- The type of vehicular access and parking (if any);
- Suitability of facilities to provide recreational opportunities and access for persons with disabilities (i.e., compliance with current Americans with Disabilities Act (ADA) standards for accessible design); and
- Photographic documentation of recreation facilities and GPS location.

Additionally, a qualitative assessment of the condition of the recreation facilities was performed using a Facility Inventory and Condition Assessment Form. Using the Facility Inventory and Condition Assessment Form, the recreation amenities available at each facility were rated using the following criteria: (N) Needs replacement (broken or missing components, or non-functional); (R) Needs repair (structural damage or otherwise in obvious disrepair); (M) Needs maintenance (ongoing maintenance issue, primarily cleaning); and (G) Good condition (functional and well-maintained). If a facility is given a rating of “N”, “R”, or “M”, an explanation for the rating was provided.

5.2 Site Visit with Stakeholders to Discuss Existing and Future Recreational Opportunities

Appalachian convened a site visit with key relicensing stakeholders 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.

5.3 Recreation Visitor Use Online Survey

HDR developed an online survey drawing from general concepts and guidance from the National Visitor Use Monitoring Handbook (USFS 2007) as well as from other FERC-approved relicensing studies for recreation visitor use surveys. 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 extended the online survey through the end of November 2020 (originally scheduled to end in October), at the request of stakeholders during the October 21, 2020 virtual meeting, to allow stakeholders additional time to respond. Stakeholders were able to provide a final distribution to remind users of the availability of the survey and the close of the survey period.

Appalachian posted signs at the Project and Non-Project recreation facilities (except the Byllesby Boat Launch) providing a brief description of the purpose and intent of the survey and the website address (Figure 5-1). 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 U.S. Fish and Wildlife Service (USFWS), Virginia Department of Environmental Quality (VDEQ), VDCR, VDWR, 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 (ex: Claytor Lake Facebook page) maintained by Appalachian.

The online questionnaire was designed to collect information about:

- General user information;
- Resident/visitor;
- Purpose and duration of visit;
- Distance traveled;
- Day use/overnight lodging;
- History of visiting the site or area;
- Types of recreational activities respondents participated in during their visit, including primary and secondary recreation activities;
- Other recreational sites that respondents visited during their trip;
- General satisfaction with recreational opportunities, facilities, and the respondents overall visit and/or areas that need improvement;
- Effects of Project operations on recreation use and access; and
- Accessibility of facilities.

Figure 5-1. Recreation Use and Needs Survey Sign

5.4 Recreational Use Documentation

Appalachian documented usage of the recreational areas of interest through the installation of trail cameras. HDR deployed eight Browning Strike Force 2015 Edition HD Sub Micro Trail Game Cameras on October 15 and 16, 2019 at the locations listed in Table 5-2. The cameras were removed on November 5, 2020.

Table 5-2. Locations of Trail Cameras

Recreation Facility	Project or Non-Project Facility	Purpose	Number of Cameras
Byllesby 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

Recreation Facility	Project or Non-Project Facility	Purpose	Number of Cameras
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

The cameras were installed to collect site visitor data and document use patterns. When installed, the trail cameras were set to take photos when activated by motion. Before taking a second photo, the camera was set to wait a full minute, again requiring activation from motion. After the first trail camera data download in mid-November 2019, the settings of Camera 7 facing the Buck tailrace – Fishing Access (Loafer's Rest area of interest) were adjusted. This adjustment was necessary because discharge from the sluice adjacent to the powerhouse intakes repeatedly activated the motion sensor, potentially preventing the camera from capturing motion across the tailrace. The photo collection methodology for Camera 7 was thus revised to a video time lapse in which a photo was captured every 30 minutes; a daily video of the photos was created from compiling the lapsed images. Camera 7 also continued to be motion activated as well, although this did not occur often (and only from high waters) due to the lack of activity. All cameras recorded time, temperature, date, and vehicle usage.

6 Study Results

6.1 Recreation Facility Inventory and Condition Assessment

As stated in Section 5.1, LPDA performed a Recreation Facility Inventory and Condition Assessment to document usage conditions at seven existing Project and Non-Project related public recreation facilities (Table 4-1 and Table 5-1).

LPDA observed several common themes among the recreation facilities including lack of ADA accessibility, aging though functional furnishings, informally developed amenities, incomplete signage, and deferred maintenance. LPDA noted that the Project is set in scenic, natural surroundings and the historic dams provide cultural interest. LPDA recommended there is a high potential for increasing recreation value of the sites, both by improving the existing conditions and by developing related amenities.

The existing amenities and conditions for the recreation facilities assessed is summarized below. The Recreation Facility Inventory and Condition Assessment Report and corresponding maps are included in Attachment 1.

6.1.1 Byllesby Boat Launch (Project Facility)

Existing recreation amenities of the Byllesby Boat Launch (VDWR) include a 16-ft wide concrete boat ramp with a gentle slope, concrete walkway, crushed gravel parking area, 5-wheel stops, and signage. The boat ramp and other amenities are in good condition,

Potential enhancements identified for this site were as follows:

- Update and replace signage.

6.1.2 VDCR Fishing Site (Project Facility)

The VDCR Fishing Site was not included in the RSP but was evaluated since it is a Project facility as identified in the Recreation Plan (Article 411) (Appalachian 1994b).

Existing recreation amenities of the VDCR Fishing Site include a fire pit and grill, bench, lantern hook, and trash can. Access to the water is difficult with a very steep slope (too steep to launch a canoe). The trash can, bench, fire ring, lantern hook and grill are aged and there are no signs or maps at this facility. Parking for the fishing site is provided by the Byllesby Canoe Portage parking lot. The fishing site is accessed by the New River Trail and is 3,100 ft (0.59 miles) from the parking lot.

Potential enhancements identified for this site were as follows:

- Maintenance or replacement of amenities.
- Addition of signage.

6.1.3 Byllesby Canoe Portage (Project Facility)

Existing recreation amenities of the Byllesby Canoe Portage include a 1,235-ft-long (0.23 miles) portage path, a 12-space gravel parking area, large wetland area, 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.

6.1.4 New River Canoe Launch (Project Facility)

Existing recreation amenities of the New River Canoe Launch include a 10-space gravel parking area, portage/no-fishing signs, a gate (dam maintenance access road) and a canoe portage in a relatively flat, sandy area where the water is shallow. A 125-ft-long portage trail connects the parking lot to the canoe portage. and the put-in location is 1,175 ft (0.22 miles) from the portage take-out above Byllesby dam. The signage at this facility is in good condition with adequate directional information.

No potential enhancements were identified for this site.

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

The New River Trail Picnic Area has an upper area that includes a picnic table shelter, bike rack (up to four bikes), and hitching trail. The site primarily serves trail users, though there is an informal car pull-off and trail accessing the picnic area. The informal dirt trail is narrow and could be widened and surfaced, as could the informal parking area. The shelter is in good condition and is ADA accessible. The bike rack and hitching rail are in good condition.

The New River Trail Picnic Area also has a lower area which includes existing recreation amenities such as a trash can, barbeque grill, 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. The barbeque grill is severely corroded.

Potential enhancements identified for this site were as follows:

- Widen and surface informal dirt trail and informal parking area.
- Maintain or replace amenities.

6.1.6 Buck Dam Picnic Area (Non-Project Facility)

Existing recreation amenities at the Buck Dam Picnic Area include a parking area with a trash can, kiosk with regulation signs and old machinery. The trash can is dented and aged, though usable and regularly serviced. From the parking area, there is a 650-ft-long crushed stone trail, a section of the New River Trail with No Trespassing Signs along the bank edge 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 identified for this site were as follows:

- Improve signage for educational and safety purposes.

6.1.7 Buck Dam Canoe Portage (Non-Project Facility)

Existing recreation amenities of the Buck Dam Canoe Portage includes a take-out above and a put-in below Buck Dam. The portage route between the take-out and put-in is via an asphalt maintenance road, gravel access road, and a gravel walking trail. The road surface is approximately 10 ft wide. The asphalt portion of the maintenance road is 820 ft long, the gravel portion is 570 ft long, and the walking trail is 50 ft long. The total portage route is 1,440 ft long (0.27 miles). The gravel surface is rough and uneven, and the walking trail has not been graded or surfaced. There is an unlined trash can at the put-in. The signage is in good condition.

Potential enhancements identified for this site were as follows:

- Improve safety and regulatory signage.

6.2 Site Visit with Stakeholders to Discuss Existing and Future Recreational Opportunities

Meeting notes documenting both the virtual meeting on October 21, 2020 and site visit on October 28, 2020 are included in Attachment 2. During the site visit, the Project and Non-Project recreation facilities visited by Appalachian, their consultants, and the stakeholders are noted in Table 5-1.

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.

During these two meetings, an informal area known locally as Fowler's Ferry was identified as an area that agencies are potentially interested in developing for future recreational usage. Fowler's Ferry is located on river-right, upstream of Buck Dam (see Figure 3-1), off of Fowlers Ferry Road and provides informal recreation access for picnicking, camping, ATV, fishing, wading, and canoe/kayaking. This area was not specifically studied under other tasks for the Recreation Study. There are no formal recreation facilities at this site, but the VDWR has expressed interested in developing this area and controlling access from unauthorized users. Land in this area is owned by Appalachian but is not formally maintained. Buck Dam Canoe Portage has also been discussed as a site where stakeholders have interest in potential recreation facility improvements.

6.3 Recreation Visitor Use Online Survey

The online survey provided 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] at the Project. From April 21, 2020 to December 1, 2020, Appalachian received 142 responses to the online survey. A high-level summary of all the recreation facility user responses is provided below:

- 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.

- Forty-two percent of the survey respondents traveled from three nearby zip code areas, with 92 percent considering themselves to be regular visitors to the recreation facility (considered at least 3 or more times a year) and staying at the Project an average length of 5 hours per trip. Eighty-three percent of respondents did not stay overnight at the Project.

- Males made up 74 percent of the respondents, 49 percent were in their thirties and forties.

- Facility usage followed traditional seasonal recreation patterns with May, June, and July being the peak months (Figure 6-1).

- As shown in Table 6-1, fishing and canoe/kayaking were the most popular activities at the Project documented in the online survey.

- Visitors rated recreational facilities on the following metrics: accessibility, parking, crowding, safety, condition, availability, and overall experience. The sliding scale rating system indicated that visitors generally found the individual metrics and general overall experience "acceptable" (Figure 6-2). The only metric that was not rated highest in the acceptable category was the available facilities, which was rated neutral.

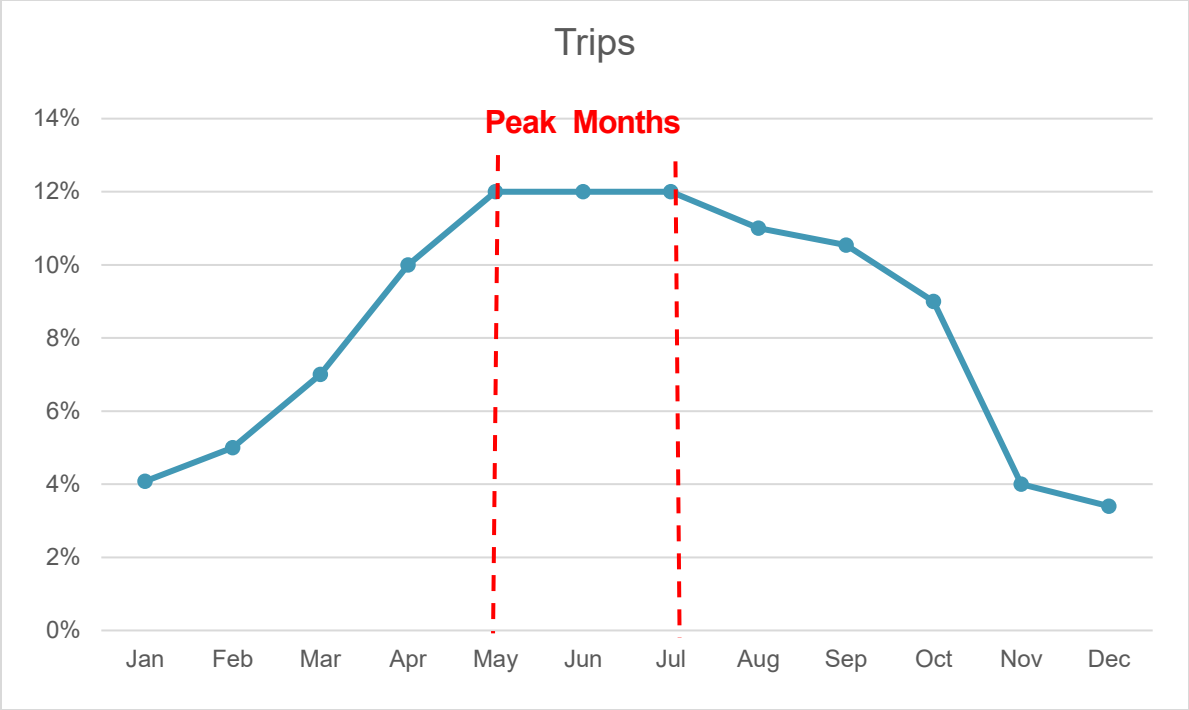

Figure 6-1. Monthly Recreation Activity for Project and Non-Project Facilities

Table 6-1. Online Survey Summary for Primary Recreation Activities at 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

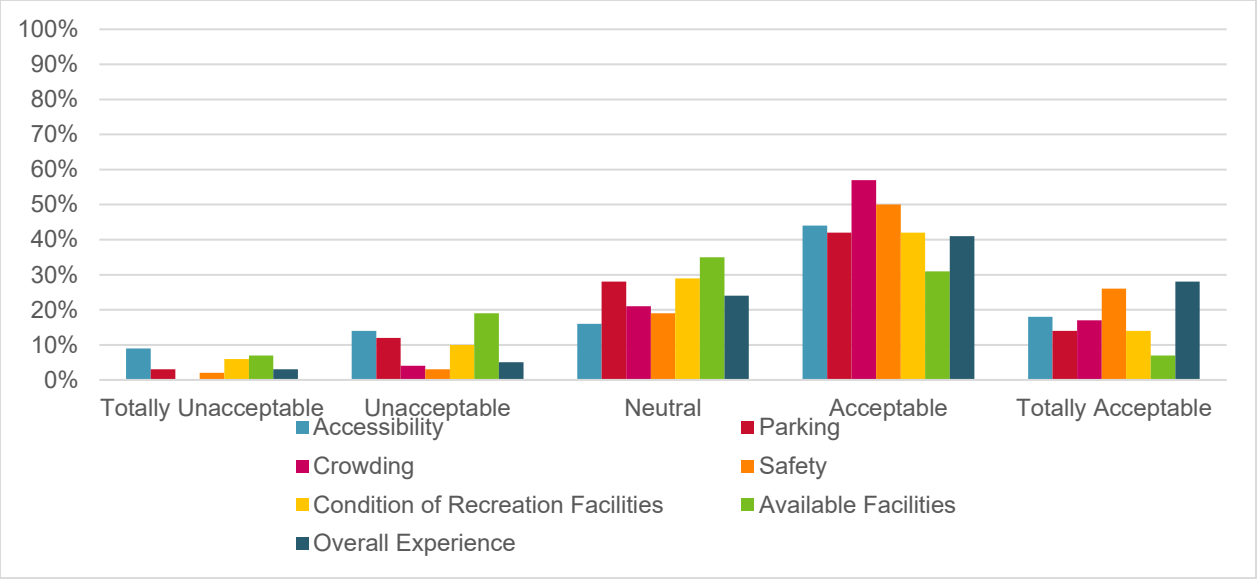

Figure 6-2. Online Survey Summary for Overall Rating on All Visits at Project and Non-Project Facilities

Facility-specific summaries and verbatim user comments from the online survey are included in Attachment 3.

The Thompson Campground located between Byllesby and Buck dams was mentioned in the online survey comments frequently, however the VDCR explained during the recreation site visit that previous efforts (1990s and as recently as two years ago with an attempt to reach terms of a 99-year lease) by the VDCR to acquire the land from USFS were unsuccessful, reportedly due to unresolvable USFS interests pertaining to liability and insurance. This area is the most suitable area for a campground near the Project and has existing picnic areas, horse facilities, and general campground infrastructure. While there is still widespread interest in this development, the Project currently lacks an advocate at the federal level (legislative or agency). This area remains of interest to the VDCR and online survey users.

6.4 Recreational Use Documentation

As discussed in 5.4, HDR documented and reviewed over a full year of Project and Non-Project recreation facility usage with motion-activation trail cameras. Eight trail cameras were installed on October 15 and 16, 2019 and were removed on November 5, 2020[2]. During the trail camera component of the study, HDR downloaded data from the cameras on eight different occasions, capturing thousands of photos.

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

[2] Camera 1 and 8 did not collect data from July 28 through November 9, 2020 (equipment malfunction). Camera 5 did not collect data from May 27 through July 28 (theft). Camera 6 did not collect data from May 18 through July 28 (fallen tree).

Trail. While some of the recreation facilities were used for their intended use, some were used differently than predicted, as further discussed below.

6.4.1 Project Facilities Trail Camera Assessment

The Project facilities most frequented by users are the Byllesby 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 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.

As a note of clarification, the Byllesby Canoe Portage trail camera faced the associated parking lot and not the canoe take-out. HDR expected the parking lot would be used to transport canoes or kayaks after portaging, however this was not observed. The Byllesby Canoe Portage parking lot was largely used to access the New River Trail (including biking, hiking, and walking and dog walking).

The New River Canoe Launch is also a Project facility and was used as intended (canoe/kayak put-in), but more frequently used for bank fishing or relaxing along the sandy shore. This facility was not as popular as the Byllesby Boat Launch and the Byllesby Canoe Portage but generally had a consistent amount of foot traffic, especially during the warmer days.

The final Project facility assessed by the trail camera was the Buck Dam Canoe Put-In. This facility was seldomly used but when it was, it was used as a put-in or for bank fishing. Stakeholders noted during the October 28, 2020 site visit that users cross the Buck bypass to Mountain Island[3] to gain angler access further downstream. It is possible that use around this area is higher than observed on the trail cameras, but the Buck Dam Canoe Put-In itself was generally not used and the trail camera did not capture a high use. On approximately three occasions, the camera captured motorboats accessing the tailrace to fish.

6.4.2 Non-Project Facilities Trail Camera Assessment

Just upstream of the Buck Dam Canoe Put-In, HDR used a time lapse camera to record activity on the right bank of the tailrace. This area is referred to as Buck Dam – Fishing Access which is accessed from the VDWR's Loafer's Rest Non-Project facility. The general area of the Buck Dam – Fishing Access was understood by Appalachian to be of interest to the stakeholders during the development of the RSP; however the camera in this area recorded approximately two users during the entire survey window. At the October 28, 2020 site visit with the stakeholders, the VDWR noted that there is a No Trespassing sign (public access is prohibited proximate to the powerhouses and dams due to public safety and security concerns) and users are aware of this and avoid the area. Prior to the installation of the No Trespassing sign, this site was suggested to be popular for angler access.

The New River Trail Picnic Area is a Non-Project facility maintained and operated by the VDCR. The 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

[3] The Buck Dam Canoe Put-In is located on Mountain Island which is an island between the Buck powerhouse and the bypass (Figure 3-1).

more. This area is accessed directly from the New River Trail and recorded consistent usage throughout the survey window, especially from spring to fall.

The final Non-Project recreation facility assessed with the trail cameras was the Buck Dam Picnic Area. This facility is just downstream of the New River Trail Picnic Area and is also on the New River Trail, therefore, the use was very similar and generally included picnicking, hiking, biking, horseback riding and walking (and dog-walking). This area has direct access from the New River Trail and saw consistent usage throughout the survey window especially from spring to fall.

6.4.3 Daily Counts

As a metric to provide specific user counts per day, HDR has chosen three representative spring, summer, and fall days over the weekend (Friday through Sunday), when recreation levels are typically higher[4]. FERC defines a recreation day as each visit by a person to a facility for recreational purposes during any portion of a 24-hour period. Table 6-2 provides a count of the number of vehicles or people observed on a given day (from dawn until dusk) as a method to quantify a recreation day through the three highest usage seasons.

At Cameras 1 and 2, the viewpoint of the camera showed mostly vehicles, and vehicles were counted in these instances as one count. For these two cameras, it is likely the recreation usage per person is higher than what is provided in Table 6-3. For the rest of the cameras (3 through 8), individual people were counted as one count. Table 6-2 also summarizes the primary activity(s) observed over the study period at each facility.

Attachment D provides a representative photo from each trail camera for each day denoted below. The date, time, and temperature are also provided in the information block at the bottom of each picture for each day.

[4] The authors of this report acknowledge that a holiday is typically also included for this type of analysis, but due to the loss of data explained in footnote 2, the dates selected here provide a more holistic summary of the usage.

Table 6-2. Trail Camera Primary Recreation and Usage Counts

Recreation Facility	Project or Non-Project Facility	Primary Recreation Activity(s) Observed	Representative Spring Count Sunday, May 10, 2020	Representative Summer Count Friday, July 24, 2020	Representative Fall Count Saturday, October 24, 2020	Additional Notes
Camera 1: Byllesby 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.

6.4.4 Capacity

FERC defines peak weekend use as weekends when recreational use is at its peak for the season (i.e. July 4 weekend and other holiday weekends). On these instances, recreational use may exceed the capacity of the area to handle such use.

The Byllesby Boat Launch and the parking lot at the Byllesby Canoe Portage had the highest overall usage of the recreation facilities during the trail camera analysis. As provided in the Assessment Report (Attachment 1) the Byllesby boat launch has 18 parking spaces and 7 spaces for boat trailers. The Byllesby Canoe Portage parking area has 12 spaces. At these two facilities, there were approximately ten to fifteen days during peak weekends (e.g., holidays) or when weekend weather was optimal where the parking lot appeared to reach capacity. An example of Byllesby Canoe Portage parking area reaching the parking lot capacity is shown in Figure 6-3.

However, on non-peak weekends or a typical recreation day (i.e. non-holiday weekends or weekend's when weather was not optimal) these two facilities did not appear to reach parking capacity. The New River Canoe Launch also has a parking area; however, the viewpoint of the camera did not capture parking capacity, but instead the canoe put-in. Based on the generally lower recreational use of the canoe put-in, it is assumed the parking lot did not reach or exceed capacity. Lastly, the Buck Dam Picnic Area also has a parking lot; however, the viewpoint of the camera did not capture parking capacity, but instead the picnic area. Based on the remote location of the parking area and assumed access of the picnic area via the New River Trail it is also assumed that the parking lot generally did not reach or exceed capacity. The other facilities assessed by the trail cameras (i.e. the New River Trail Picnic Area, Buck Dam Fishing Access, and Buck Dam Canoe Portage Put-In) did not have an associated parking area but are accessed via the New River Trail or boat.

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.

Figure 6-3. Optimal Weather Weekend – Parking Capacity at Byllesby Canoe Portage

7 Summary and Discussion

The Recreation Study captured consistent recreation usage at most of the Project and Non-Project facilities, with usage peaking on the weekends, holidays, and warmer months, as anticipated. In general, the recreation facilities experienced similar types of recreational activities and consistent recreational usage over the study period, especially from May through October. 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 fishing via boating) and canoe/kayaking were the primary recreation activities at Project and Non-Project facilities. 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. 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.

Preliminary agency interests and recommendations to date are summarized in the meeting summaries in Attachment 2. At the October 28, 2020 site visit, improvements to the facilities were discussed. Global comments and recommendations were made for improved signage regarding intended use, restricted access areas (e.g. tailrace areas, dams), safety, and consistent FERC, regulatory, and identification signage. Upgrades and improvements at recreation facilities upstream of the Byllesby dam are limited due to localized flooding (Byllesby Boat Launch) and wetland impacts (Byllesby Canoe Portage). The stretch from Byllesby dam to Buck dam has more potential for facility improvements (New River Canoe Launch, New River Trail Picnic Area, and Buck Dam Picnic Area), and while these facilities do not have the highest usage (compared to the Byllesby Boat Launch and Byllesby Canoe Portage), they do have generally consistent usage due to access along the New River trail. The study results summarized in Section 6.0 do not directly support improvements to areas below Buck Dam to the Buck Dam Canoe Portage. HDR preliminarily evaluated alternative portage locations for the Byllesby Canoe Portage (take-out above the dam) and concluded it was not feasible to shorten the length of the portage or relocate the take-out further upstream, due to the presence of a large wetland area. HDR and their consultant continue to evaluate improvements at the Buck Dam Canoe Portage put-in below the tailrace, to enhance ease of launch and public safety.

At the October site visit and ISR meeting, agencies did provide additional information about and interest in the downstream Loafer's Rest Non-Project facility, which could provide improved angler access to the area below the Buck Dam. Based on stakeholder interest at the Loafer's Rest site, Appalachian, HDR, LPDA, and VDWR conducted a site visit on March 24, 2021 to better understand the site and existing features, stakeholder interests, and potential improvements. As a follow up to the site visit, Appalachian, HDR, LPDA, and VDWR participated in a conference call 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.

Appalachian is presently developing a draft Recreation Management Plan which will provide documentation of the existing Project facilities, agreements with agencies for operation and

maintenance of facilities within the Project boundary (if and as applicable), and proposed enhancement measures for the new license term. Enhancements are anticipated to include improvements to signage throughout the Project boundary, upgrades to the Byllesby Boat Launch and improvements to the Buck Canoe Portage. Appalachian is also proposing to construct new facilities at VDWR's Loafer's Rest area, to be maintained by VDWR in accordance with the lease from Appalachian for this land.

Appalachian expects to distribute the draft Recreation Management Plan to VDWR, VDCR, and other relicensing study participants for comments after the USR meeting so that a draft Recreation Management Plan can be filed with the FLA.

8 Variances from FERC-Approved Study Plan

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

9 Germane Correspondence and Consultation

Attachment 2 includes a list of correspondence between Appalachian, HDR and stakeholders (USFWS, VDWR, VDCR, Carroll County, and the New River Conservancy) with documentation from these key meetings:

- Recreation Study Update and Planning for Facilities Site Visit (October 2, 2020)
- Byllesby-Buck Recreation Study Update - Meeting Notes and Presentation (October 23, 2020)
- Byllesby-Buck Recreation Site Visit Meeting Summary (November 18, 2020)
- Recreation Stakeholder Meeting and Site Visit to Loafer's Rest recreational facility (VDWR) (March 24, 2021)
- Potential Recreation Improvements Discussion with DWR (Virtual Meeting) (June 29, 2021)

10 References

Appalachian Power Company. 1994a. Revised Recreation Plan – Memorandum of Understanding. Byllesby-Buck Hydroelectric Project, FERC No. 2514-003, Virginia. June 7, 1994.

Appalachian Power Company. 1994b. Revised Recreation Plan, Byllesby-Buck Hydroelectric Project, FERC No. 2514-003, Virginia. August 30, 1994.

U.S. Forest Service (USFS). 2007. National Visitor Use Monitoring Handbook. National Visitor Use Monitoring Program, U.S. Forest Service, Washington, D.C

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Attachment 1

Attachment 1 – Recreation Facility Inventory and Conditions Report

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Byllesby-Buck Hydroelectric Project

Carroll County, VA

Recreation Facility Inventory and Condition Assessment

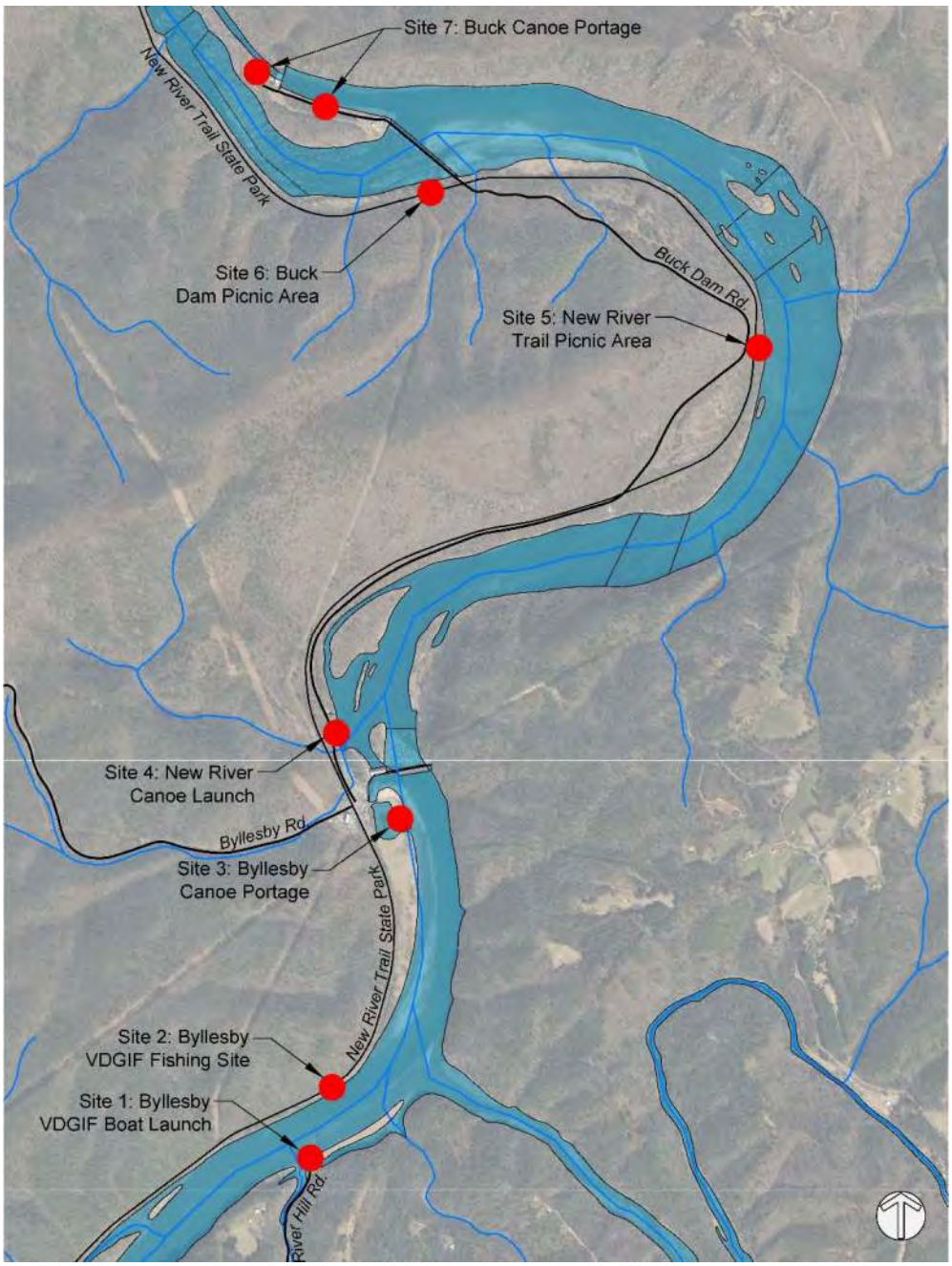
Performed on November 13, 2019

LPDA
LANDSCAPE ARCHITECTURE
LAND PLANNING

Summary:

LPDA conducted a recreation facility inventory and condition assessment of existing recreation facilities associated with the Byllesby-Buck Hydroelectric Project (FERC No. 2514-186) in support of the project's relicensing process. Condition assessment reports and maps for each site are included in this report.

LPDA observed several common themes between the sites. They include lack of ADA accessibility, aging though functional furnishings, informally developed amenities, incomplete and/or scattered signage, and deferred maintenance. The area is set in beautiful natural surroundings and the historic dams provide cultural interest. There is high potential for increasing the recreational value of the sites, both by improving the existing conditions and by developing related amenities like trails, boardwalks, fishing piers, and interpretive signage.



Area Map

Methodology

LPDA conducted a recreation site inventory and conditions assessment of seven sites total, six related to the Byllesby-Buck Hydroelectric project: the Byllesby VDGIF Boat Launch, Byllesby Canoe Portage, New River Canoe Launch, New River Trail Picnic Area, Buck Dam Picnic Area, and Buck Canoe Portage. LPDA evaluated an additional recreation site in the vicinity of the Byllesby Canoe Portage, the Byllesby VDGIF Fishing Site. LPDA staff conducted the site assessments on November 13, 2019 is association with a team from HDR. LPDA evaluated the type and condition of all amenities at each site, including parking, furnishings, access, and signage. LPDA also evaluated the suitability of facilities to provide recreational opportunities and access for persons with disabilities. Where appropriate, LPDA noted opportunities for improvements to existing facilities and opportunities to develop new amenities. LPDA evaluated the inventory and condition of amenities at each site using conditions evaluation forms, photo-documentation, and noted amenity location on GIS developed field maps. LPDA cross referenced the gathered data with georeferenced aerial imagery to develop a conditions assessment report and site layout map for each of the seven sites. The maps are sufficient for site inventory and planning. The sites will need to be surveyed in advance of developing construction plans for site improvement and development.

Site Conditions Assessments

The following are the assessment reports for the seven recreational sites.

RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT
Byllesby-Buck Hydroelectric Project (FERC No. 2514)

Location:	**Site 1: Byllesby VDGIF Boat Launch**		
Date:	**11/13/2019, 8:00 am**	**Surveyor:**	**Tristan Cleveland**
Photo Number(s):			**Map Sheet 1**

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	1	no	N / R / M / (G)	16-ft wide concrete ramp with gentle slope. Can be used by canoe and kayak as well as boats.
Portage (put-in/take-out)	0		N / R / M / G	
Portage Trail/Walking Trail (include length and footing materials)	0		N / R / M / G	
Picnic Table	0		N / R / M / G	
Trash Receptacles	0		N / R / M / G	
Other			N / R / M / G	
Other			N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: ___18__ Standard: __11___ ADA: __0___ Double (trailer): ___7__ Other: _____	**Condition**
	Surface Type: *Asphalt* *Concrete* (*Gravel*) *Other:*_____ Edges are soft. Additional wheel stops are needed.	N / R / (M) / G

Signs	#	Size	Material	Condition	Comments
FERC Project	0		wood / metal / other	N / R / M / G	
Facility ID	0		wood / metal / other	N / R / M / G	
Regulations	4	36”x18” (2) 18”x12” (2)	wood / (metal) / other	N / (R) / M / G	A facility I.D. sign should be placed on the site. The red and the brown regulations signs and the no vehicles sign are damaged. All signs should be collected into a kiosk.
Directional	0		wood / metal / other	N / R / M / G	The only wayfinding sign directing visitors to the site is one sign at the intersection of Hebron Road and Glendale Road. Need more wayfinding signs along Hebron Road directing visitors to the site.
Interpretive	0		wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
R - Needs repair (structural damage or otherwise in obvious disrepair)
M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
G - Good condition (functional and well-maintained)
If a facility is given a rating of “N”, “R”, or “M”, provide specific details.

ADDITIONAL COMMENTS/NOTES: *Note the age of the facilities (if known) as well as any signs of overuse.*
With birds, beavers and wildlife habitat next to the site, there is opportunity to include a walking trail with interpretive signage. Opportunity exists for an ADA accessible fishing pier as well. Recommend adding a picnic table and several trash receptacles, provided that the trash will be serviced regularly. If trash will not be serviced, it should not be added as receptacles will overflow, and signs instructing users to pack out their trash should be placed instead.

Site Photos:

Photo 1-1: Entrance into parking lot

Photo 1-2: Boat Ramp

Photo 1-3: Parking along entrance into the site. There are currently five wheel stops; one more should be added. Possible trailhead access for interpretive trail.

Photo 1-4: Soft dirt edge along parking lot

Photo 1-5: Damaged Sign

Photo 1-6: Damaged Sign

Photo 1-7: Damaged Sign

Location:	**Site 2: Byllesby VDGIF Fishing Site**		
Date:	**11/13/2019, 11:15 am**	**Surveyor:**	**Tristan Cleveland**
Photo Number(s):			**Map Sheet 2**

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	0		N / R / M / G	
~~Portage (put-in/take-out)~~ Water Access	1	no	N / (R) / M / G	Appears to be an informal fishing area. The riverbank to access the water is very steep – too steep to launch a canoe.
Portage Trail/Walking Trail (include length and footing materials)	0		N / R / M / G	
Picnic Table	0		N / R / M / G	
Trash Receptacles	1	no	N / R / (M) / G	Trash can is old and dented, but has a liner and is being serviced.
Bench	1		N / R / (M) / G	Old, rough hand-built wood bench without a back.
Fire ring with grill	1		N / R / (M) / G	Fire ring and grill are old and outdated.
Lantern hook	1		N / R / (M) / G	Lantern hook is old and has chipped, peeling paint.

PARKING	Total Spaces: n/a Standard: _____ ADA: _____ Double (trailer): _____ Other: _____ Parking served by Byllesby trailhead	**Condition**
	Surface Type: *Asphalt* *Concrete* *Gravel* *Other:*_____	N / R / M / G

Signs	#	Size	Material	Condition	Comments
FERC Project	0		wood / metal / other	N / R / M / G	
Facility ID	0		wood / metal / other	N / R / M / G	A sign identifying the fishing site is needed.
Regulations	0		wood / metal / other	N / R / M / G	A sign with fishing and general site use regulations should be posted on the site.
Directional	0		wood / metal / other	N / R / M / G	
Interpretive	0		wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
R - Needs repair (structural damage or otherwise in obvious disrepair)
M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
G - Good condition (functional and well-maintained)
If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES: *Note the age of the facilities (if known) as well as any signs of overuse.*

The site is accessed by walking upriver on the NR Trail and is approximately half a mile from the Byllesby parking lot. There is no signage or maps at the trailhead informing users of the site's existence.

Note: The Fishing Trail was not part of the relicensing Recreation Study Plan, but was evaluated due to its proximity to other recreation sites and the potential to develop the site as a recreational amenity.

Site Photos:

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

Photo 2-2: Looking across the river to Byllesby boat launch.

Photo 2-3: Trash can across the trail from the fishing site. Can has a dent at the bottom.

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

Location:	**Site 3: Byllesby Canoe Portage**		
Date:	**11/13/2019, 10:00 am**	**Surveyor:**	**Tristan Cleveland**
Photo Number(s):			**Map Sheet 3**

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	0		N / R / M / G	
Portage (put-in/take-out)	1	no	N / (R) / M / G	Portage take-out site is poorly defined with limited amenities
Portage Trail/Walking Trail (include length and footing materials)	1	no	N / (R) / M / G	The trail to the portage/river access gate is gravel and fades out with vegetation growing over it for the last section leading to the river. Trail is in poor condition and there is limited signage. Trail length from the river access gate to the portage is 775 ft. It is 460 ft from the parking lot to the river access gate.
Picnic Table	0		N / R / M / G	
Trash Receptacles	1	no	N / (R) / M / G	Trash can is old and has holes in it, but has a liner and is being serviced.
Other			N / R / M / G	
Other			N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: 12 Standard: 12 ADA: 0 Double (trailer): 0 Other: _____	**Condition**
	Surface Type: *Asphalt* *Concrete* (*Gravel*) *Other:* Edges could be graveled. Bollards are aging but in decent condition.	N / R / (M) / G

Signs	#	Size	Material	Condition	Comments
FERC Project	1	24"x36"	wood / (metal) / other	N / R / (M) / G	FERC sign is at portage gate.
Facility ID	3	18"x24" 12"x18"	(wood) / (metal) / other	N / R / (M) / G	The free-standing red and white Byllesby Reservoir sign is very dirty and should be cleaned or replaced. At the portage gate is a sign for the hydroelectric plant. There is a facility I.D. sign on the water for boats as well.
Regulations	3	18"x24" (3)	wood / (metal) / other	N / R / (M) / G	
Directional	5	12"x18" 18"x24" 24"x24" (2) 48"x48"	(wood) / (metal) / other	N / R / (M) / G	The portage sign at the gate is very small and cracked/peeling and the dam ahead sign is faded. The portage directional sign along the trail and river is very small and attached to the bottom of a large post. Additional and larger directional/wayfinding signs are needed.
Interpretive	0		wood / metal / other	N / R / M / G	
Other	2	30"x30" 18"x24"	wood / (metal) / other	(N) / R / M / G	At the parking lot there is a wood kiosk containing a sign for New River Trail State Park and several small informational posts. There is a sign along the trail and river bank the reads "Danger – Dam Ahead." The sign is orientated toward the water to warn boats that they are approaching the dam. The sign is very faded and should be replaced.

N - Needs replacement (broken or missing components, or non-functional)
R - Needs repair (structural damage or otherwise in obvious disrepair)
M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
G - Good condition (functional and well-maintained)
If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES: *Note the age of the facilities (if known) as well as any signs of overuse.*
There is nice wetland area along the river, making a good opportunity for a boardwalk with interpretive signage.

Site Photos:

Photo 3-1: Parking Lot and portage sign

Photo 3-2: Kiosk with New River Trail Sate Park sign and informational posts. The Byllesby Reservoir sign is very dirty.

Photo 3-3: Dirty sign


Photo 3-4: Trash can with holes and old wood post

Photo 3-5: Gate to canoe portage with FERC, regulatory, and directional signage.

Photo 3-6: Portage sign on gate is very small and cracking/peeling

Photo 3-7: Portage sign along trail and river is small, does not fit posts and needs replaced


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

Photo 3-9: Trail following the river leading to the portage

Photo 3-10: Looking back toward Byllesby Dam. The dam ahead warning sign is very faded and the trail has grass growing in the center.

Photo 3-11: Section of trail near the portage take-out is grown over with vegetation and needs to be resurfaced to provide sufficient walking surface and to clarify trail route.

Photo 3-12: Canoe portage/river access and sign for the portage path. Portage take-out has no supporting infrastructure and the site is poorly maintained.

Location:	**Site 4: New River Canoe Launch**		
Date:	**11/13/2019, 2:30 pm**	**Surveyor:**	**Tristan Cleveland**
Photo Number(s):			**Map Sheet 4**

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	0		N / R / M / G	
Portage (put-in/take-out)	1	no	N / R / (M) / G	Portage is a relatively flat, sandy area. Water is shallow. Put-in has no improvements.
Portage Trail/Walking Trail (include length and footing materials)	1	no	N / R / M / (G)	Short gravel road leads from the parking area down the hill to the portage. It is 125 ft. from the gate at the dam maintenance road. It is 1,175 ft from the portage take-out gate to the portage put-in gate.
Picnic Table	0		N / R / M / G	
Trash Receptacles	0		N / R / M / G	
Other			N / R / M / G	
Other			N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: 10 Standard: 10 ADA: 0 Double (trailer): 0 Other: No marked parking spaces	**Condition**
	Surface Type: - *Asphalt* *Concrete* (*Gravel*) *Other:* There is a flat area adjoining the parking area along the road that could potentially be surfaced and used for additional parking.	N / R / (M) / G

Signs	#	Size	Material	Condition	Comments
FERC Project	0		wood / metal / other	N / R / M / G	
Facility ID	1	24"x48"	(wood) / (metal) / other	N / R / M / (G)	Portage sign at the parking area with arrow pointing down the gravel road to the portage. (also serves as a directional sign to the portage)
Regulations	2	10"x12" (2)	wood / (metal) / other	N / R / M / (G)	No Fishing and No Trespassing signs nailed to tree.
Directional	0		wood / metal / other	N / R / M / G	The portage sign at the parking lot has an arrow pointing down the gravel road to the portage.
Interpretive	0		wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)
R - Needs repair (structural damage or otherwise in obvious disrepair)
M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
G - Good condition (functional and well-maintained)
If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES: *Note the age of the facilities (if known) as well as any signs of overuse.*
Portage put-in is informal, but functional. Proximity of parking to the put-in and arrangement of put-in site makes this portage site comfortable to use.

Site Photos:

Photo 4-1: Parking lot and portage sign


Photo 4-2: Flat area adjacent to road and parking lot that could potentially be graveled and used for additional parking

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

Photo 4-4: Canoe portage put-in

Location:	**Site 5: New River Trail Picnic Area**
Date:	**11/13/2019, 2:00 pm** **Surveyor:** **Tristan Cleveland**
Photo Number(s):	**Map Sheet 5**

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	0		N / R / M / G	
Portage (put-in/take-out)	0		N / R / M / G	
Portage Trail/Walking Trail (include length and footing materials)	1	no	N / (R) / M / G	Narrow dirt path leads from the road down to the picnic area. The path should be widened and surfaced to make it more defined and walkable. Ideally reroute the path so it is ADA accessible.
Picnic Table	2	1	N / R / (M) / G	The upper picnic table is under a small shelter. The shelter is in good condition; the table is ADA accessible and has chipped paint on the metal legs but is otherwise fine. The lower table has some wear but is still usable.
Trash Receptacles	1		N / (R) / M / G	Old metal trash can in good condition except for several holes in the side. Has a liner and is being serviced.
Bike Rack	1		N / R / M / (G)	Parks four bikes and recently painted.
Hitching Rail	1		N / R / M / (G)	Recently painted
Benches	3		N / R / (M) / G	One bench has a missing slat
Lantern Hooks	2		N / R / (M) / G	Old with chipping paint, but usable
Fire ring with grill	2		N / R / M / (G)	
BBQ Grill	1		(N) / R / M / G	Grill bottom is rusted out. Grill is unusable and needs to be replaced.

PARKING	Total Spaces: 0 Standard: 0 ADA: 0 Double (trailer): 0 Other: Can park two cars in informal pull-off along road	**Condition**
	Surface Type: *Asphalt* *Concrete* *Gravel* *Other:*	N / R / M / G

Signs	#	Size	Material	Condition	Comments
FERC Project	0		wood / metal / other	N / R / M / G	
Facility ID	0		wood / metal / other	N / R / M / G	A sign should be placed along the road at the pull-off area identifying the picnic area below.
Regulations	0		wood / metal / other	N / R / M / G	A sign with fishing regulations and general site use rules should be posted within the picnic site.
Directional	0		wood / metal / other	N / R / M / G	The picnic area I.D. sign should point to the path the leads down to the picnic area.
Interpretive	0		wood / metal / other	N / R / M / G	
Other	3	6”x6” 3”x4” 8”x10”	wood / (metal) / (other)	N / R / M / (G)	There is an emergency contact sign and a dedication plaque attached to the picnic shelter post and a bear warning sign on the picnic table under the shelter.

N - Needs replacement (broken or missing components, or non-functional)
R - Needs repair (structural damage or otherwise in obvious disrepair)
M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
G - Good condition (functional and well-maintained)
If a facility is given a rating of “N”, “R”, or “M”, provide specific details.

ADDITIONAL COMMENTS/NOTES: *Note the age of the facilities (if known) as well as any signs of overuse.*
Lower picnic area has cleared bank for fishing access and a shallow slope with shallow water. Could possibly be used for wading. There is a bird nesting box near the riverbank at the edge of the lower picnic area.

Site Photos:

Photo 5-1: Informal parking pull-off and path leading down to picnic area

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

Photo 5-3: Path from picnic shelter down to lower picnic area and river

Photo 5-4: Lower picnic area

Photo 5-5: Benches, fire rings and lantern hooks along the riverbank.

Photo 5-6: BBQ grill with rusted out bottom

Photo 5-7: Trash can with holes in the side

Photo 5-8: Bird nesting box

Photo 5-9: Bench with missing slat

Photo 5-10: Steep path leading from picnic area back up to road

Location:	**Site 6: Buck Dam Picnic Area**		
Date:	**11/13/2019, 1:15 pm**	**Surveyor:**	**Tristan Cleveland**
Photo Number(s):			**Map Sheet 6**

Type of Amenity	#	ADA	Condition	Notes
Boat Launch Ramp/Lane	0		N / R / M / G	
Portage (put-in/take-out)	0		N / R / M / G	
Portage Trail/Walking Trail (include length and footing materials)	1	yes	N / R / M / (G)	New River Trail State Park leads from the parking area to the porta toilet and picnic shelter. Distance is 650 ft and the surface is crushed stone.
Picnic Table	1	no	N / R / (M) / G	Picnic table under a small shelter. The shelter is in good condition. The table is old but usable.
Trash Receptacles	1		N / R / (M) / G	Old metal trash can with minor dents in the side and chipped/faded paint on the lid. Has a liner and is being serviced.
Porta Potty	1	yes	N / R / (M) / (G)	Located along the gravel road by the picnic shelter. Has a screening panel.
Hitching Rail	1		N / R / (M) / G	Has faded paint and a chipped post, but is usable.
Bike Rack	1		N / R / M / G	Old rack with chipped paint, but it usable. Parks four bikes.

PARKING	Total Spaces: 5 Standard: 5 ADA: 0 Double (trailer): 0 Other:	**Condition**
	Surface Type: *Asphalt* *Concrete* (*Gravel*) *Other:*	N / R / (M) / G

Signs	#	Size	Material	Condition	Comments
FERC Project	0		wood / metal / other	N / R / M / G	
Facility ID	1	18”x24”	wood / (metal) / other	N / R / M / (G)	Sign identifies the Byllesby/Buck Hydroelectric Plant but not the picnic area. There should be a sign at the parking lot identifying and directing visitors to the picnic area and another identification sign at the picnic area as well.
Regulations	5	24”x24” 18”x24” (2) 12”x18” (2)	wood / (metal) / other	(N) (R) / M / (G)	The no trespassing sign is very faded and unreadable. The “do not block gate” sign is faded and chipped and the “park at your own risk” sign has small dents. All other signs are in good condition.
Directional	0		wood / metal / other	N / R / M / G	A sign at the parking area is needed directing visitors to the picnic area down the trail and stating how far it is.
Interpretive	0		wood / metal / other	N / R / M / G	Interpretive signage could be added for the dam, river, and the metal machinery piece.
Other	4	30”x30” 12”x18” 10”x8” 6”x6”	wood / (metal) / other	N / R / M / (G)	Kiosk at parking area with a sign for New River Trail State Park, a bear warning sign, and several informational posts. There is a bear warning sign on the picnic table and an emergency contact sign and dedication plaque on the picnic shelter.

N - Needs replacement (broken or missing components, or non-functional)
R - Needs repair (structural damage or otherwise in obvious disrepair)
M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
G - Good condition (functional and well-maintained)
If a facility is given a rating of “N”, “R”, or “M”, provide specific details.

ADDITIONAL COMMENTS/NOTES: *Note the age of the facilities (if known) as well as any signs of overuse.*

Site Photos:

Photo 6-1: Parking lot at the dam

Photo 6-2: Dam gate with regulatory signs

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

Photo 6-4: Old piece of machinery

Photo 6-5: Trash can at parking lot with dents and faded lid

Photo 6-6: Faded regulations sign

Photo 6-7: New River Trail State Park leading from parking area to picnic shelter

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

Photo 6-9: Portable toilet near picnic shelter

Photo 6-10: Hitching rail with chipped post and faded paint

Location:	**Site 7: Buck Canoe Portage**		
Date:	**11/13/2019, 11:45 am**	**Surveyor:**	**Tristan Cleveland**
Photo Number(s):			**Map Sheets 7, 8, 9**

Type of Amenity	#	ADA	Condition	Notes
Upper Portage (take out)	1	no	N / R / M / (G)	Takeout has been improved recently with new sign, graded access, and aggregate surfacing.
Lower Portage (put-in)	1	no	N / (R) / M / G	Steep and rocky with limited access, water is deep.
Portage Trail/Walking Trail (include length and footing materials)	1	no	N / R / (M) / G	The portage route between the take-out and put-in sites is via an asphalt maintenance road, gravel access road, and an informal gravel walking trail. The road surface is approximately 10 ft wide. The route on asphalt is 820 ft, the route on the gravel road is 570 ft, and the walking trail is 50'. The total portage route is 1,440 ft. (0.27 miles). The gravel surface is rough and uneven, and the walking trail has not been graded or surfaced.
Picnic Table	0		N / R / M / G	
Trash Receptacles	1		N / (R) / M / G	Trash can at the lower portage put in is an old rusted 55-gallon drum tied to a tree. There is a lid but no liner. Trash can is used; unsure if it is being serviced.
Other			N / R / M / G	
Other			N / R / M / G	
Other			N / R / M / G	

PARKING	Total Spaces: 0 Standard: 0 ADA: 0 Double (trailer): 0 Other: Public vehicular access is not available at this portage.	**Condition**
	Surface Type: *Asphalt* *Concrete* *Gravel* *Other:*	N / R / M / G

Signs	#	Size	Material	Condition	Comments
FERC Project	0		wood / metal / other	N / R / M / G	
Facility ID	1	24"x48"	wood / (metal) / other	N / R / (M) / G	Sign at the upper portage has some minor dents but is otherwise in good condition. There needs to be a sign identifying the lower portage put-in point.
Regulations	0		wood / metal / other	N / R / M / G	
Directional	3	20"x20" 48"x48" (2)	wood / (metal) / other	N / R / (M) / G	20"x20" portage 500 ft sign has peeling lettering and the length is wrong (620 ft, not 500 ft). There is a 48"x48" sign just past the powerhouse directing users to the lower portage path and another 48"x48" sign across the river that says "Portage left bank" directing boats to the portage downriver.
Interpretive	0		wood / metal / other	N / R / M / G	
Other	1	18"x24"	wood / (metal) / other	N / R / (M) / G	There is an ID sign on the gate at the powerhouse for Byllesby/Buck Hydroelectric Plant. The sign is in good condition except the emergency phone number is faded/covered up and unreadable.

N - Needs replacement (broken or missing components, or non-functional)
R - Needs repair (structural damage or otherwise in obvious disrepair)
M - Needs maintenance (ongoing maintenance issue, primarily cleaning)
G - Good condition (functional and well-maintained)
If a facility is given a rating of "N", "R", or "M", provide specific details.

ADDITIONAL COMMENTS/NOTES: *Note the age of the facilities (if known) as well as any signs of overuse.*
Portage is open to the public by water access only. No public parking is available, which limits the usability of the facility. Note that water elevation was low during site visit.

Site Photos:

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 7-2: Upper canoe portage take-out/water access

Photo 7-3: Sign at upper portage take-out has minor dents

Photo 7-4: Directional sign for lower portage has peeling letters and advertises incorrect distance

Photo 7-5: Non-readable phone number

Photo 7-6: Gravel road/trail leading to the lower portage put-in

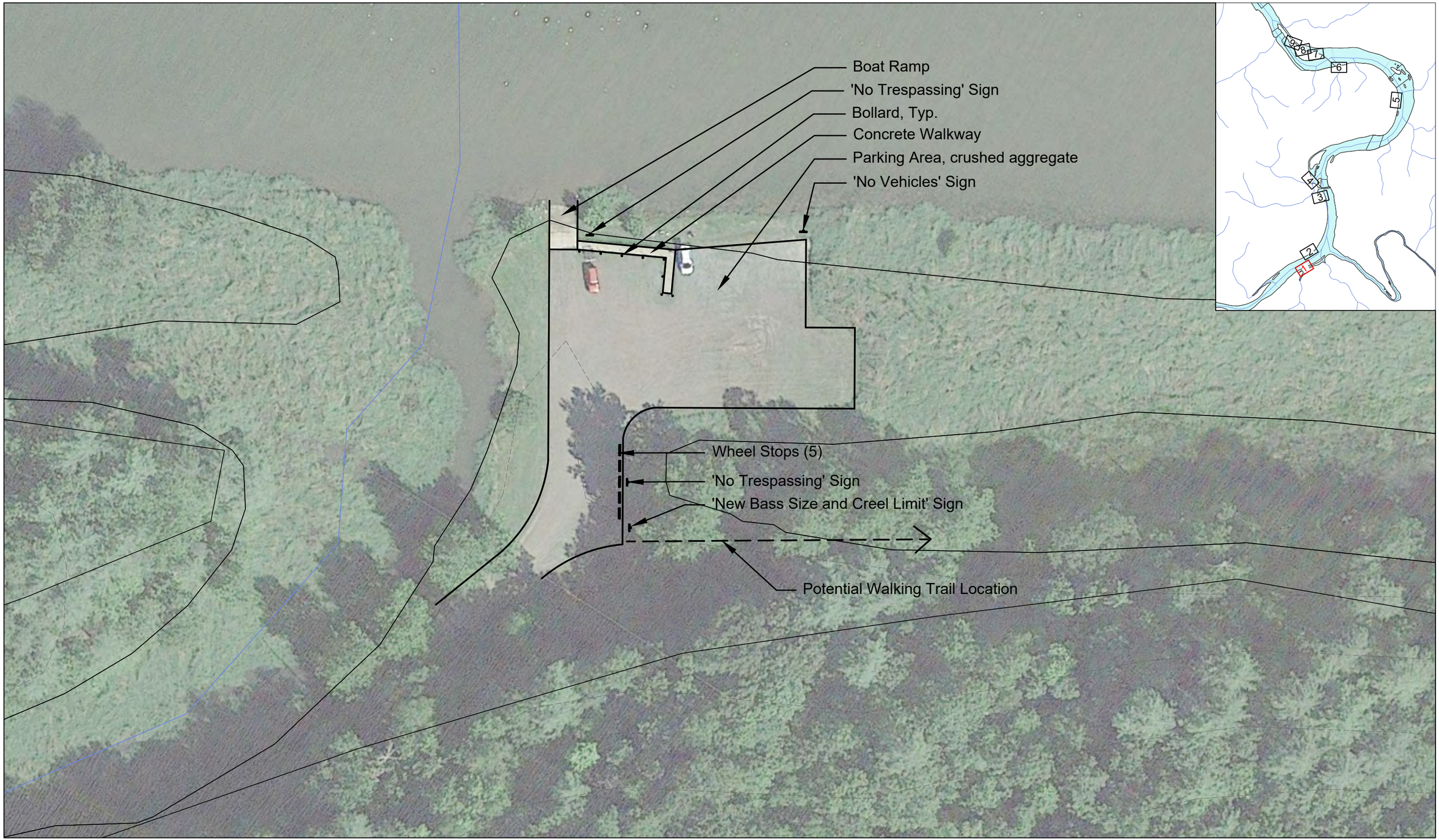

Photo 7-7: Arriving at the lower portage area

Photo 7-8: Lower portage put-in, facing upstream

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

Photo 7-10: Trash can at lower portage (put-in).

Photo 7-11: Directional sign to portage across the river from the road and portages



LPDA
LANDSCAPE ARCHITECTURE
LAND PLANNING

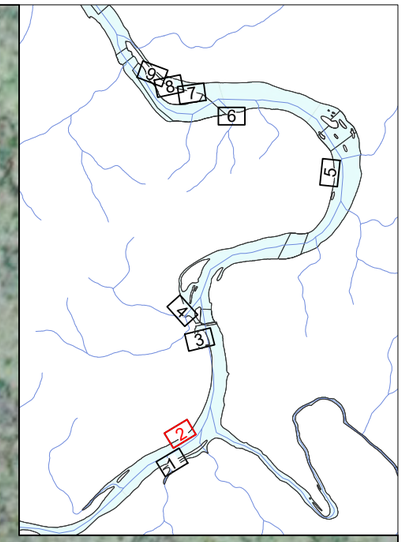
BYLLESBY-BUCK HYDROELECTRIC PROJECT

Carroll County, VA

Site 1: Byllesby VDGIF Boat Launch

Sheet 1

Scale: 1"=50'-0"
0' 50'



New River Trail State Park

Fire Pit and Grill

Bench

Lantern Hook

Trash Can

LPDA
LANDSCAPE ARCHITECTURE
LAND PLANNING

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Carroll County, VA

Site 2: Byllesby VDGIF Fishing Site

Sheet 2

Scale: 1"=30'-0"

0' 30'

LPDA
LANDSCAPE ARCHITECTURE
LAND PLANNING

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Carroll County, VA

Site 3: Byllesby Canoe Portage

Sheet 3

Scale: 1"=50'-0"
0' 50'

Parking Area

'Portage' Sign

Gate

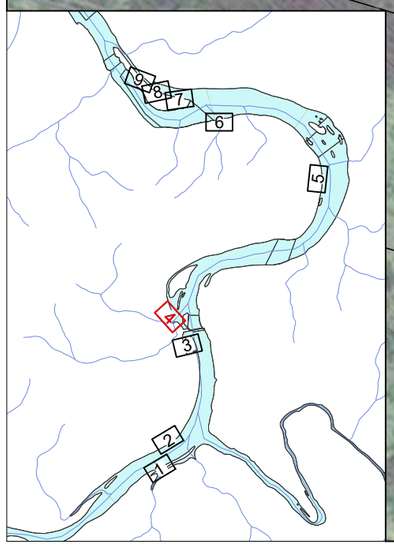
Buck Dam Road

Dam Maintenance Access Road

Canoe Portage

'No Fishing' 'No Trespassing' Sign

New River Trail State Park



LPDA
LANDSCAPE ARCHITECTURE
LAND PLANNING

BYLLESBY-BUCK HYDROELECTRIC PROJECT

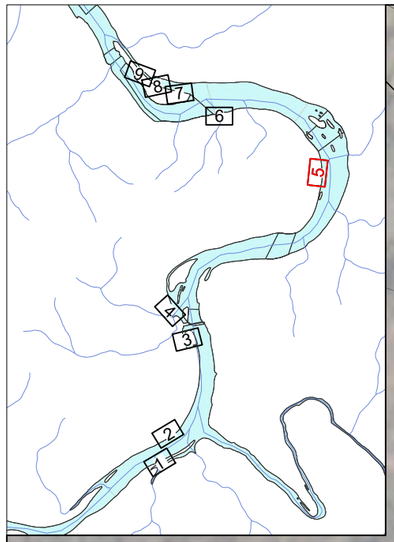
Carroll County, VA

Site 4: New River Canoe Launch

Sheet 4

Scale: 1"=50'-0"

0' 50'



Buck Dam Road
Informal Car Pull-Off
Informal Trail
Picnic Table Shelter
Bike Rack
Hitching Rail
New River Trail State Park
Trash Can
BBQ Grill
Picnic Table
Bird Nesting Box
(2) Lantern Hooks, Typ.
(2) Fire Rings, Typ.
(3) Benches, Typ.

LPDA
LANDSCAPE ARCHITECTURE
LAND PLANNING

BYLLESBY-BUCK HYDROELECTRIC PROJECT

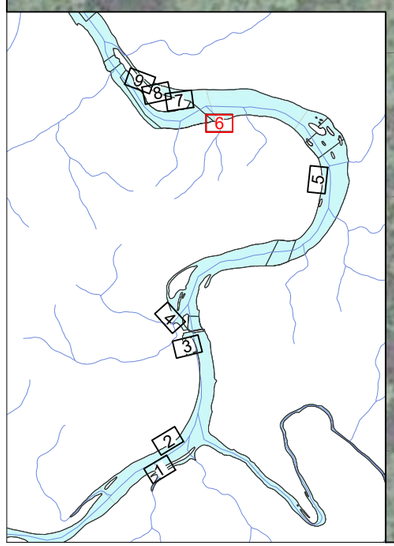
Carroll County, VA

Site 5: New River Trail Picnic Area

Sheet 5

Scale: 1"=50'-0"
0' 50'

Parking Area
Trash Can
Regulations Sign
Kiosk
Old Machinery
'No Trespassing' Sign
'No Trespassing' Sign
'No Trespassing' Sign
New River Trail State Park
'No Boats' Sign
Porta Toilet
Hitching Rail
Bike Rack
Picnic Table
Shelter



LPDA
LANDSCAPE ARCHITECTURE
LAND PLANNING

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Carroll County, VA

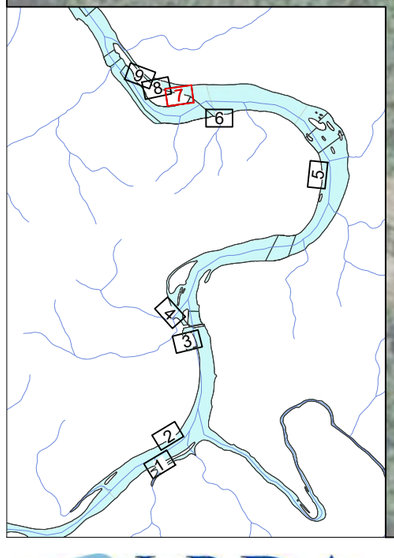
Site 6: Buck Dam Picnic Area

Sheet 6

Scale: 1"=60'-0"
0' 60'

'Portage' Sign

MATCH LINE



LPDA
LANDSCAPE ARCHITECTURE
LAND PLANNING

BYLLESBY-BUCK HYDROELECTRIC PROJECT

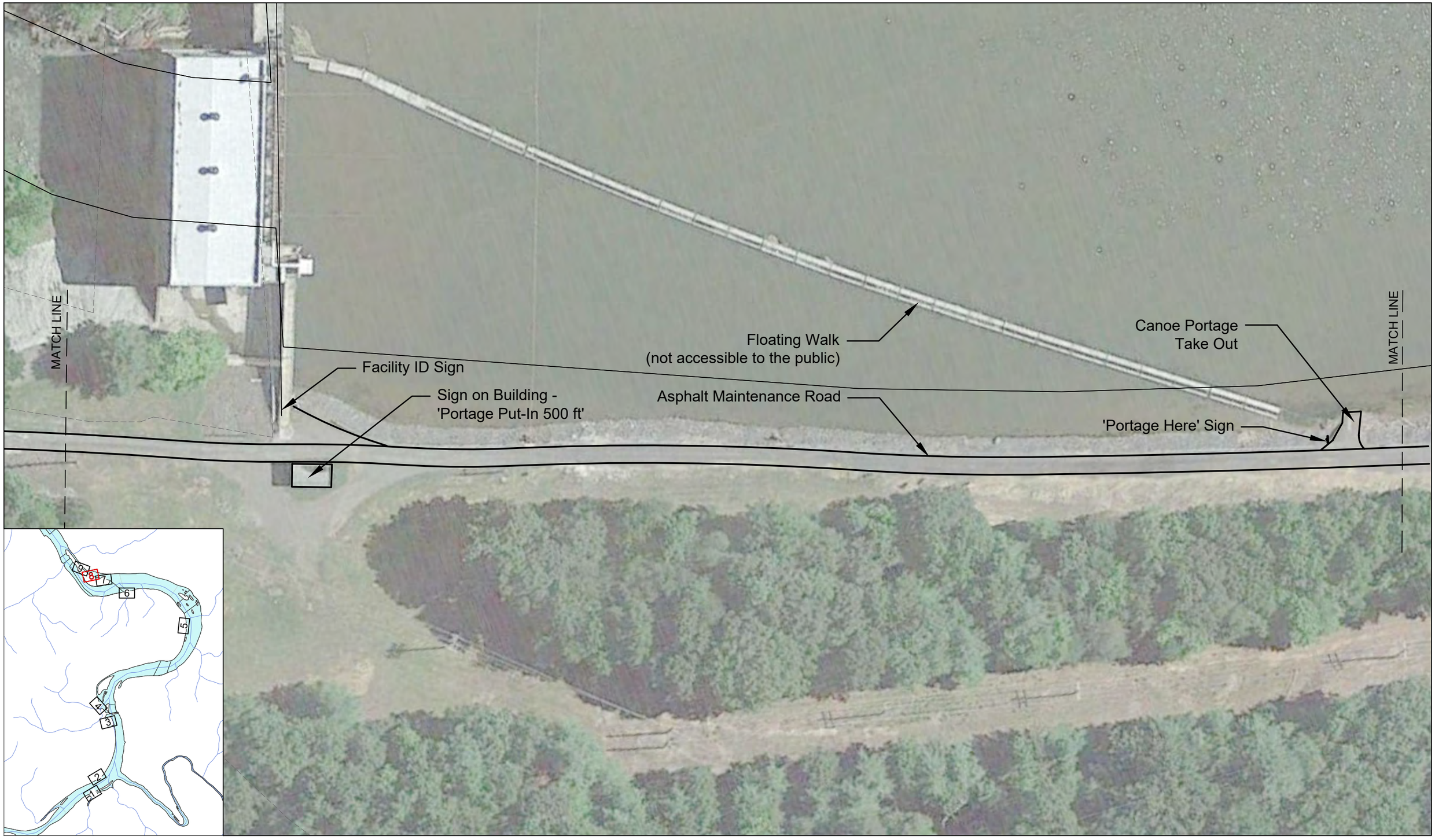
Carroll County, VA

Site 7: Buck Canoe Portage (south)

Sheet 7

Scale: 1"=50'-0"

0' 50'



LPDA
LANDSCAPE ARCHITECTURE
LAND PLANNING

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Carroll County, VA

Site 7: Buck Canoe Portage (center)

Sheet 8

Scale: 1"=50'-0"
0' 50'

LPDA
LANDSCAPE ARCHITECTURE
LAND PLANNING

BYLLESBY-BUCK HYDROELECTRIC PROJECT

Carroll County, VA

Site 7: Buck Canoe Portage (north)

Sheet 9

Scale: 1"=50'-0"

0' 50'

Attachment 2

Attachment 2 – Stakeholder Recreation Meeting Notes

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Subject: FW: AEP Byllesby-Buck Relicensing: Recreation Study Update and Planning for Facilities Site Visit

From: Elizabeth B Parcell <ebparcell@aep.com>
Sent: Friday, October 2, 2020 2:51 PM
To: joseph.grist@deq.virginia.gov; sharon.ewing@dcr.virginia.gov; claytorlakegirl@gmail.com; janet_norman@fws.gov; rex.hill@carrollcountyva.gov; james.elliott@dcr.virginia.gov; Bill.Kittrell@dgif.virginia.gov; John.Copeland@dgif.virginia.gov; SAM.SWEENEY@DCR.VIRGINIA.GOV
Cc: Jonathan M Magalski <jmmagalski@aep.com>; Yayac, Maggie <Maggie.Yayac@hdrinc.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>
Subject: AEP Byllesby-Buck Relicensing: Recreation Study Update and Planning for Facilities Site Visit

Happy October!

As you may recall from this past spring, the recreational site visit planned under the Byllesby-Buck Project's Revised Study Plan had to be rescheduled due to COVID-19 travel restrictions. Appalachian Power Company would still like to convene a 2020 site visit with interested relicensing participants to discuss existing and potential recreation facilities and enhancements at the Project.

Prior to meeting at the site, we would like to convene a conference call (Webex) with this group. We can use the call to coordinate logistics and safety planning for the site visit, and we will also plan to provide a Recreation Study update, including preliminary trail camera and online survey results. We are looking to block out 2 hours on folks' calendars for this meeting. Please let me know if you have availability at 9-11 a.m. or 2-4 p.m. **Wednesday, October 21st** for this call; if this day doesn't work for most we'll find an alternative time.

The site visit will allow time to visit each recreation facility. We propose to begin the day at the VDGIF Boat Launch on river-right at 9 a.m. We will continue to the Byllesby dam and work our way towards the Buck dam to view all six recreation facilities. We are presently targeting **Wednesday, October 28th** to complete the site visit, weather permitting. Please let me know at your earliest convenience if you are interested in/available to participate or have any questions, or if you would like to suggest additional potential participants.

Please don't hesitate to contact me with any questions or concerns, and thanks in advance for your participation in this process.

Liz

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ELIZABETH B PARCELL | **PROCESS SUPV**
EBPARCELL@AEP.COM | D:540.985.2441 | C:540.529.4191
40 FRANKLIN ROAD SW, ROANOKE, VA 24011

Subject: FW: Byllesby-Buck Recreation Study Update - Meeting Notes and Presentation
Attachments: AEP Byllesby-Buck Recreation Stakeholder Virtual Mtg_10212020.docx; AEP Recreation Stakeholder Presentation.pdf

From: Yayac, Maggie
Sent: Friday, October 23, 2020 12:35 PM
To: ben.boyette@dwr.virginia.gov; Kittrell, Bill (DGIF <bill.kittrell@dwr.virginia.gov>; Hampton, Tom (DGIF <tom.hampton@dwr.virginia.gov>; John Copeland <john.copeland@dwr.virginia.gov>; sam.sweeney@dcr.virginia.gov; joseph.grist@deq.virginia.gov; claytorlakegirl@gmail.com; janet_norman@fws.gov; rex.hill@carrollcountyva.gov; james.elliott@dcr.virginia.gov
Cc: David Keene <david.keene@dwr.virginia.gov>; sharon.ewing@dcr.virginia.gov; Kulpa, Sarah <sarah.kulpa@hdrinc.com>; Elizabeth B Parcell <ebparcell@aep.com>; Jonathan M Magalski <jmmagalski@aep.com>; Tristan Cleveland <tristan@lpda.net>
Subject: Byllesby-Buck Recreation Study Update - Meeting Notes and Presentation

Good afternoon,

Thank you to those of you who joined us on the conference call on Wednesday. Attached are the meeting notes from the call, please let us know if you have any comments. Additionally, the presentation is included as an attachment for those of you who were unable to make it.

We look forward to seeing some of you next Wednesday, October 28th for the site visit. If you have not RSVP'd to the meeting invitation please do so at your earliest convenience.

Have a great weekend!

Maggie Yayac
Regulatory Specialist

HDR
440 South Church Street, Suite 900
Charlotte, NC 28202
D 704.248.3666 **M** 610.299.0959
Maggie.Yayac@hdrinc.com

hdrinc.com/follow-us

Meeting Summary

Project:	Byllesby-Buck Hydroelectric Project (FERC No. 2514) - Relicensing
Subject:	Byllesby-Buck Recreation Study Update and Site Visit Planning
Date:	Wednesday, October 21, 2020
Location:	WebEx

Attendees:

Laura Walters (New River Conservancy)
Janet Norman (USFWS)
Bill Kittrell (VDWR)
Ben Boyette (VDWR)
Tom Hampton (VDWR)
John Copeland (VDWR)
Sam Sweeney (New River Trail State Park)
Joe Grist (VDEQ)
Jon Magalski (AEP)
Liz Parcell (AEP)
Tristan Cleveland (LPDA)
Sarah Kulpa (HDR)
Maggie Yayac (HDR)

- **Introductions/welcome/meeting purpose**
- **Recreation Study Plan** – Maggie (HDR) provided overview of the Recreation Study Plan as described in the Revised Study Plan (Tasks 1 through 4).

  Throughout the meeting general questions about the Recreation Study methods were discussed and are summarized below:

- **Quantifying recreational use**: Discussion of the relationship between number of respondents and number of users. Appalachian/HDR are unable to develop any statistical relationship to compare to similar comparable studies, but there does appear to be a relationship and themes that have emerged (i.e., Byllesby Boat Ramp had highest number of visitors and survey respondents).

- **Online Survey**: The Online Survey was advertised primarily via signage at the Project recreation facilities (QR Code not included; only full link). This is a potential limitation of this study, though Appalachian/HDR expect that sufficient input was captured from motivated visitors and visitors who frequent the area. Demographic information about survey respondents (age and gender) was collected in the Online Survey and will include additional information in the study report.

- **Trail cameras**: Trail cameras provide better information than the online survey about the number of users during representative periods. The number of photos is related to the how often a site is visited, but not a direct indication of how many people visited (because multiple images may be captured of the same user or other motions can activate the camera). The intent of the study was not to inventory and count recreation users over a continuous period, but rather to characterize usage levels, identify recreation patterns, and develop estimates for representative periods. Maggie (HDR) explained that the trail cameras are motion activated and set to record a next motion after 5 minutes (default setting). The cameras are

not recording every 5 minutes if no motion is detected. Data was from trail cameras collected from November 2019 through present, unless otherwise noted as there are minor data gaps at specific locations due to issues with individual trail cameras. The methodology, data gaps, and results will be presented in the study report.

- **Review of Recreation Facilities –** Maggie (HDR) provided an overview of the Recreation Study Area and the formal recreation facilities it encompasses. Sarah (HDR) noted the Study Area encompasses the full reach of the river between Byllesby and Buck Dams, although the FERC Project boundary does not encompass the entire contiguous area. Additional informal facilities, as well as facilities associated with the New River Trail State Park, may occur in or near the FERC Project boundary.

  John Copeland (VDWR) raised question about Loafer's Rest area and noted that it may not be encompassed by the online survey. Land on the right bank of the Buck tailrace is leased by VDWR from Appalachian Power Company (lease extends through 2023). VDWR noted that in the past many anglers did access the Buck tailrace, but security and public safety concerns now prohibit and discourage access in that area. There is a no trespassing sign currently posted and this likely discourages tailrace fishing. Maggie (HDR) explained this was consistent with the results of the trail camera data facing the Buck tailrace, as there were only two instances of recreational activity at this location. No trail cameras or other monitoring have focused on Loafer's Rest (downstream of Buck tailrace), but this site can be added to the facility inventory and discussed during the site visit as requested.

- **Overview of Preliminary Study Results by Location –** Maggie (HDR) and Tristan (LPDA) reviewed results and findings of the Recreation Study tasks (Recreation Facilities Inventory and Condition Assessment, Online Survey, Trail Camera Monitoring) to date, for each facility. Refer to attached PowerPoint presentation for additional information and details.

  – **Byllesby VDWR Boat Launch** – Based on the online survey and trail camera monitoring, this site receives high volume of use relative to the other facilities, primarily from local residents/regional visitors. Individuals who completed the survey provided generally favorable feedback about this facility.

    Boating appears to be dominant use from trail camera, while online survey respondents indicated fishing as the primary activity. Bill (VDWR) noted that he expect the primary use is fishing, and boating is the means of doing so.

  – **Byllesby Canoe Portage -** This site was anomalous in that only one online survey response was received. Trail camera monitoring indicates that portage of canoe/kayak is not common, though the parking area is busy and provides access to the New River Trail, particularly for biking.

  – Janet (USFWS) asked whether trashed fishing lines are a concern at any of the sites and whether there is a need to consider signage and disposal facilities. Janet noted USFWS has good signage to encourage responsible disposal, if helpful.

  – **New River Canoe Launch** - Visitors to this site are primarily from local area and considered themselves regular visitors. Fishing and canoeing/kayaking were

reported as the primary activities in the online survey, which the trail camera data confirmed, however fishing was more likely to be observed than use of the portage.

- **New River Trail Picnic Area –** Recreation site has two parts, an upper and lower, so there are two trail cameras at this location. The upper is consistently used for biking and picnicking and the lower for fishing.

- Ben (VDWR) noted he was surprised only one camera was stolen and explained the cameras generated a lot of curiosity and questions from the public.

- Ben (VDWR) asked whether any formal or informal usage monitoring had been focused on the area on the opposite bank of the river and Maggie (HDR) confirmed none to date. Sam Sweeney (New River Trail State Park) noted that the area Ben mentioned is relatively popular for fishing and camping. Group discussed that this area does attract a different user base than the other recreation facilities and they see a higher percentage of illegal activities. This area (Laurel/Woodlawn) is informally referred to as Fowlers Ferry, and Fowlers Ferry Road provides access.

- **Buck Dam Picnic Area (off the Buck bypass) -** VDWR noted surprised that online survey respondents indicated canoeing/kayaking and fishing as primary activities since banks are steep and access is limited. Maggie agreed as there are no formal canoeing/kayaking or fishing recreational access points at this recreational facility. It was assumed respondents may have been visitors to the broader Project area/downstream of recreation site.

- **Buck Dam Canoe Portages –** Online survey responses were higher than expected for an area that is only accessed by canoe/kayak. This area had a higher percent of respondents who were not satisfied with the recreational facilities, likely attributed to a high interest in fishing but no formal angling facilities on Mountain Island. Trail camera observations and recreational use were low.

- **Buck Dam Fishing Access (informal) –** A trail camera was added to this informal recreation spot as a result of agency request/interest in the area for fishing in the tailrace. A time-lapse video was used instead of motion-activated at this site only. Only two instances of bank fishing in this area were recorded.

  Ben (VDWR) noted this area has a high degree of interest by the public. Bill (VDWR) noted that primary access is at the end of the island and anglers are crossing from the other side of the island via wading or canoe/kayak or users access the area downstream of Buck and travel up in boat/canoe/kayak. If the camera had been pointed downriver, additional activity may have been captured. Safety is a concern to AEP in this area (high flows as units come on, access across bypass reach, deep water, and steep banks).

- **Site Visit Planning for Wednesday October 28th –** Maggie (HDR) reviewed plan and agenda for Wednesday's site visit, including meeting time by 9:30 a.m. at VDWR Byllesby Boat Ramp. If practical and individuals are comfortable doing so, it may be necessary to consolidate cars at points along the way due to limited parking on the New River Trail side.

Based on VDWR's suggestion and discussion by this group, we will plan to visit (drive by/hop out of vehicles to view site/take photos) the Fowlers Ferry area after the Byllesby Boat Ramp.

Action Items

Owner	Action Item	Target Date
HDR/AEP	Send copy (pdf) of the PowerPoint presentation to the group on this call or post to public relicensing website, in advance of the site visit.	10/26/2020
VDWR	Ben to send photographs of Fowlers Ferry area to (Maggie) for distribution to this group	10/26/2020
HDR	Send confirmation email day before site visit confirming site visit is a go (or providing alternative plan if bad weather is forecasted)	10/27/2020
All	Accept/decline meeting invite for next Wednesday 10/28 to provide HDR and AEP with an expected participant list and headcount	10/27/2020
HDR	Provide participants with summary of online survey respondents' comments on specific areas, during site visit	10/28/2020
HDR/AEP	Send reminder with link to Online Survey and notice of survey period close/deadline approaching to group on this call to share on Social Media or other outlets (and AEP post to Claytor Lake social media).	10/23/2020

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Byllesby-Buck Hydroelectric Project Relicensing

Recreation Study

Virtual Check-In: October 21, 2020

Site Visit: October 28, 2020

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Project Overview

- Licensee is Appalachian, a unit of American Electric Power (AEP).
- The Byllesby-Buck Hydroelectric Project (FERC No. 2514) is a 30.1-MW, two-development Project on the upper New River in Carroll County, Virginia.
- Project constructed in 1912.
- Current FERC license expires February 29, 2024.
- Upcoming dates:
  - Appalachian to file Initial Study Report (ISR) on January 18, 2021
  - ISR Meeting by February 2, 2021

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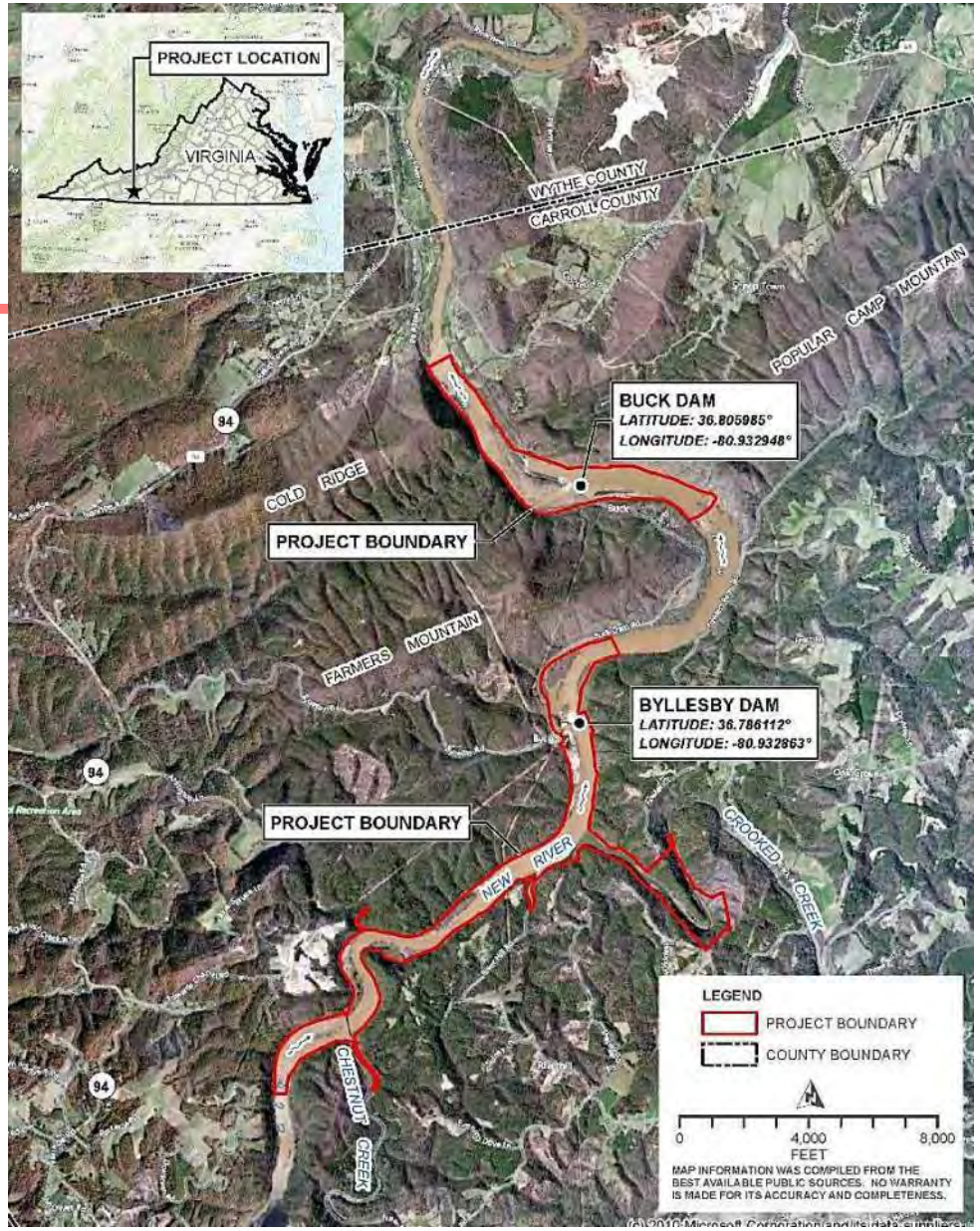
Project Location

- The Byllesby dam is approximately 8 river miles downstream of the Fries dam.
- The Buck dam is approximately 3 river miles downstream of Byllesby and 43.5 river miles upstream of Claytor dam.



Agenda

- Recreation Study Plan
- Review of Recreation Facilities
- Review Recreation Inventory, Online Survey, Trail Camera Results for the following:
  - Byllesby VDWR Boat Launch
  - Byllesby Canoe Portage
  - New River Canoe Launch
  - New River Trail Picnic Area
  - Buck Dam Picnic Area
  - Buck Dam Canoe Portages
  - Buck Dam Fishing Access (informal)
- Site Visit Planning for Wednesday October 28th

Recreation Study Plan: Goals and Objectives

- **Study Goal:** Determine the need for enhancement to existing recreation facilities, or additional recreational facilities, to support the current and future demand for public recreation in the Project area.
- **Specific Objectives:**
  - Gather information on the condition of six Project-related public recreation facilities and identify any need for improvement
  - Characterize current recreational use of the study area and estimate future demand
  - Solicit comments from stakeholders regarding potential enhancement opportunities
  - Analyze effects of continued Project operation on recreation facilities

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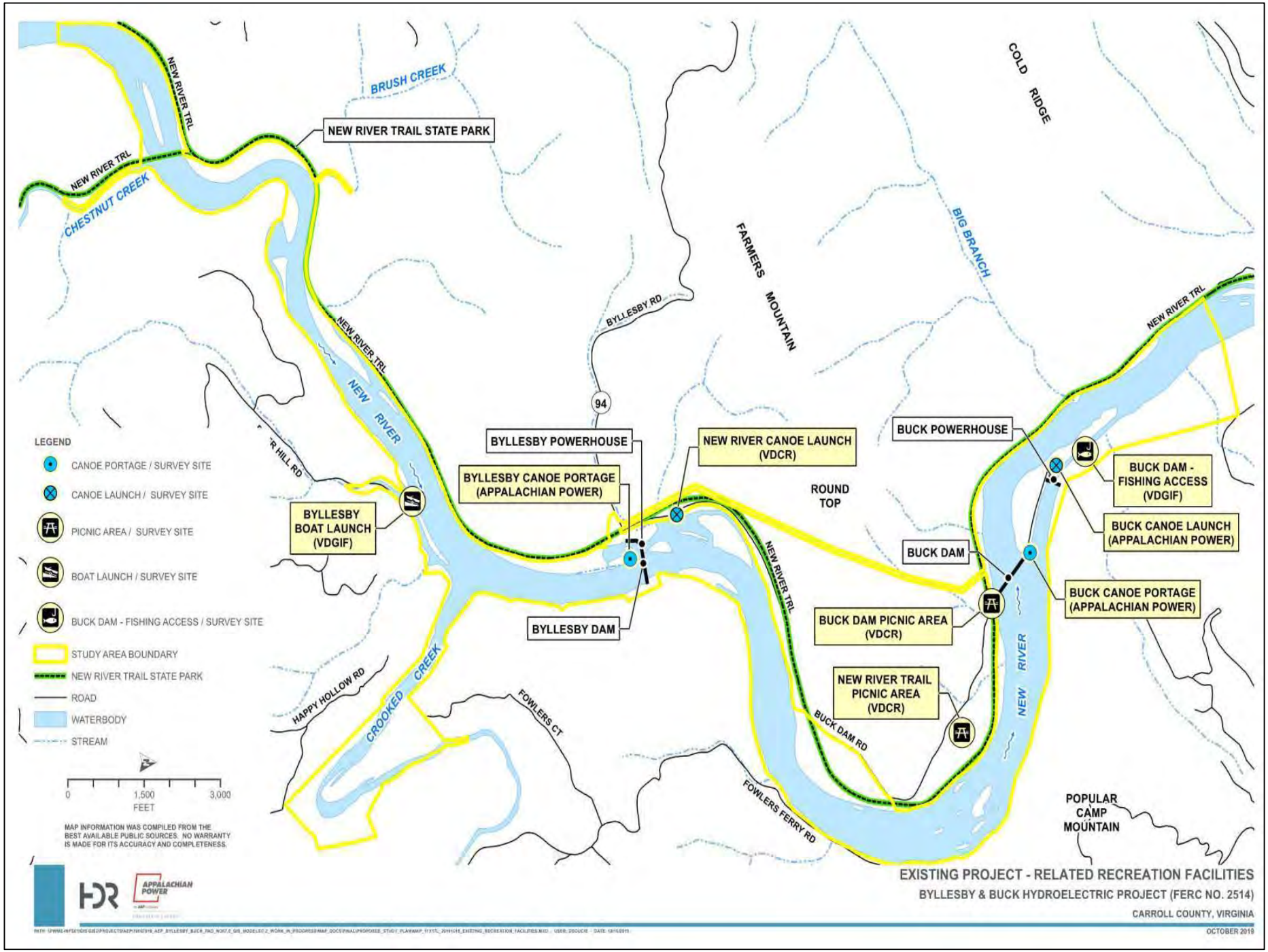
Formal Recreation Facilities

Recreation Facility	Owner / Operator	Amenities	Relationship to Project Boundary
Byllesby Development			
Byllesby VDGIF Boat Launch	Leased and Operated VDGIF	Provides single-lane boat concrete boat launch with gravel parking area.	Within
Byllesby Canoe Portage	Owned and operated by Appalachian	Provides approximate 1,500-foot portage trail. Site consists of a hand-carry canoe take-out and an information trailhead kiosk for the New River Trail State Park.	Within
New River Canoe Launch	Owned and operated by VDCR	Provides small, gravel parking area with short trail leading to a hand-carry boat launch (also serves as put-in for the Byllesby Canoe Portage).	Adjacent to
Buck Development			
Buck Dam Picnic Area	Owned and operated by VDCR	Provides gravel parking for vehicles, information kiosk, and access to New River Trail. Also provides a picnic area with picnic table, trash can, portable restroom facility, and a hitching post for equestrian trail users.	Adjacent to
New River Trail Picnic Area	Owned and operated by VDCR	Provides upper and lower recreation areas that include benches, picnic tables, bike rack, trash can, grill, and informal angling access to the Buck reservoir.	Adjacent to
Buck Dam Canoe Portage	Owned and operated by Appalachian	Provides crushed stone hand-carry take out and a hand-carry put in.	Within



EXISTING PROJECT - RELATED RECREATION FACILITIES

BYLLESBY & BUCK HYDROELECTRIC PROJECT (FERC NO. 2514)

CARROLL COUNTY, VIRGINIA

OCTOBER 2019

Recreation Study: Task 1

Task 1	
Recreation Facility Inventory and Condition Assessment	Field inventory: • Recreation site type and location • Length and type of trails • Existing facilities, signage, and sanitation • Type of vehicular access and parking (if any) • Compliance with Americans with Disabilities Act standards • Photographic documentation
	Qualitative condition assessment: • Each recreation facility will be rated with condition criteria, and explanations provided

Recreation Study: Task 2 and 3

Task 2	
Site Visit with Stakeholders to Discuss Existing and Future Recreational Opportunities	• Appalachian and primary stakeholders will visit the existing Project-related recreation facilities • Discuss potential conceptual-level enhancement and improvements
Task 3	
Recreation Visitor Use Online Survey	• Provide online survey information to stakeholders as well as recreationists who do not frequent the Project regularly

Online Survey

- Online survey notice posted at recreation facilities
- 73 visitors completed the survey, as of October 12, 2020
- Boating and bank fishing have been documented as the primary activities
- Survey live from April – October 2020

Recreation Study: Task 4

Task 4	
Recreational Use Documentation	*Trail camera installation* • Eight cameras placed at the six Project-related public recreation facilities • November 2019 – November 2020 • Motion activated, date and time stamped

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Recreation Study: Analysis and Reporting

An analysis of the current and future recreational facilities usage and needs

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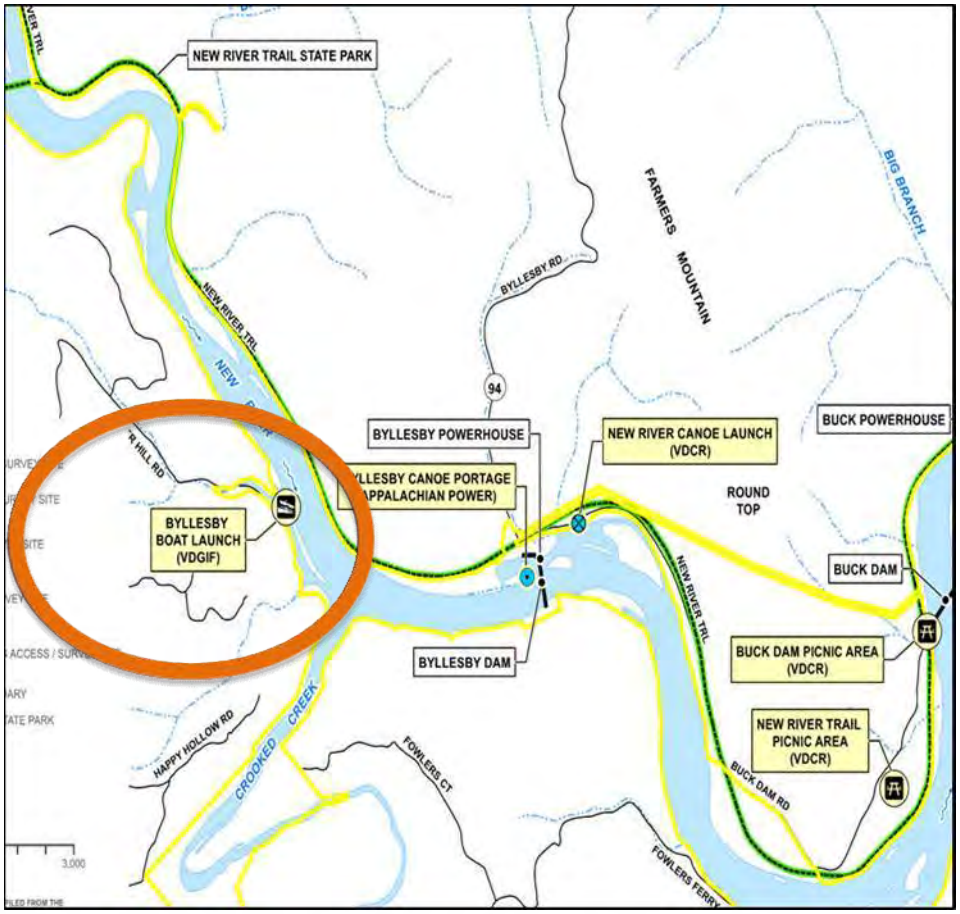
Byllesby VDWR Boat Launch

- Leased and Operated by VDGIF (now VDWR) and located within the Project Boundary
- Provides single-lane concrete boat launch with gravel parking area.



Byllesby VDWR Boat Launch: Inventory Conditions Assessment

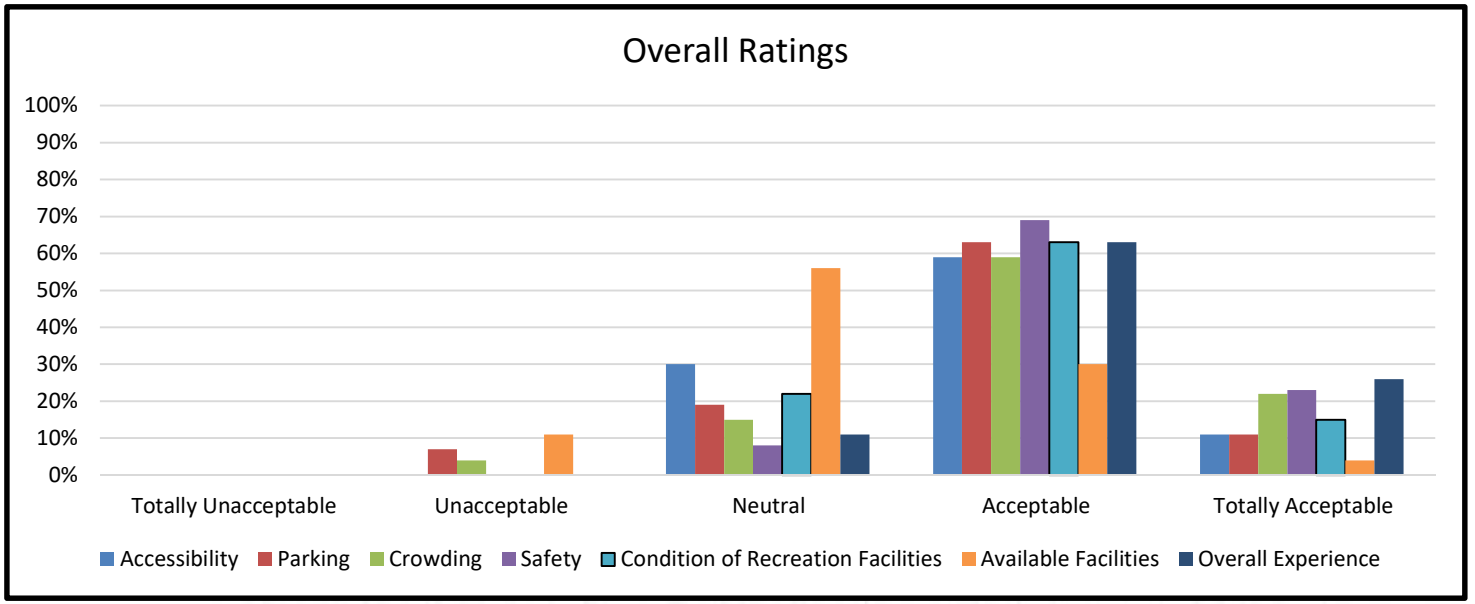
Condition:

- Boat launch/ramp in good condition
- Site is clean
- Gravel parking surface
- Undefined parking
- No site furnishings (i.e. picnic tables, trash cans) or restroom facilities
- Varying site and directional signage.
- No ADA facilities

Byllesby VDWR Boat Launch: Online Survey

- Between May 2020 to September 2020 there have been 37 visitors from Byllesby Boat Launch that responded to this survey.
- 22 miles is the average traveled by visitors as day trips (frequently from zipcodes 24330, 24333 & 24381).
- 93% of respondents consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being 5 hours.

Primary Activity	Percent
Fishing	69%
Canoeing/Kayaking	23%
Boating	4%
Picnicking	4%

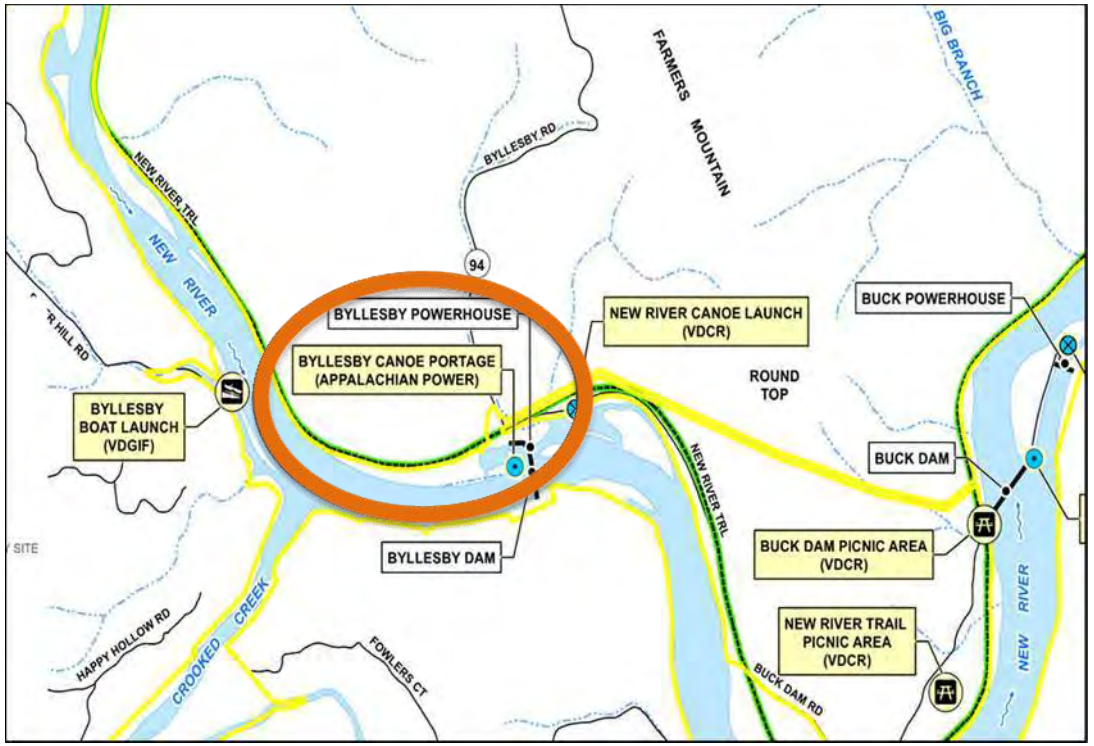


Byllesby VDWR Boat Launch: Trail Camera Results

- As of September 9, 2020, Appalachian has gathered approximately 10,000 photos.
- Significant uptick in recreation activities between the end of May and early August.
- Out of the recreation facilities this one sees the most traffic and generally consistent throughout the week (small uptick on weekends/holidays).
- Boating and bank fishing are the most popular recreational activities.

Byllesby Canoe Portage

- Owned and operated by Appalachian within the Project Boundary
- Provides approximate 1,500-foot portage trail. Site consists of a hand-carry canoe take-out and an information trailhead kiosk for the New River Trail State Park by a gravel parking area.

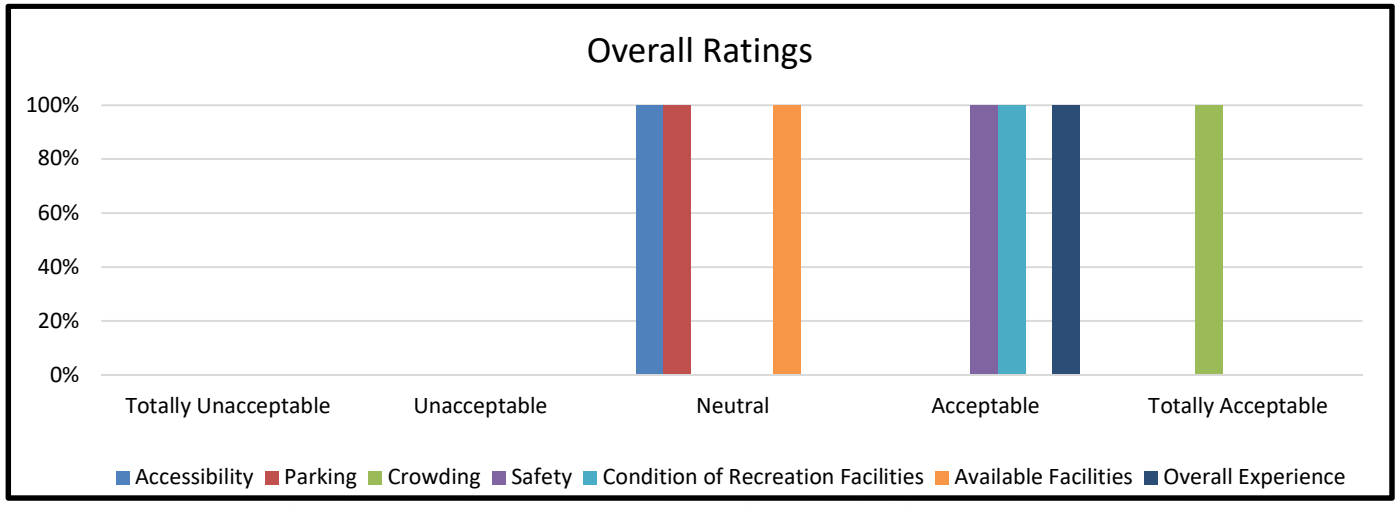


Byllesby Canoe Portage: Inventory Conditions Assessment

- Rustic portage take-out; large and level for easy transfer
- Portage is 775 ft from parking lot
- Trashcan at parking lot is aged but functional and is regularly serviced
- Varying site and directional signage
- No ADA amenities

Byllesby Canoe Portage: Online Survey

- Between May 2020 to September 2020 there has been 1 visitor from Byllesby Canoe Portage that responded to this survey.
- 200 miles is the estimated distance traveled by this visitor and as day trips.
- Considers himself to be regular visitors to the area with at least 3 or more times a year with an average length of stay being 4 hours.
- The months visited are May, July, and August primarily to canoe.

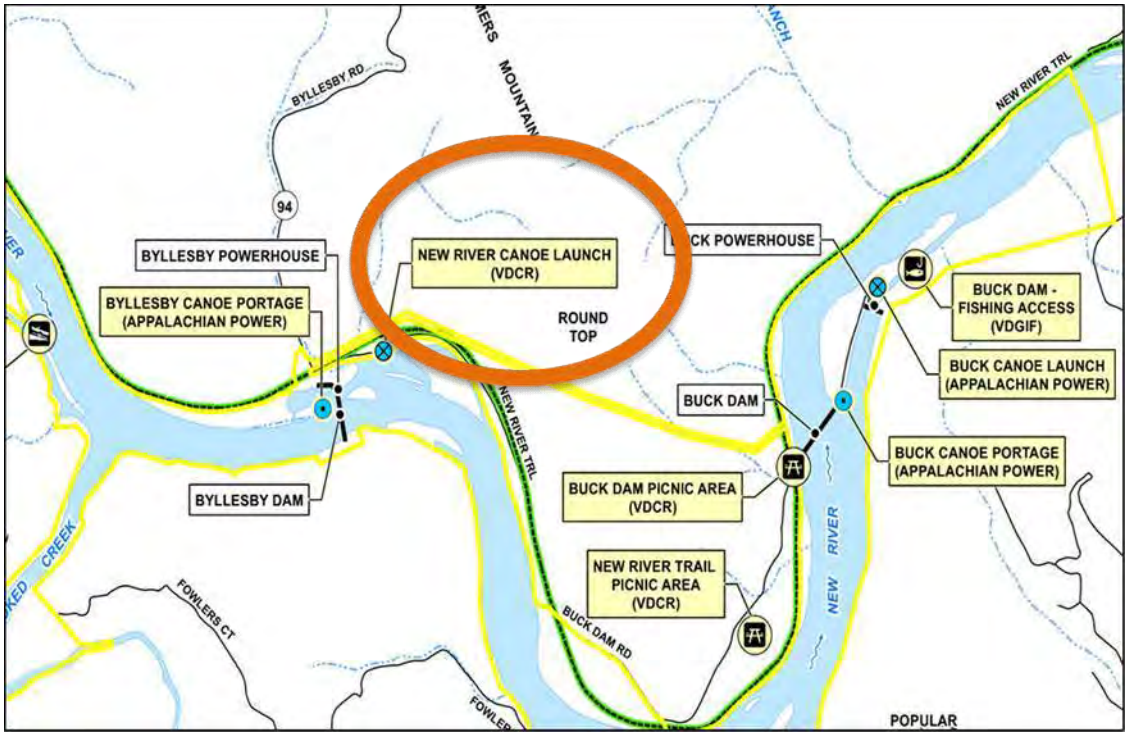


Byllesby Canoe Portage Trail Camera Results

- As of September 9, 2020, Appalachian has gathered approximately 10,000 photos.
- Parking at this location to bike, hike, or walk are the most popular recreational activities.

New River Canoe Launch

- Owned and operated by VDCR adjacent to the Project Boundary
- Provides small, gravel parking area with short trail leading to a hand-carry boat launch (also serves as put-in for the Byllesby Canoe Portage).



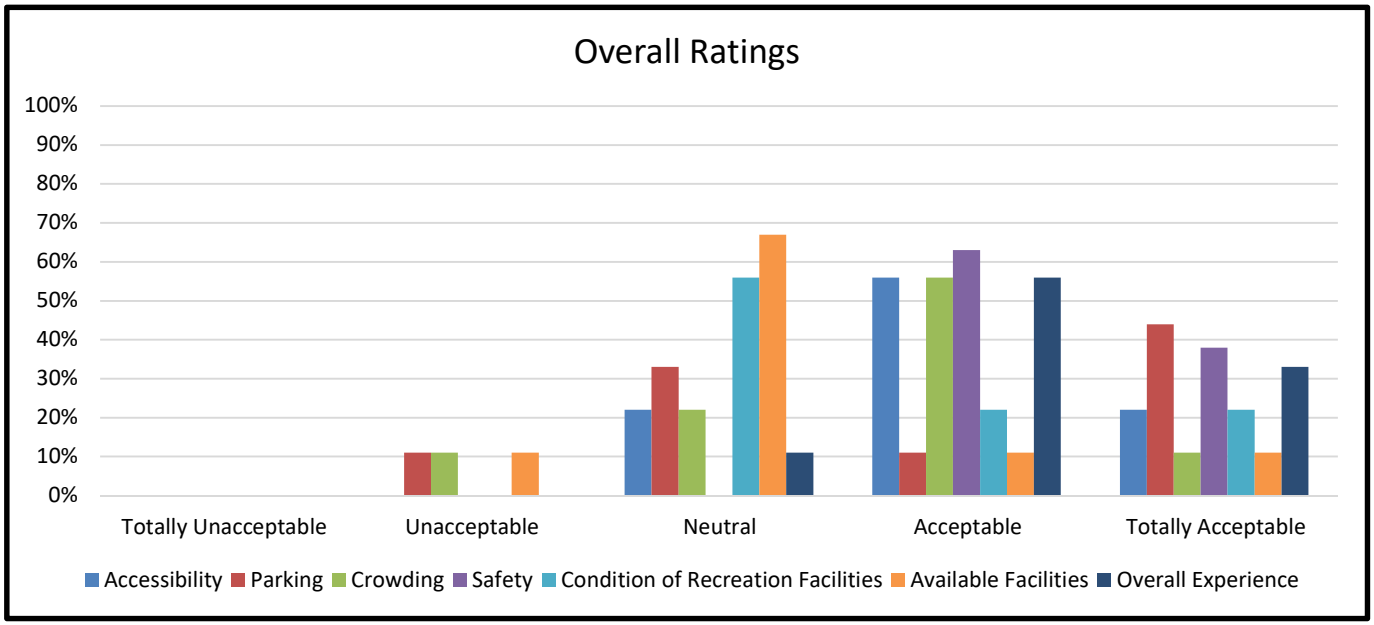
New River Canoe Launch: Inventory Conditions Assessment

- Rustic portage put-in is functional
- Large level sandy surface at portage makes transfer easy
- Gravel parking area for approximately 10 cars
- Canoe put-in is 125 ft from parking area and 1,175 ft (0.22 miles) from take-out
- Clear directional signage
- No site furnishings
- No ADA amenities

New River Canoe Launch: Online Survey

- Between May 2020 to September 2020 there have been 14 visitors from New River Canoe Launch that responded to this survey.
- 7.5 miles is the average traveled by visitors (frequently from zipcodes 24330 & 24333).
- 100% of respondents consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being 4.5 hours.

Primary Activity	Percent
Fishing	67%
Canoeing/kayaking	22%
Sight-seeing	11%

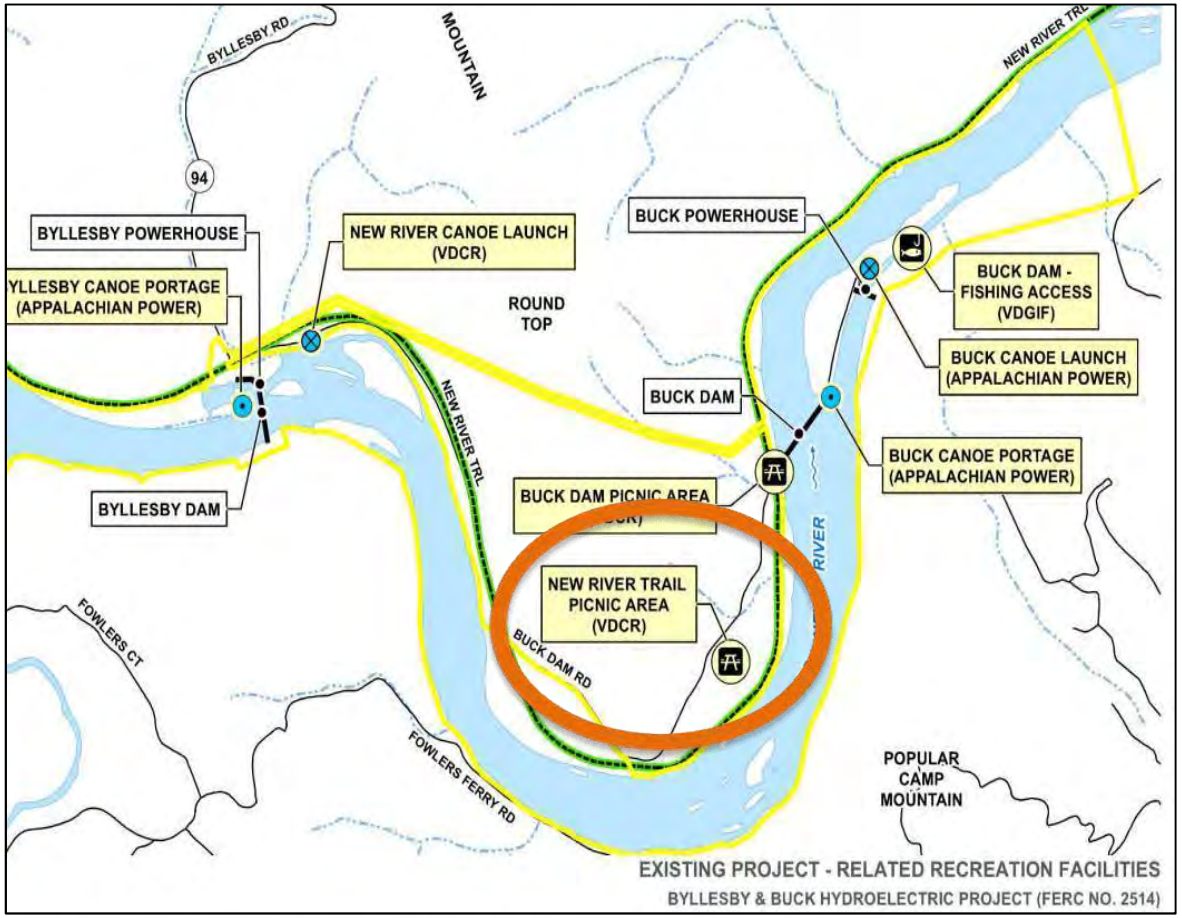


New River Canoe Launch: Trail Camera

- As of September 9, 2020, Appalachian has gathered approximately 2,800 photos.
- Bank fishing and relaxing (i.e. chairs, cooler, hanging out for the day) are the most common.

New River Trail Picnic Area

- Owned and operated by VDCR adjacent to the Project Boundary
- Provides upper and lower recreation areas that include benches, picnic tables, bike rack, trash can, grill, and informal angling access to the Buck reservoir



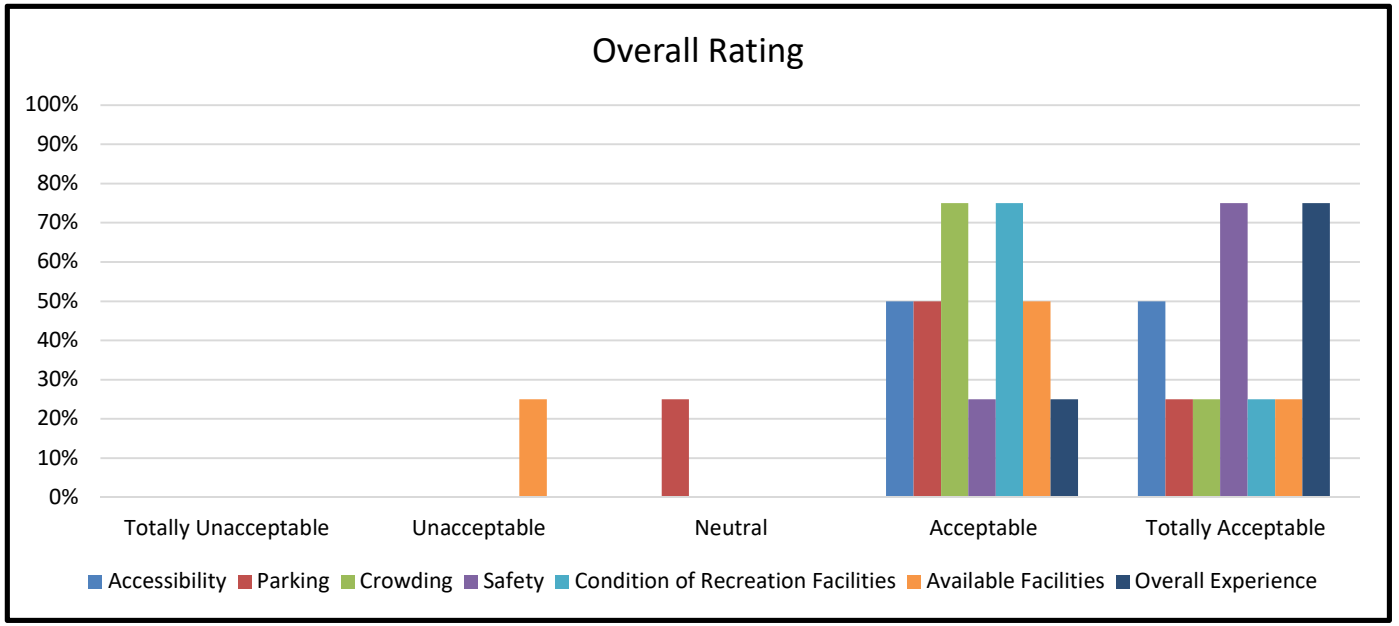
New River Trail Picnic Area: Inventory Conditions Assessment

- Informal parking on shoulder off of road.
- Informal unsigned path leads down hill to upper picnic area off New River trail.
- Upper picnic area amenities are in good/serviceable condition. Picnic table is ADA accessible.
- Lower picnic area furnishings (bench, trash can) require maintenance. Grill is older and could be replaced.
- Some degree of site and directional signage.

New River Trail Picnic Area: Online Survey

- Between May 2020 to September 2020 there have been 8 visitors from the New River Trail Picnic Area that responded to this survey.
- 12 miles is the average traveled by visitors (frequently from zipcodes 24330).
- 75% of respondents consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being 3.5 hours.

Primary Activity	Percent
Biking	75%
Fishing	25%



New River Trail Picnic Area: Trail Camera (Upper)

- As of September 9, 2020, Appalachian has gathered approximately 5,930 photos.
- Consistent use of recreation features (picnic shelter, bike rack and hitching post).

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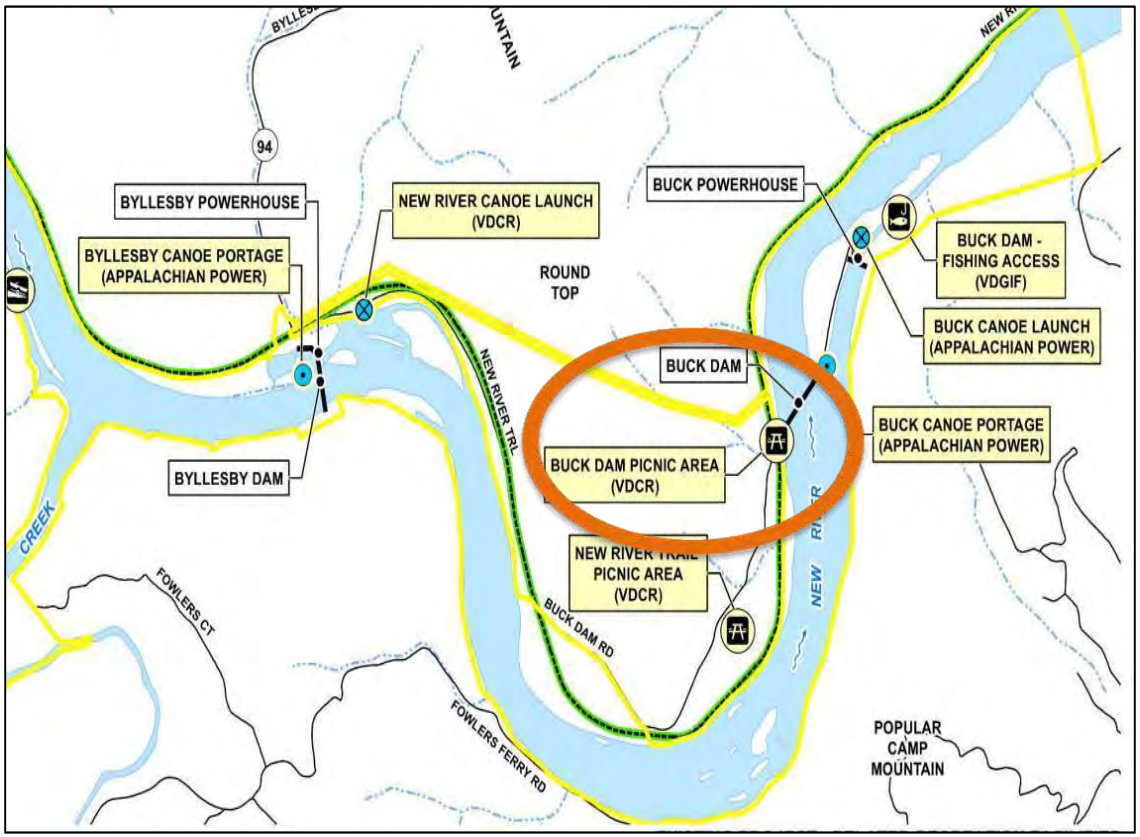
NR Trail Picnic Area (Upper)

New River Trail Picnic Area: Trail Camera (Lower)

- As of September 9, 2020, Appalachian has gathered approximately 3,220 photos.
- This trail camera was stolen and then replaced. Data was lost from May 27 – July 28th.
- Bank fishing and relaxing (i.e using picnic tables, setting up chairs/tents for the day) are also common.
- Recreational users also enjoy this as a stop off the New River trail for sight-seeing.

Buck Dam Picnic Area

- Owned and operated by VDCR adjacent to the Project Boundary
- Provides gravel parking for vehicles, information kiosk, and access to New River Trail. Also provides a picnic area with picnic table, trash can, portable restroom facility, and a hitching post for equestrian trail users.



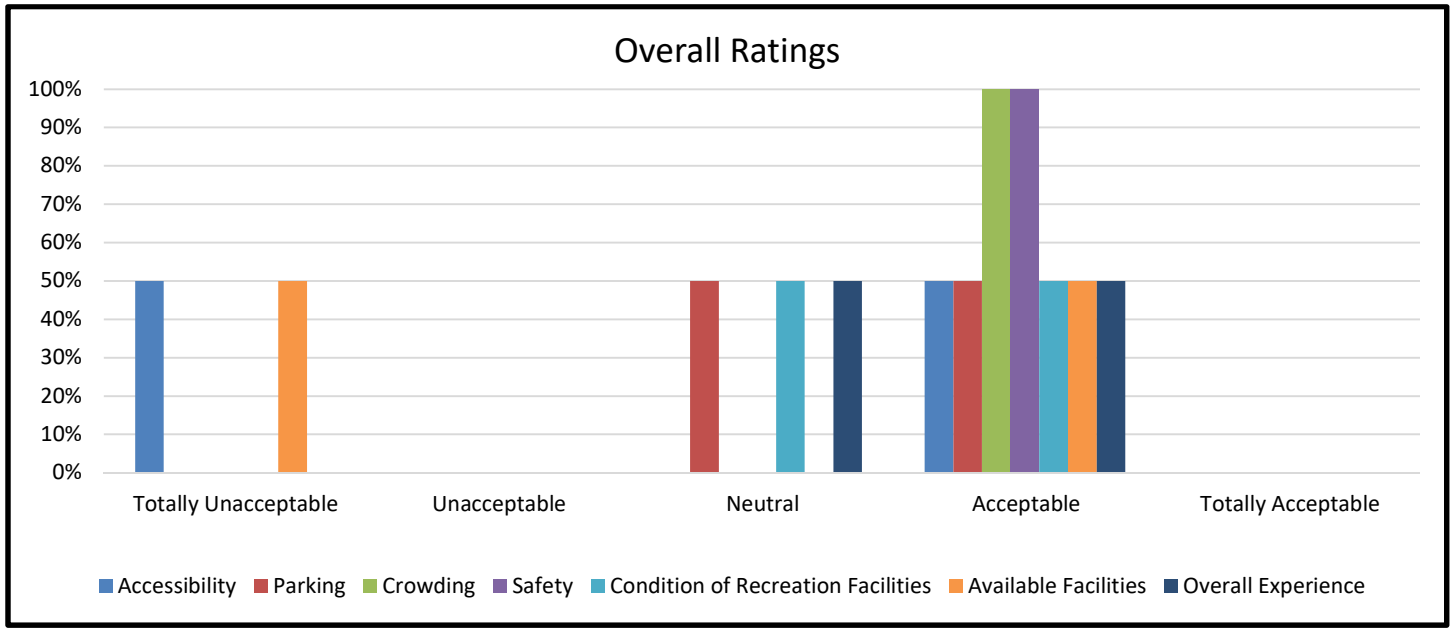
Buck Dam Picnic Area: Inventory Conditions Assessment

- Picnic site along the New River Trail, approx. 650 ft from parking area.
- Gravel parking for approx. 5 cars, needs light maintenance.
- Portable restroom is ADA accessible.
- An industrial artifact is located by parking area.
- Some degree of site and directional signage, in varying conditions.

Buck Dam Picnic Area: Online Survey

- Between May 2020 to September 2020 there have been 4 visitors from the New River Trail Picnic Area that responded to this survey.
- 12.5 miles is the average traveled by visitors (frequently from zipcodes 24330).
- 100% of respondents consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being 4 hours.

Primary Activity	Percent
Canoe/Kayaking	50%
Fishing	50%

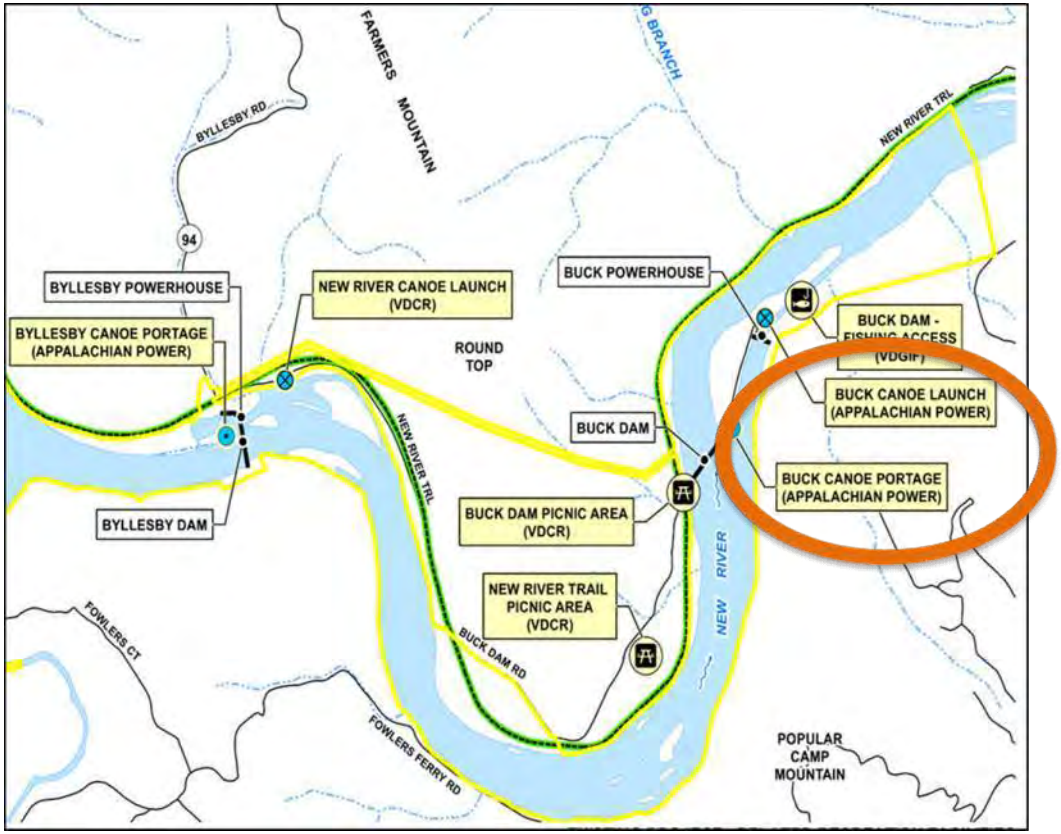


Buck Dam Picnic Area: Trail Camera Results

- As of September 9, 2020, Appalachian has gathered approximately 3,120 photos.
- The tree this trail camera was located on fell down, but was re-installed in a similar location. Data was lost from May 18 – July 28th.
- Consistent use of recreation features (picnic shelter, bike rack and hitching post).

Buck Dam Canoe Portage and Launch

- Owned and operated by Appalachian within the Project Boundary.
- Provides crushed stone hand-carry take out and a hand-carry put in above and below the dam.



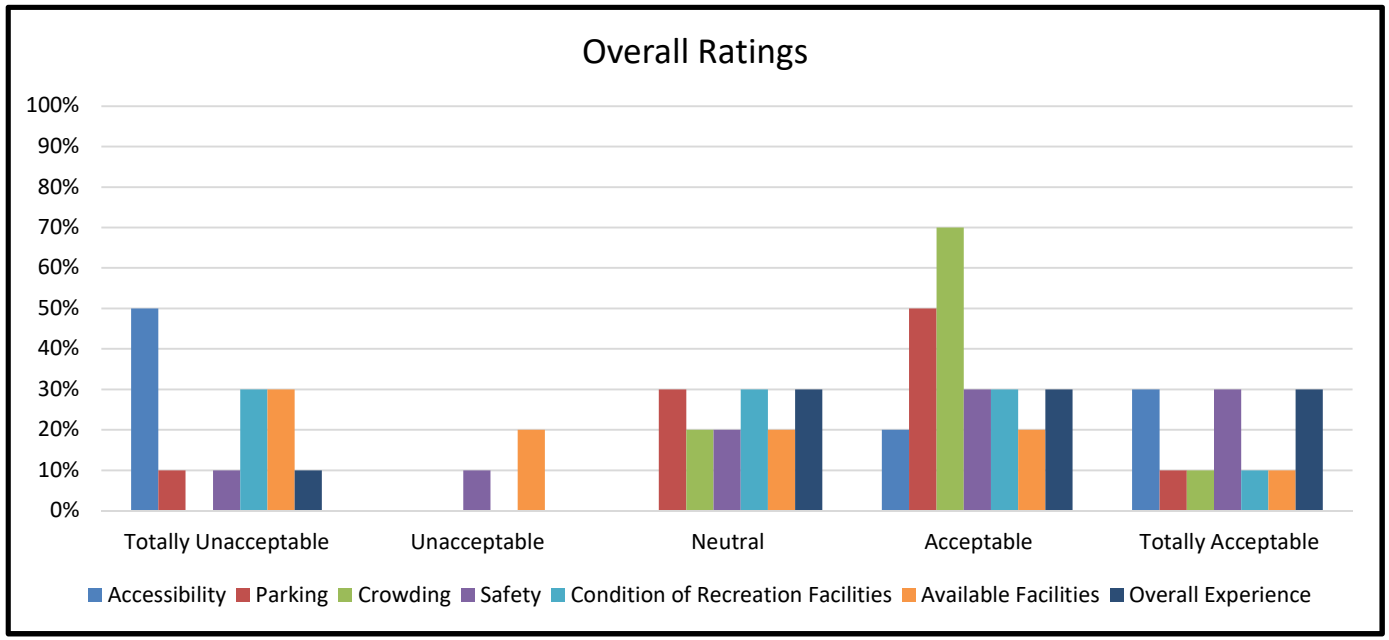
Buck Dam Canoe Portage and Launch: Inventory Conditions Assessment

- Sites accessible to public by water only.
- Crushed stone portage take-out, in good condition.
- Rustic put-in; small area with drop off to water surface.
- Portage route is 1,440 ft (0.27 miles). Surface type varies, some sections are eroded.
- Informal trash can.
- Some degree of site and directional signage, in varying conditions.
- No ADA amenities.

Buck Dam Canoe Portage and Launch: Online Survey

- Between May 2020 to September 2020 there have been 13 visitors from Buck Dam Canoe Portage that responded to this survey.
- 42 miles is the average traveled by visitors with 40% noting they were staying overnight (frequently from zipcodes 24333, 24348 & 24350).
- 100% of respondents consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being 2.6 hours.

Primary Activity	Percent
Fishing	38%
Biking	25%
Canoeing/kayaking	25%
Kayak Fishing	13%



Buck Dam Canoe Portage and Launch: Trail Camera Results

- As of September 9, 2020, Appalachian has gathered approximately 100 photos.
- Low recreational usage compared to other sites
- Bank fishing, canoe/kayaking, and motorized boat fishing into tailrace are the only activities observed.

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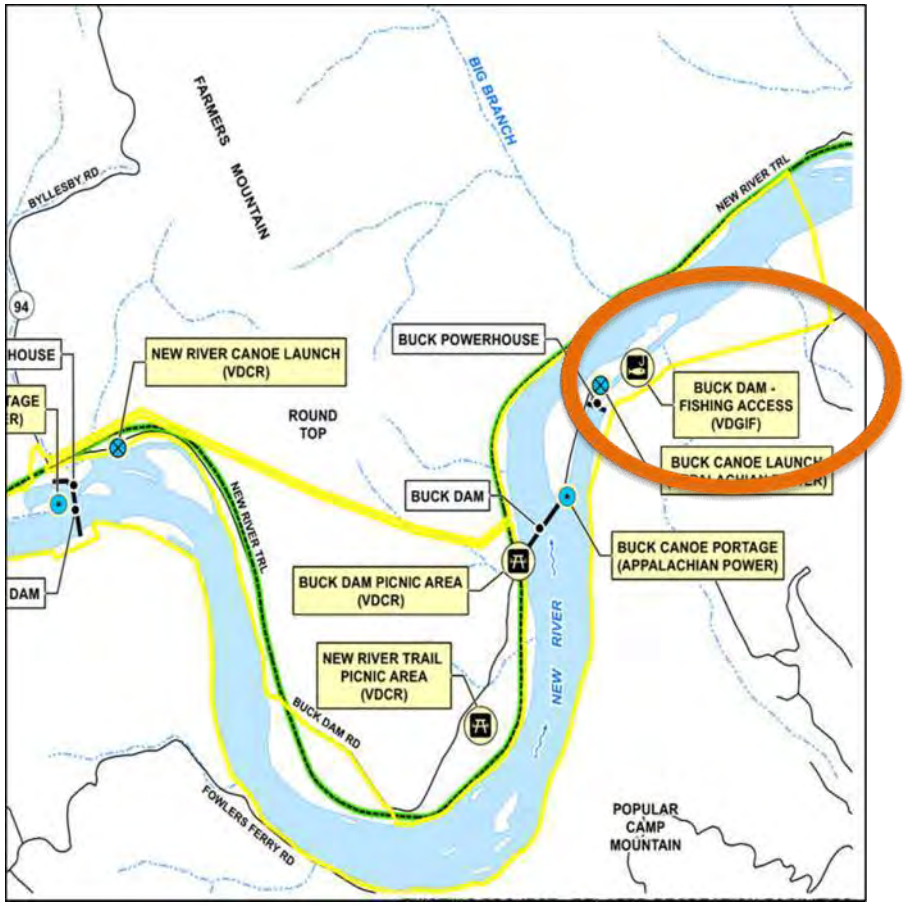
Buck Dam – Fishing Access (informal recreation)

Trail Camera goal:

- Collect data on visitors utilizing tailrace area for fishing; camera faces river-right to capture all recreation



Buck Dam – Fishing Access Trail Camera Results

- As requested by stakeholders during the preparation of the Revised Study Plan, Appalachian added a 7th location for the trail cameras to determine bank fishing at Loafer's Rest.
- Two occurrences of recreational activity.

Site Visit Planning

Wednesday, October 28th

9:30a.m. – 3:00 p.m

A reminder that cell phone service is limited at these sites. My cell phone number is 610-299-0959. Please plan to be outside all day and dress accordingly.

Also, bring a face covering or mask, as these will be required throughout the site visit.

Tentative agenda:

- 9:30am – 10:30am – Meet at VDWR Byllesby Boat Ramp on river-right for a safety briefing and to discuss the recreation site.
- 10:30am – 11:15am – Drive to Byllesby dam and meet in parking lot. Can follow HDR/Appalachian to Byllesby or directions provided.
- 11:30am-12:30pm – Drive to and discuss Buck Canoe Portage and Buck Canoe Launch/Fishing Access
- 12:30pm-1:30pm – Have lunch and discuss recreation site at the Buck Dam Picnic Area. We ask that you bring your own lunch, snacks, and water.
- 1:30pm-2:00pm – Drive to and discuss New River Trail Picnic Area
- 2:00pm-2:30pm – Drive to and discuss New River Canoe Launch
- 2:30pm-3:00pm – Drive to and discuss Byllesby Canoe Portage

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Closing

BOUNDLESS ENERGY℠

Yayac, Maggie

Subject: FW: Byllesby-Buck Recreation Site Visit Meeting Summary
Attachments: AEP Byllesby-Buck Recreation Stakeholder Site Visit Summary_10282020.pdf

From: Yayac, Maggie
Sent: Wednesday, November 18, 2020 9:20 AM
To: Kittrell, Bill (DGIF <bill.kittrell@dwr.virginia.gov>; John Copeland <john.copeland@dwr.virginia.gov>; sam.sweeney@dcr.virginia.gov; rex.hill@carrollcountyva.gov; Boyette, Benjamin <benjamin.boyette@dwr.virginia.gov>; toby.mcclanahan@dwr.virginia.gov; james.elliott@dcr.virginia.gov
Cc: David Keene <david.keene@dwr.virginia.gov>; Hampton, Tom (DGIF <tom.hampton@dwr.virginia.gov>; joseph.grist@deq.virginia.gov; sharon.ewing@dcr.virginia.gov; claytorlakegirl@gmail.com; Kulpa, Sarah <sarah.kulpa@hdrinc.com>; Elizabeth B Parcell <ebparcell@aep.com>; Tristan Cleveland <tristan@lpda.net>; Jonathan M Magalski <jmmagalski@aep.com>; Bill.Kittrell@dgif.virginia.gov; janet_norman@fws.gov
Subject: Byllesby-Buck Recreation Site Visit Meeting Summary

Good morning,

Attached is the meeting summary documenting the recreation site visit at Byllesby-Buck. I've also cc'd the stakeholders that weren't able to make the trip so they would have the latest summary. Please let me know if you have any questions or comments. I hope you all have enjoyable, safe holidays if we don't talk before!

Thanks,

Maggie Yayac
Regulatory Specialist

HDR
440 South Church Street, Suite 900
Charlotte, NC 28202
D 704.248.3666 **M** 610.299.0959
Maggie.Yayac@hdrinc.com

hdrinc.com/follow-us

Meeting Summary

Project:	Byllesby-Buck Hydroelectric Project (FERC No. 2514) - Relicensing
Subject:	Byllesby-Buck Recreation Site Visit
Date:	Wednesday, October 28, 2020
Location:	Byllesby-Buck
Attendees:	Bill Kittrell (VDWR) Ben Boyette (VDWR) Toby McClanahan (VDWR) John Copeland (VDWR) Sam Sweeney (New River Trail State Park - VDCR) Jimmy Elliott (New River Trail State Park - VDCR) Rex Hill (Carroll County) Liz Parcell (AEP) Tristan Cleveland (LPDA) Sarah Kulpa (HDR) Maggie Yayac (HDR)

General Comments:

- At each recreation facility, HDR reviewed the trail camera findings, online survey results and presented the recreation features that were studied in support of the Recreation Study Plan.
- Virginia Department of Wildlife Resources (VDWR) explained their recreation goals are to support fishing, hunting, boating, and wildlife viewing. VDWR does not promote primitive camping on its lands.
- Tom Hampton is the VDWR lead for the Memorandum of Agreement with Appalachian that governs the land lease and terms of the Byllesby Boat Launch.
- Thompson Campground site – Sam Sweeney explained that the New River Trail State Park is still very interested in acquiring, re-developing, maintaining, and operating the former Thompson Campground, located between Byllesby and Buck Dams. Previous efforts (1990s and as recently as two years ago with an attempt to reach terms of a 99-year lease) by the State Park to acquire the land from USFS were unsuccessful, reportedly due to unresolvable USFS interests pertaining to liability and insurance. This area is the most suitable area for a campground near the Project and has existing picnic areas, horse facilities, and general campground infrastructure. While there is still widespread interest in this development, the project currently lacks a champion at the federal level (legislative or agency).
- Primitive camping is not encouraged on State Park or VDWR lands but is known to occur. There is little to no posted signage about whether and where camping is allowed.
- Posting a 911 address at formal recreation sites could aid in emergency response. Lack of cell phone coverage is also a safety concern at nearly all of the recreation areas at the project.

- Global comments and recommendations for improved signage regarding intended use, restricted access areas (e.g. tailrace areas, dams), and consistent FERC, regulatory, and identification signage.
- Photos of each recreation facility discussed in this meeting summary are included.

Recreation Facilities (in order of visitation)

- **Byllesby Boat Launch** – VDWR noted that the only approved use of this facility is for boating and fishing. The site is also used for duck hunting access in the winter months. All other use is technically considered trespass. Site is open at all hours for these recreation activities only.
  - VDWR performs site maintenance once a month at a minimum. VDWR contracts with a vendor for regular mowing and trash pickup.
  - The access road to the site is on the list (i.e., Carroll County 6-year plan) to be paved by Virginia Department of Transportation. VDWR noted that they do not control the fabrication or placement of the "trailblazer" signs on public roads.
  - The boat ramp is not usable when the reservoir is drawn down (e.g., for dam maintenance). Appalachian pointed out that the frequency of drawdowns has and is expected to continue to decrease due to operation of the inflatable crest gates preventing flashboard failure.
  - The facility is generally subject to flooding during periods of high inflow.
    - VDWR reported that the area appears to be subject to larger and more frequent flood events over recent years (due to precipitation events).
    - Because of flood siltation deposits, the parking area must be regularly scraped and new aggregate placed.
  - Concerns: Unauthorized uses (including nighttime parking not for fishing access), congestion along the bank (greatest fishing pressure is summer months), and flooding. Other resident comments to VDWR include request for lighting and restrooms. It was noted that any amenities such as lighting, restrooms, benches, etc. would be difficult to maintain due to the flooding. The existing paved walkway near the bank is sloped (shifted) to the extent that it may not conform to ADA requirements for grade.
    - VDWR noted it is common not to have restroom facilities at remote sites such as this.
    - The site may not have a 911 address (Rex Hill to confirm).
  - Potential improvements: concrete paving of parking lot (though significant cost) and/or paved accessible parking spot, extension of bank fishing (if feasible due to floodplain development and wetland impacts), solar-powered dusk to dawn light (near main sign), and facilities to promote wildlife viewing.

- **Fowlers Ferry (informal)**: Appalachian owns the land on the river side of the road (confirmed on Carroll County GIS map). There are a few informal recreation spots along the river, but one larger area unseen from the road. Ben Boyette explained that known/observed uses include picnicking, primitive camping, ATV, fishing, wildlife viewing wading, and canoe/kayaking. A large informal road through the area creates a loop, and there are numerous informal road/trail spurs. Ben also confirmed that this area saw the highest usage of illegal activity within/adjacent to the Project Boundary. The site provides a unique viewing perspective and reservoir access for this side of the river. The County Sheriff Deputy patrols the area but relies heavily on VDWR Conservation Officers to do so.
    - Concerns:
        - Illegal uses, trash, unauthorized and uncontrolled vehicle access.
        - Lack of signage regarding land ownership or authorized uses (if any).
        - ATV use is not compatible with VDWR site uses but would be difficult to prevent.
        - Large area that is largely out of sight from the road.
    - Opportunities:
        - The agencies would like to control (or at a minimum have grounds to enforce) usage and access.
        - Bill mentioned that VDWR has a grant to lease land from private owners for long term fishing and boating access that may apply to a site such as this. VDWR has interest in acquiring the site from Appalachian.
        - Potential to serve as (hand) launch area for canoes and kayaks (although not much river reach to paddle before Buck dam).
        - Barriers could be placed to prevent vehicle access and a designated parking area established near the road.
        - Potential to formalize foot path.
- **Buck Dam Picnic Area**: Users access the Buck bypass via the New River trail informally to bank fish around this facility. The State Park maintains the site and the restroom (portable toilet, not ADA accessible). The New River Trail State Park right of way is 40 ft from the center of the trail (in both directions). Agencies noted it is unclear how far away users are required to stay from the dam.
    - Opportunities:
        - Clear signage below the dam demarcating point at which access is prohibited (difficult for VDWR to enforce no access to the dam without this).

        - Additional signage and audible alarm warning of dam operations and rising water levels.

- **Buck Dam Canoe Portage/Downstream Fishing Access**:
    - Canoe portage is not heavily used. Put-in to the tailrace below the dam and powerhouse is steep and the current is swift, making it hard to put a canoe in. Canoe take-out commonly accumulates debris and is also relatively steep. This portage is unlikely to be widely used because the user base/craft type is very different for the reservoir and the downstream river reach. Use would likely be to connect the reservoir and downstream reach for continuity by very motivated paddlers.

    - Agencies noted that access to the island across the bypass reach for fishing is by boat (traveling upstream) or wading (less often due to challenging terrain and flows).

    - VDWR noted that they have not issued as many tickets to trespassers near the Buck powerhouse/tailrace channel in recent years and No Trespassing signage has likely deterred users. Usage has gone down over the recent years, however from an angler perspective it is still a desirable fishing location because the tailrace channel attracts fish.

        - Discussion of origins of 200-yard setback from dam or powerhouse rule (Appalachian and VDWR to confirm this)[1].

    - Opportunities:

        - Agencies suggest a more level portage or a step-down launch, though noted that installed at Foster Falls would likely receive much more use than this site.

        - Installation of clear usage signage below the dam and emergency contact signage should a user access the portage outside of station work hours and need help.

        - There is little signage on the island between the dam and powerhouse, including for trespassing or fishing setbacks making it difficult for VDWR to enforce use of the area.

    - HDR/LPDA investigated other portage opportunities on river-left in the bypass off the New River trail. Upstream of the dam is a large wetland blocking access and below the dam has geology unsuitable to canoeing or kayaking.

- **Loafer's Rest (informal area) –** Group did not visit Loafer's Rest, but discussed it from Buck Dam Put-In. Parcels of land in this area are presently leased from Appalachian to VDWR

[1] Based on further review after the site visit, the 200-yard setback is not universal/state-wide but applicable only to Kerr Dam and Leesville Dam. 4VAC15-370-40. Vessels prohibited within certain areas below John H. Kerr Dam and Leesville Dam. Appalachian to evaluate appropriate public safety setback requirement(s) and implement related measures as appropriate.

under a separate agreement from 2000. VDWR noted that this area provides the best river access downstream of Buck Dam and supports a broad user base.

  - Opportunity:

    - Formalize as a VDWR river access, improve unmaintained trail to Buck tailrace, install signage, locate parking area closer to river (especially to improve access for senior citizens).

- **New River Trail Picnic Area –** VDCR maintains the area and noted the amenities (grill, benches, picnic table, etc.) have likely been there for well over 10 years. There is a trash can at this location (trash pickup done by State Park). They do not maintain the trail from Buck Dam Rd or the informal parking area. Does not appear the parking area could be expanded immediately adjacent to the picnic area (currently space for 2 vehicles). The road and shoulder is U.S. Forest Service land.

  - Opportunities:

    - Additional identifying signage and posted rules for use

    - Repair/update existing amenities such as bench and fire pit.

- **New River Canoe Launch (downstream of Byllesby Dam)** – Discussion of the temporary access road Appalachian periodically replaces for vehicle/equipment access to the lower level of the powerhouse and whether it will become permanent in the future. Bill expressed concern that the temporary access road washes away and deposits culverts and other materials downstream and noted that if the road is to be made permanent a bottomless culvert may be necessary. No specific recreational improvements were noted or discussed at this site. There is clear signage denoted trespassing and fishing access boundaries along the bank, though no formal FERC recreation sign. There is also no boating/fishing boundary signage from the water. The group discussed that the area is used more for fishing/river access than canoe or kayak launch.

- **Byllesby Canoe Portage -** VDWR noted that the portage take-out used to be along the left bank close to the parking area. However, when the wetland was created following dredging in the late 90's, the portage was moved to the current location. VDWR is concerned that the linear distance to walk between the take-out and parking lot is far and creates a barrier to use. The group discussed the potential of cutting a channel through the wetland or adding a boardwalk, but these may not be feasible due to wetland impacts and the probability of the channel silting in during frequent flood events.

  - VDWR noted that in the past they've tried to use the portage for emergency boat access to Byllesby reservoir (significantly reduces travel time if don't have to drive to the opposite side of the river to launch), but they were only able to launch the boat near the buoy line since the portage was heavily silted and the water depth was nearly too shallow. VDWR inquired about the potential for an emergency-use only boat access in the Byllesby reservoir to allow them to gain access to the river faster.

- HDR/LPDA walked the New River trail upstream of the site to assess potential for portage take-out above the wetland, however the portage route would be even longer if that was implemented. Desktop estimates of trail length are provided:
    - Portage take-out to access gate: 775 feet
    - Access gate to parking lot: 460 feet
    - Top of wetland to parking lot: 2,400 feet

- **Closing** – Brief discussion/recap of major observations at each site. Appalachian/HDR to develop meeting summary and distribute to this group for review (copy others invited to meeting but who were unable to attend, for awareness). Meeting participants agreed that the trail camera monitoring had proven effective with only one camera lost to vandalism/theft and had captured data from a peak recreation season. The group supported removal of the trail cameras at the end of the month, in accordance with the schedule proposed in the approved Revised Study Plan.

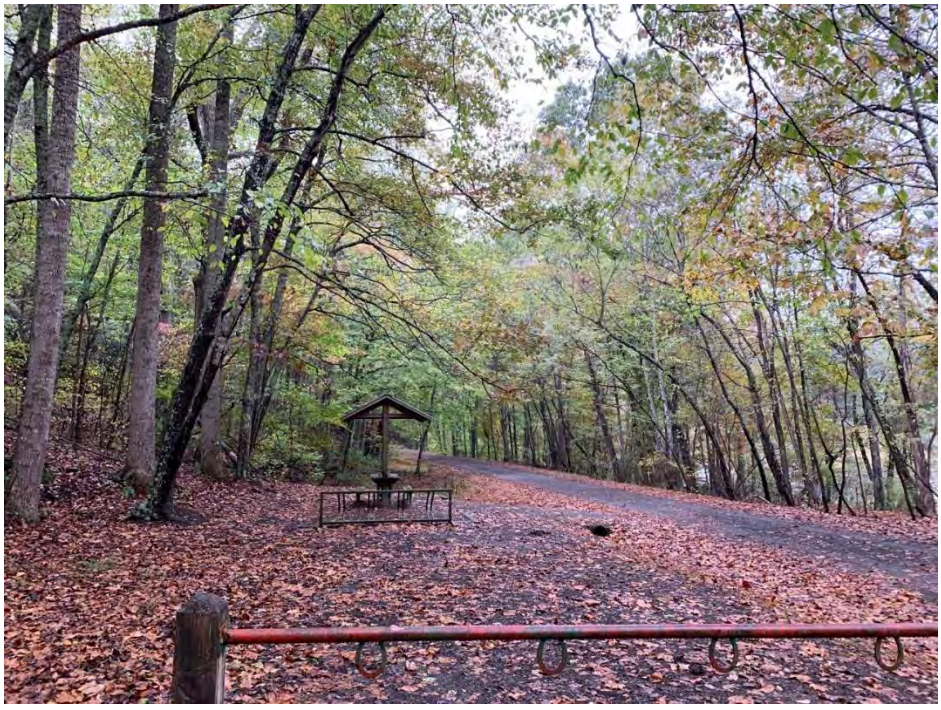
Photos of Recreation Facilities

Byllesby VWDR Boat Launch

Byllesby VWDR Boat Launch Parking Area

Fowlers Ferry (informal)

Buck Dam Picnic Area



Buck Dam Canoe Portage Take-Out

Buck Dam Canoe Portage Put-In

Interested Buck Angler Access from Loafer's Rest

New River Trail Picnic Area Lower Area

New River Trail Picnic Area Upper Area

New River Canoe Launch

Byllesby Canoe Portage Take-Out

Byllesby Canoe Portage Parking Lot

Thompson Campground site

Subject: Loafer's Rest Access/Buck Dam Tailrace Site Visit

Start: Wed 3/24/2021 9:30 AM
End: Wed 3/24/2021 12:30 PM

Recurrence: (none)

Meeting Status: Accepted

Organizer: john.copeland@dwr.virginia.gov

This event has been changed.

Loafer's Rest Access/Buck Dam Tailrace Site Visit

When Wed Mar 24, 2021 9:30am – 12:30pm Eastern Time - New York

Joining info Join with Google Meet
meet.google.com/nxu-fphp-wgz

Join by phone
(US) +1 513-909-9897 (PIN: 771320209)

More phone numbers

Calendar maggie.yayac@hdrinc.com

Who
- john.copeland@dwr.virginia.gov - organizer
- tom.hampton@dwr.virginia.gov
- ebparcell@aep.com
- jeff.williams@dwr.virginia.gov
- Yayac, Maggie
- Tristan Cleveland
- maggie.yayac@hdrinc.com (Google Calendar) - optional

more details »
Going (maggie.yayac@hdrinc.com)? **Yes** - **Maybe** - **No** more options »

Meeting Summary

Project:	Byllesby-Buck Relicensing
Subject:	Potential Recreation Improvements
Date:	Tuesday, June 29, 2021
Location:	WebEx
Attendees:	Elizabeth Parcell (AEP) Tom Hampton (VDWR) John Copeland (VDWR) Jeff Williams (VDWR) Sarah Kulpa (HDR) Maggie Yayac (HDR) Kerry McCarney-Castle (HDR) Tristan Cleveland (LPDA)

Opening Remarks

S. Kulpa opened the call and provided introductions, opening remarks, and objectives of call:

> The Byllesby-Buck Hydroelectric Project (Project) Draft License Application (DLA) will be submitted by or on Oct 1, 2021 to the Federal Energy Regulatory Commission (FERC) and relicensing participants. The objective of this call was to introduce the recreation enhancements Appalachian Power Company (Appalachian) is considering proposing in the DLA, in collaboration with the Virginia Department of Wildlife Resources (VDWR), and seek preliminary VDWR feedback.

Loafers Rest

M. Yayac screen shared to display trail maps and design options developed by LPDA for potential Project recreation enhancements at Loafers Rest and talked about progress since the site visit in March 2021. **M. Yayac** noted that all potential enhancements are on property owned by Appalachian leased to the VDWR.

T. Cleveland explained the proposed fishing trail (majority follows an existing trail bed and farm track) and pointed out where new/updated signage would be required. The trail would require a newly constructed portion (0.09 miles) to join the upgraded existing trail to the proposed fishing access in the tailrace. Improvements are outside of current FERC Project Boundary. See Figure 1 (attached).

J. Copeland agreed the fishing trail location and layout makes sense and was in line with discussions in the field. On behalf of VDWR, J. Copeland expressed interest in enhancements at Loafers Rest beyond the trail access. HDR/LPDA confirmed there are no additional proposed enhancements for the fishing access and provided an overview of potential enhancements (based on field discussions) at Loafers Rest to facilitate water access.

T. Cleveland presented enhancement options as follows:

Option A

In an effort to improve public access to water and carrying boats down to the water, a proposed 12-foot entry drive to connect to existing Farm Lane, bollard and cables would be constructed, leading to a proposed primary (gravel) parking area with 12 spaces with staging area for drop-

off/unloading boats and an improved 10-foot river access trail. Water access would be hardened and/or have canoe/kayak slide. Banks would be stabilized. Additionally, LPDA proposed new signage, loading bars (t bars) for kayaks and pullover spots for larger vehicles (trailers). See Figure 2 (attached).

Option B

Similar to Option A, however, lower costs associated with a smaller turnaround with only 4 parking spaces for loading and unloading and no additional parking spaces (same proposed entrance drive, improved surface conditions for put-in, water access, and kayak slide as Option A). See Figure 3 (attached).

J. Copeland stated he thought the options were appropriate and asked for T. Hampton's opinion.

T. Hampton stated he prefers Option A over Option B to facilitate parking and therefore usage for a broad range of recreation visitors, including older adults. He indicated that VDWR has moved away from kayak slides and requested a concrete hardened access. He explained with a hardened access, emergency response personnel could launch a boat (which they could not do on a kayak slide). He asked about the surface of the parking area and **T. Cleveland** responded that it would be gravel. **T. Hampton** said gravel would be advantageous for maintenance.

T. Cleveland asked for clarification regarding emergency/administrative access and if the conceptual design should include straightening out the curb of the parking area; this design change would result in increased construction cost including additional clearing.

Action Item: LPDA to develop an "Option C" that would allow Emergency Vehicles to access and turn in the parking lot and revise kayak slide to hardened water access.

E. Parcell asked if the Loafers Rest improvement could potentially benefit from funding through U.S. Fish and Wildlife Service (USFWS) or other grants. **T. Hampton** did not have definitive answer. **E. Parcell** suggested a follow-up with contact at VDWR to see if there is potential for funding. **E. Parcell** had dealt with James Adams at VDWR in the past; however, he is no longer with the agency and has not been replaced. **E. Parcell** asked if T. Hampton could track down the person to start a conversation regarding federal funding. T. Hampton noted they would not have the opportunity to get a proposed project in front of USFWS until December.

Action Item: T. Hampton and E. Parcell to coordinate and reach out about funding assistance from the USFWS.

S. Kulpa asked if the additions to Loafers Rest would continue to be maintained by VDWR. **T. Hampton** believed that they could get it added to their list to fall under VDWR maintenance and asked if Loafers Rest would be included in the license. Currently it is not part of the license either as a Project or Non-Project facility. **S. Kulpa** said it would be beneficial to include as a licensing proposal so that FERC can reference and recognize the Project's efforts for recreation enhancement and mitigation. Appalachian currently proposes to designate this as a Non-Project facility since it falls outside of the FERC Project Boundary. The benefit of keeping outside of the Project Boundary is the ease of process (i.e., not under FERC jurisdiction).

J. Copeland asked to clarify the fishing trail is only to provide public access to the Buck tailrace. **S. Kulpa** agreed. **T. Cleveland** noted a portion of the proposed fishing trail would be completely new trail, but the rest would not require much improvements (on existing trail bed). **E. Parcell** agreed and

noted that she revisited the site with a general contractor who confirmed that the existing base trail is in decent shape and wouldn't need much work. **J. Copeland** asked about the existing farm bridge along the trail. **E Parcell** mentioned installing handrails could improve the bridge and culverts/bridge may be grandfathered in and not require a permit. However, replacing the bridge would increase the cost significantly due to the large culverts required.

T. Hampton mentioned there is an existing dove hunting field that is popular and asked if there a need to make notation that it's a recreation opportunity provided to the public. **E. Parcell** said continue to use as dove hunting area as-is. **T. Cleveland** said any improvements would not affect dove hunting field.

T. Cleveland referred back to the earlier discussion regarding the proposed parking area in Option A and asked about the size of the proposed parking lot and if 12 spaces would be adequate. **T. Hampton** said 12 spaces would be adequate and asked about the vegetated "islands" in the parking area – acknowledged they help prevent people from doing "donuts" with vehicles but was concerned about maintenance of green space on the islands. **T. Cleveland** said they could possibly make it gravel-topped instead of green, but ultimately group decided to leave as currently proposed and believed that since the site will already require mowing this should not be a significant maintenance issue.

Fowler's Ferry

S. Kulpa asked if VDWR would be interested in leasing the area from Appalachian or had any more thoughts about this area. See Figure 4 (attached).

T. Hampton stated that if Bill Kittrell (VDWR) had started a conversation about leasing this property he did not hear about it, however, he reiterated that the grant program through NRCS is available to lease private land for public access. Therefore, VDWR would be interested in leasing this land from Appalachian and would be interested in continuing the conversation.

S. Kulpa asked if the grant would cover necessary improvements to the site. **T. Hampton** confirmed the grant would cover improvements and asked about next steps. E. Parcell said she would bring in somebody from AEP real estate to start that conversation.

Action Item: E. Parcell to connect with AEP real estate and set-up call with VDWR regarding leasing the area associated with Fowler's Ferry.

S. Kulpa mentioned the potential to keep leasing of this land/development of this area outside of the relicensing process since the location is completely outside of the FERC Project Boundary.

J. Copeland stated that, as background, the interest in this area came from their conservation officer and his difficulties in enforcing access and safety from a law enforcement standpoint.

T. Cleveland stated there is evidence of heavy use and trash, camping (informal), and the access road is rutted and undergoing erosion. Improvements to the site would address erosion and prevent vehicles from accessing the site (trail only would be provided). T. Cleveland pointed out where barriers would need to be placed along Fowler's Ferry Road to help enforcement and also would install usage signage. Additionally, parking and vehicular access would be provided along the road by slightly widening Fowler's Ferry road.

Portages

S. Kulpa – The Buck take-out is upstream of the dam and forebay. Other than debris accumulation, it's a well-established trail to the put-in; however, some additional signage would be a useful enhancement. Perhaps improving the area of the put-in, which is currently very steep into the bottom of the tailrace channel would be beneficial. **VDWR** agreed being able to safely hand-launch there would be a useful improvement.

T. Cleveland noted that the step downs are by tree-roots, therefore, enhancement may include hardening up the banks and providing a wider spot or downstream location for people to access.

S. Kulpa confirmed the Buck put-in enhancement under discussion is the only portage location proposed for improvement as part of Appalachian's licensing proposal and asked VDWR if they had any suggestion regarding prioritization or any other portage locations, or any other improvements to note. **J. Copeland** acknowledged challenges (i.e., length) and constraints of the Byllesby take-out above the dam but lack of feasible alternatives and satisfactory conditions of the put-in below and confirmed nothing additional is being requested from them at this time.

Byllesby Boat Launch

This improvement presently involves resurfacing the parking lot at the VDWR Byllesby boat launch. **E. Parcell** is waiting for a response from AEP contractor regarding resurfacing and costs.

S. Kulpa asked VDWR if they have other priorities regarding Byllesby Boat Launch. **J. Copeland** remarked he did not recall anything, but Toby and Ben (also VDWR) may have had concerns/suggestions during the last meeting. **M. Yayac** pulled up the previous site visit notes which indicated fishing extension and wildlife viewing enhancements.

J. Copeland stated bank fishing in this location occurs daily and stated perhaps some sort of extension of parking area (concrete) would facilitate shoreline use. **T. Hampton** mentioned that facilities to promote wildlife viewing would be beneficial to the area. **J. Copeland** mentioned the new Wildlife Viewing Plan was approved in early June and will share with E. Parcell.

Action Item: VDWR will share Wildlife Viewing Plan with E. Parcell (Complete)

S. Kulpa confirmed the following three items are the correct priorities (and in the correct order) for the Project recreational improvements:

1. Loafers Rest
2. Buck Portage
3. Byllesby Boat launch

Other Items

J. Copeland mentioned the campground near the area and stated the need to bring in Sam Sweeney with VDCR, to which **S. Kulpa** replied AEP understands there was very strong interest in Forest Service leasing land for campground, but there's really no nexus to the Project and this is out of Appalachian's control to improve. **T. Copeland** recommended involving Rex Hill regarding campground area.

S. Kulpa asked if VDWR would lead the effort for construction/modification to existing site with funding from Appalachian or is VDWR looking for Appalachian to handle capital improvements (all

sites). **T. Hampton** stated VDWR was happy to partner but thought it may be easier for modifications to be done outside of the state processes.

S. Kulpa asked if there were any other areas or interests to discuss. **T. Cleveland** mentioned consistent signage would be a useful improvement at all of the sites. **S. Kulpa** asked if there are VDWR signage guidelines. **T. Hampton** replied there are many kinds of signs with different color schemes, for different uses and will send a guidelines document. The group discussed potential benefits and feasibility of the addition of more interpretive signage at recreation areas.

Action Item: VDWR to provide standard signage guidelines document and/or POC for standard guidelines (Complete)

Figures

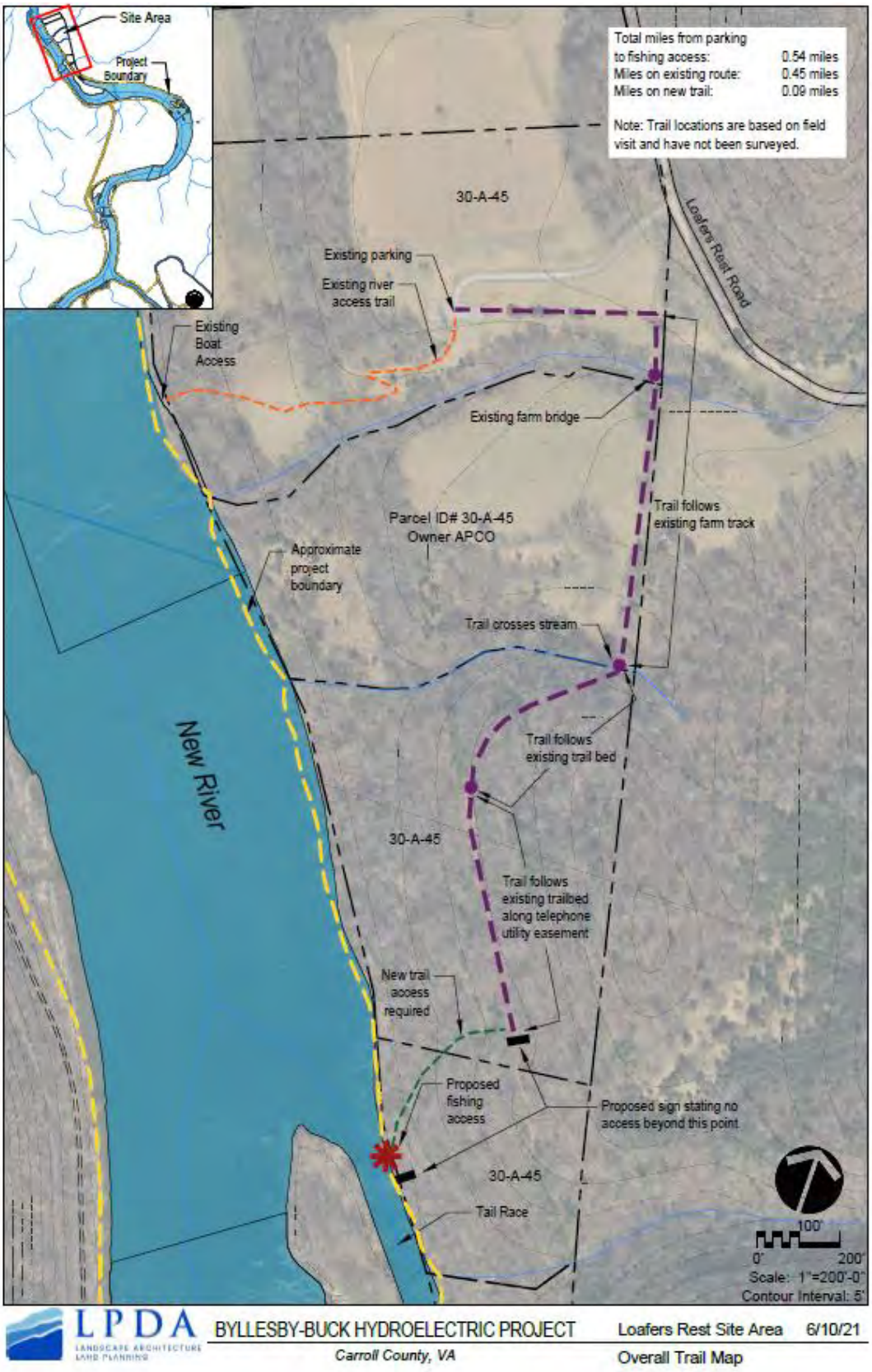


Figure 1. Preliminary Overall Trail Map at Loafers Rest

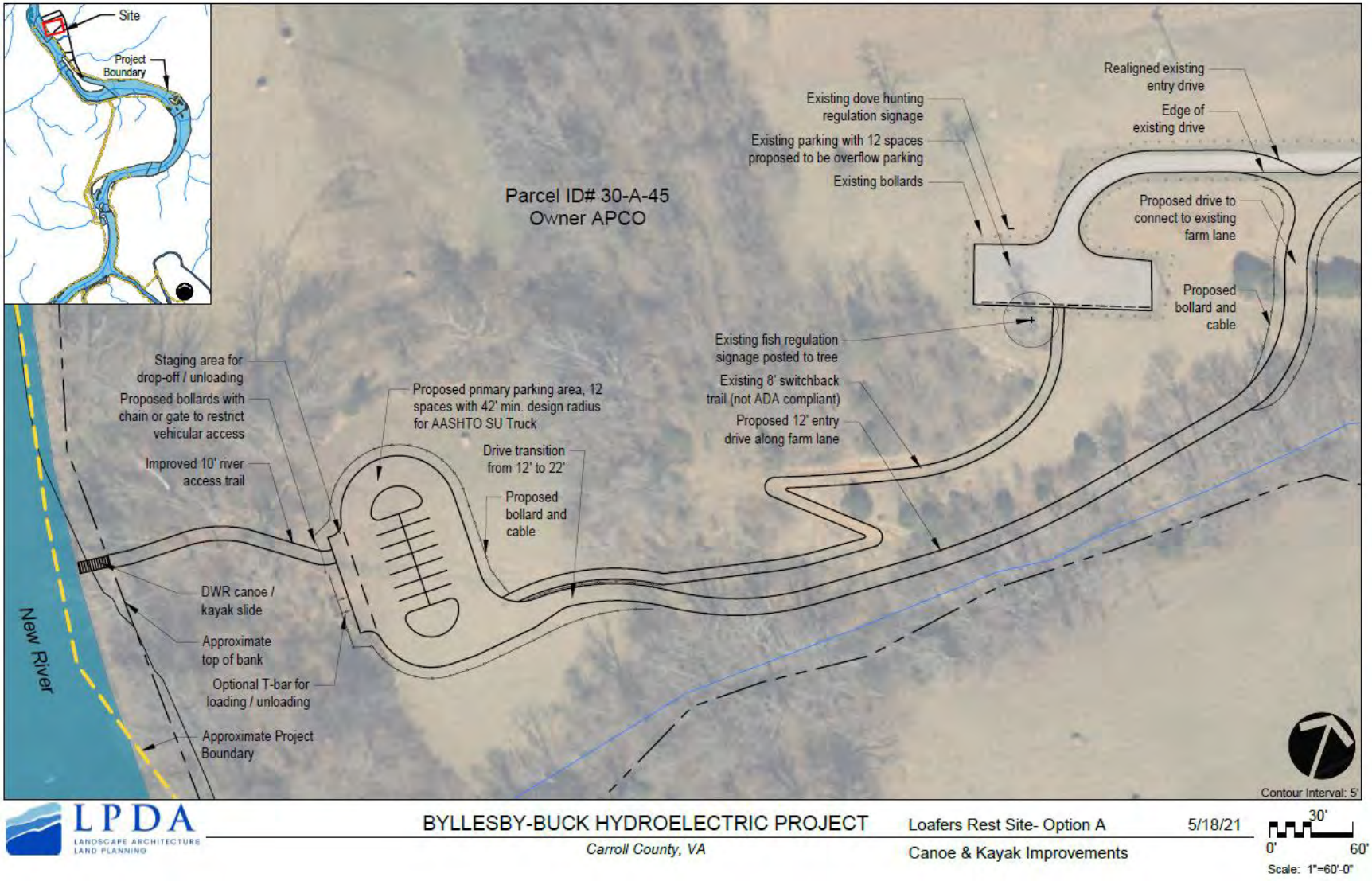


Figure 2. Proposed Canoe & Kayak Improvements – Loafers Rest Site Option A

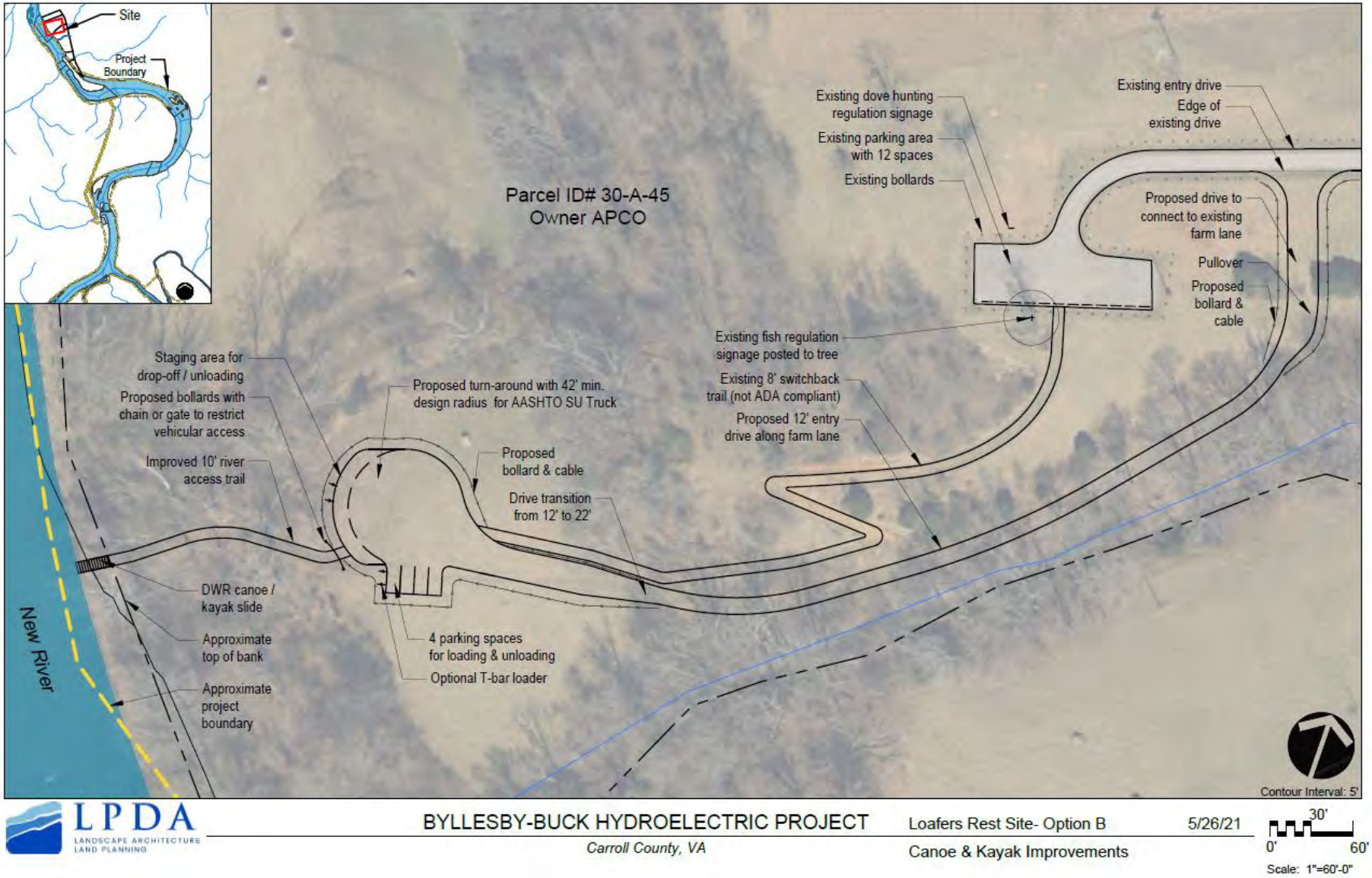


Figure 3. Proposed Canoe & Kayak Improvements – Loafers Rest Site Option B

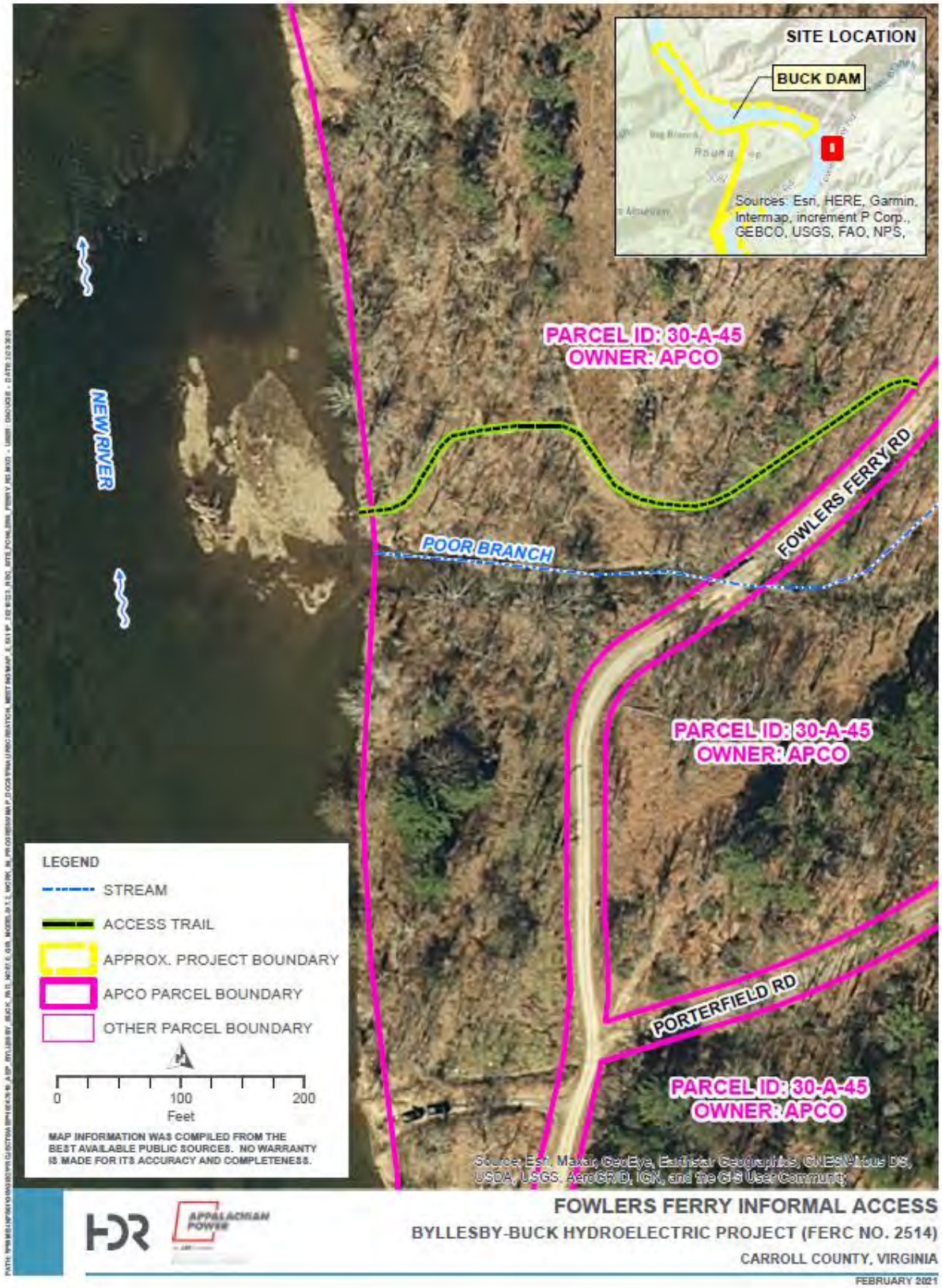


Figure 4. Fowlers Ferry Proposed Informal Access

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Attachment 3

Attachment 3 – Visitor Online Survey Results

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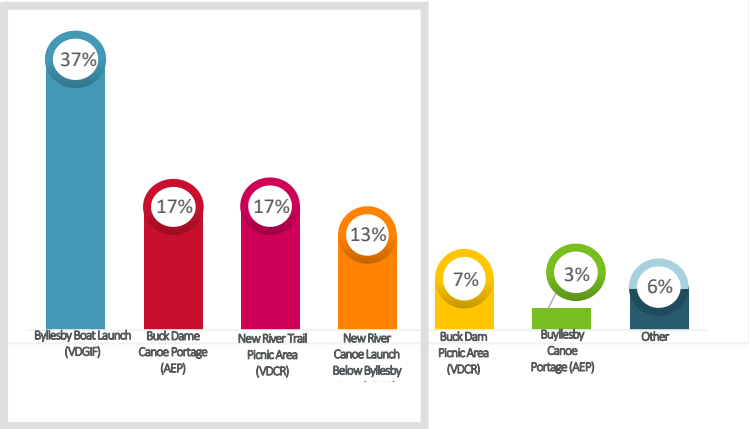
Byllesby-Buck Recreation – *Overall Summary Results*

Survey Locations:



From **April 2020 to December 2020** there have been **142** respondents at various locations within the Byllesby-Buck Recreation Project Area who completed this online survey. During this timeframe **84%** of the responses primarily came from four locations: Byllesby Boat Launch (VDWR), Buck Dam Canoe Portage, New River Trail Picnic Area, and New River Canoe Launch Below Byllesby Dam.

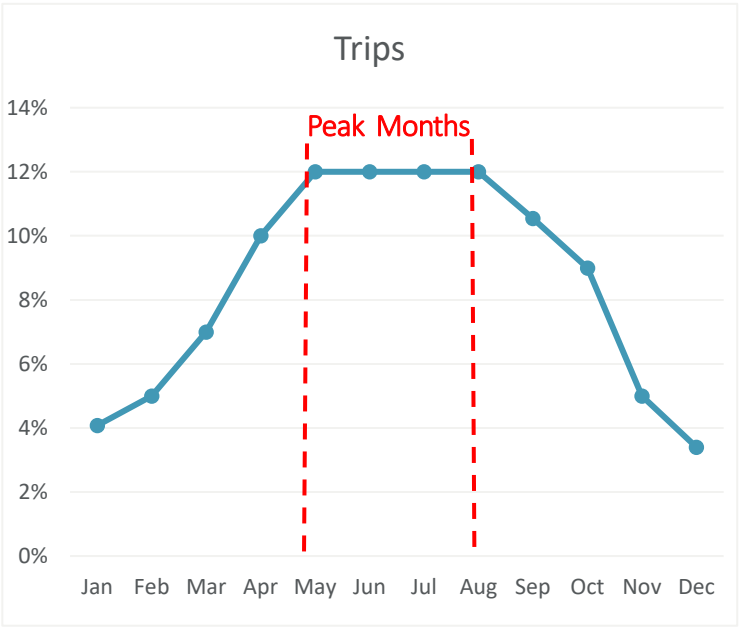
These respondents answered questions about their use of the recreation facilities. This data is collected to support the Federal Energy Regulatory Commission (FERC) relicensing process.

Predominately **42%** of the survey respondents come from three zip code locations, which are on average **18** miles away from Byllesby – Buck Recreation. **92%** consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being **5** hours.

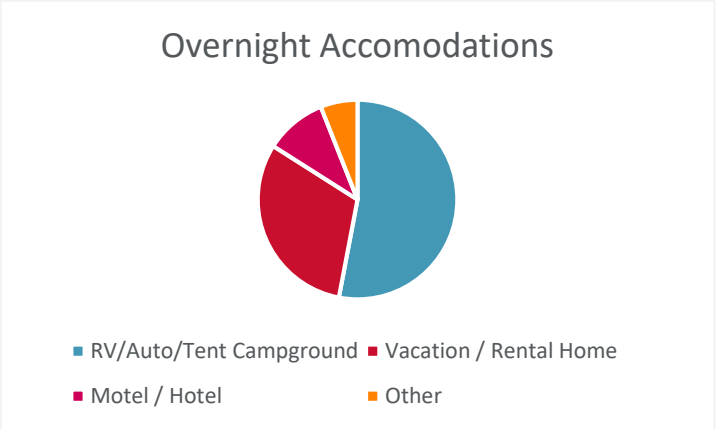
Males made up **74%** of the respondents, **49%** in their thirties and forties.

The most frequent months visited are from April to September, with May, June, July, and August being the peak months.

- Zip codes of most frequent visitors: **24330, 24333 & 24382**
- Average # of visits per year are **18**
- Average miles traveled: **34**

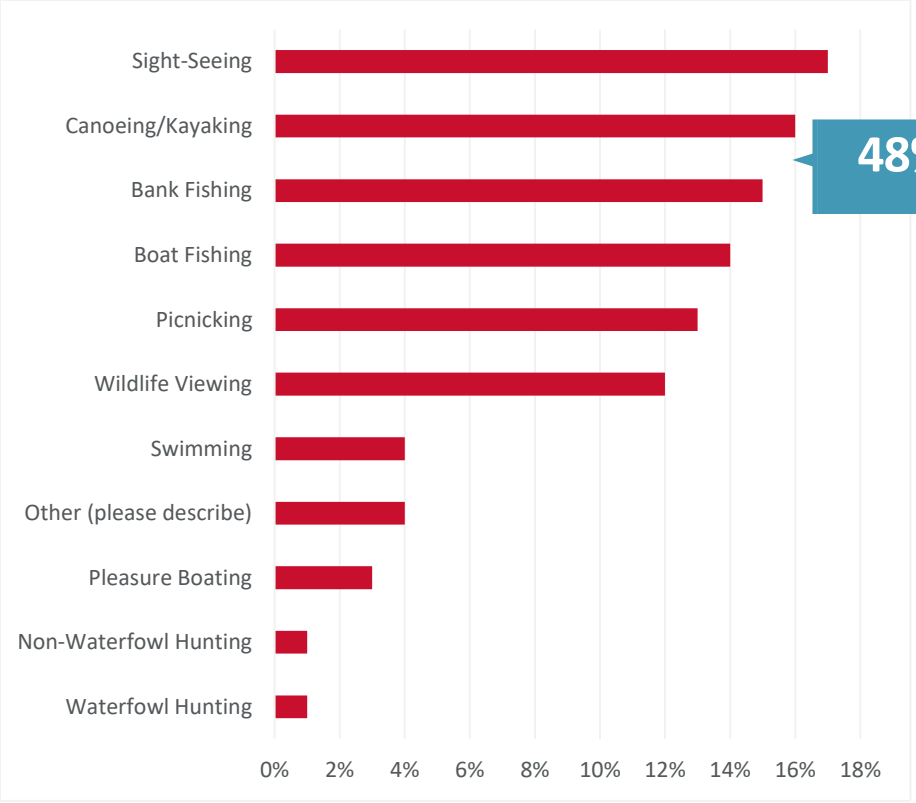


83% of respondents were not staying overnight in the Byllesby-Buck Project area. Of the **17%** that were staying overnight a breakdown of the accommodations used is shown:



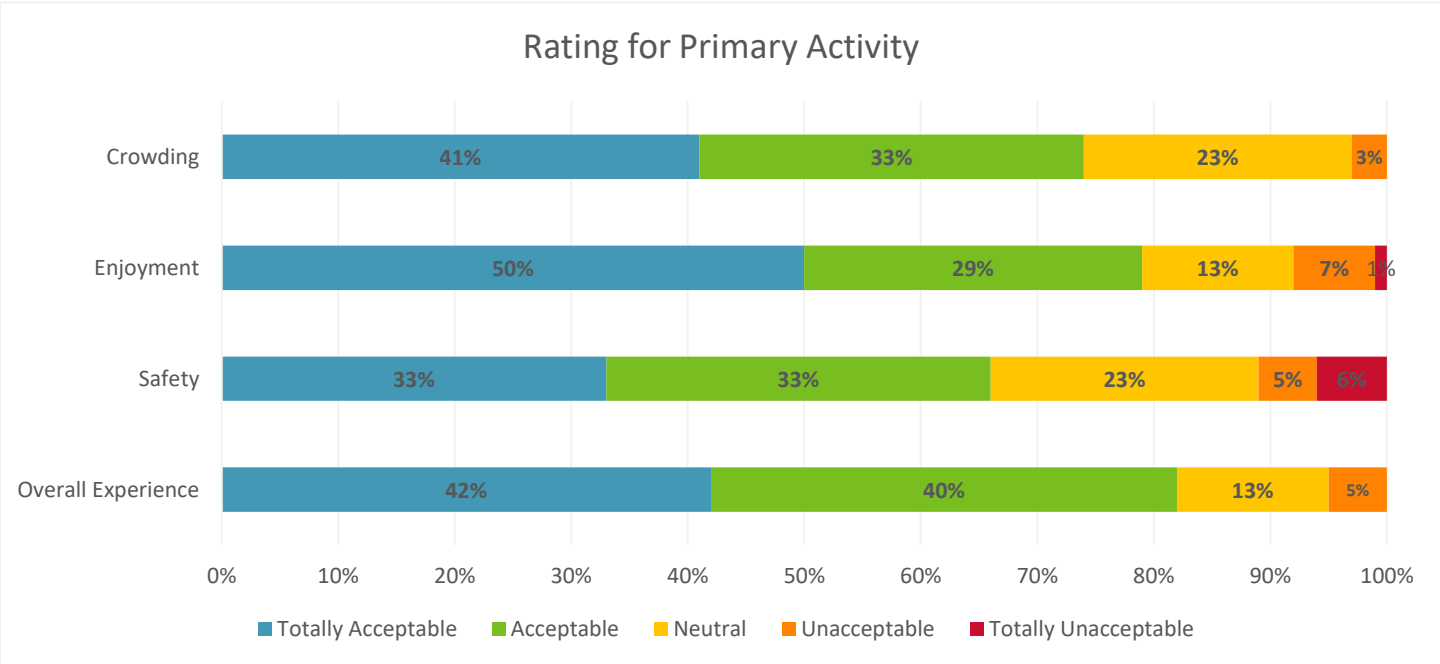
Byllesby-Buck Recreation – *Overall Summary Results*

Activities Participated on Trip:

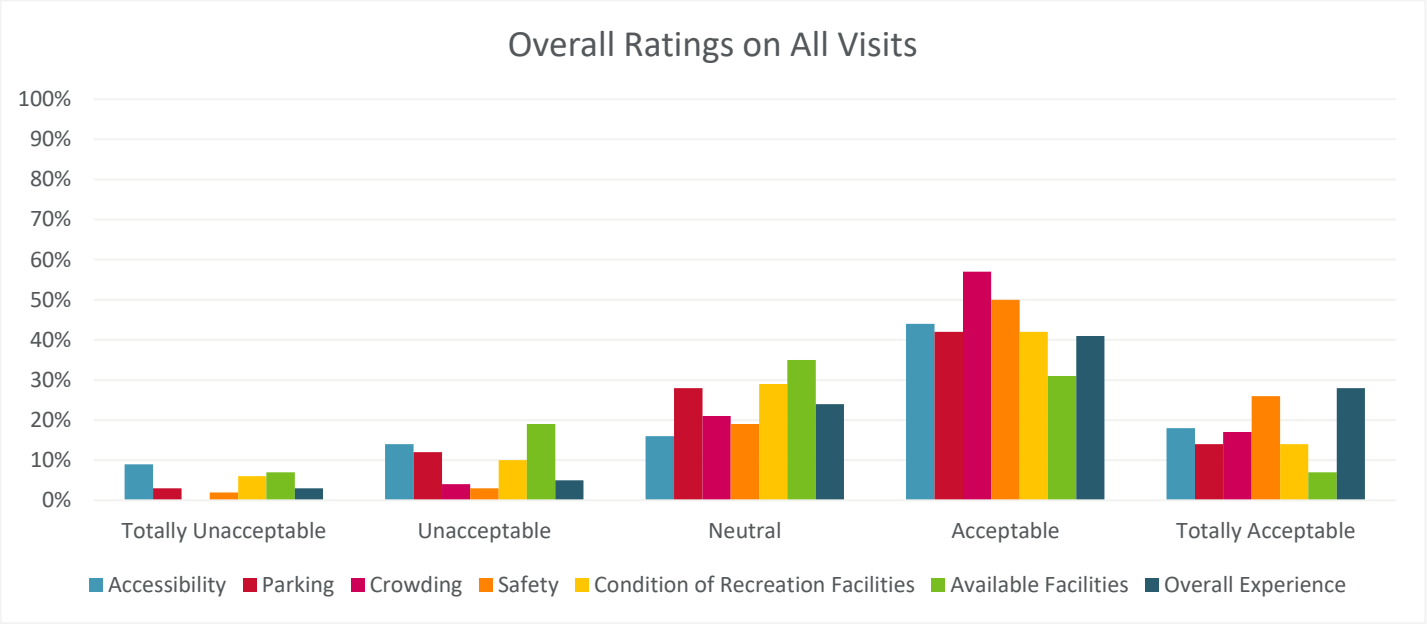


48% fishing is the primary activity

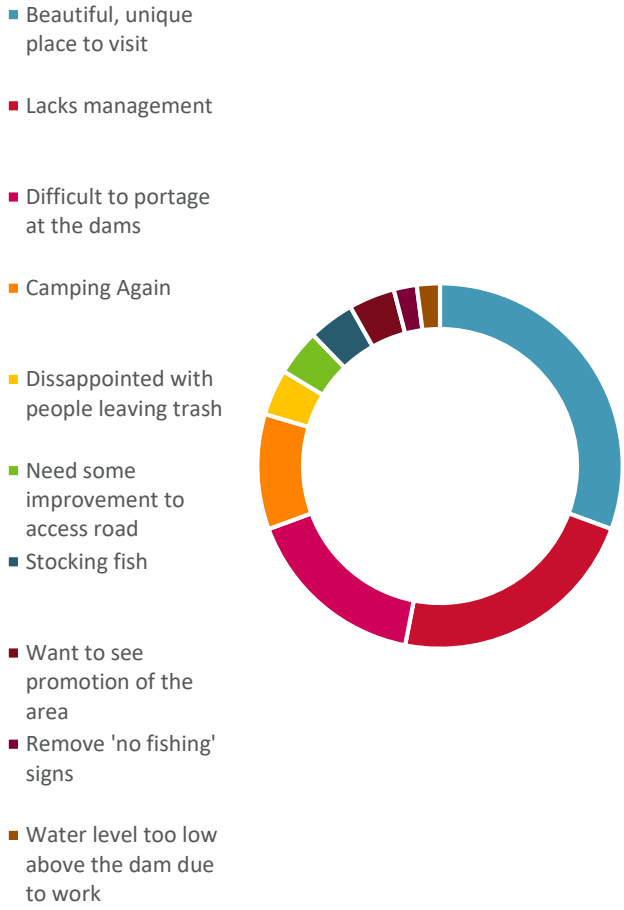
Primary Activity	Percent
Fishing	48%
Canoeing/kayaking	20%
Sight-seeing	11%
Biking	9%
Picnicking	4%
Hiking	2%
Hunting	2%
Wildlife Viewing	2%
Swimming	1%



Byllesby-Buck Recreation – *Overall Summary Results*



Improvement Suggestions	Count
Improved or additional boat access	31
Restrooms	15
Maintain a full, stocked pond w/ Clear water	13
Better parking	8
Re-open campgrounds	8
Covered shelter	3
Drinking water available	3
Regular patrols / VDGIF presence	3
Better handicap accessibility / signage	2
Fishing piers	2
Light pole @ boat ramp	2
Wider access road	1

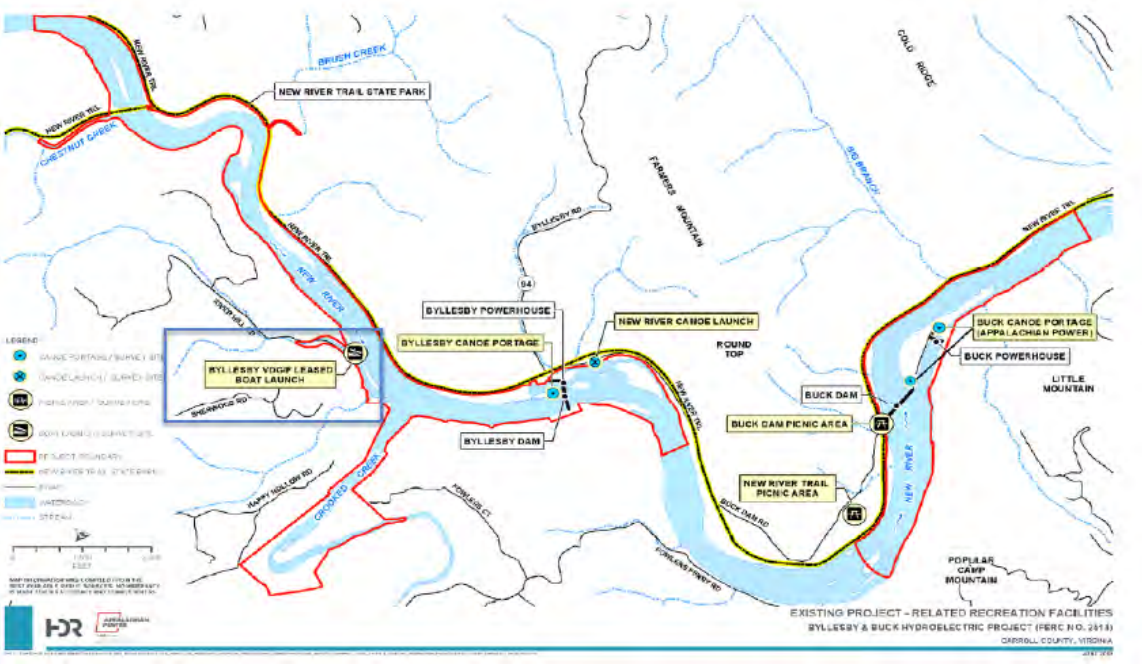


Overall the comments from the respondents show that nearly half view Byllesby-Buck as a beautiful & unique place to visit.

The top **3** suggestions for improvement include improve/ additional boat access, adding restrooms, have better parking available. The biggest impact would be improvement to portage at the dam.

Byllesby-Buck Recreation – *Cumulative Results for Byllesby Boat Launch*

Survey Locations:



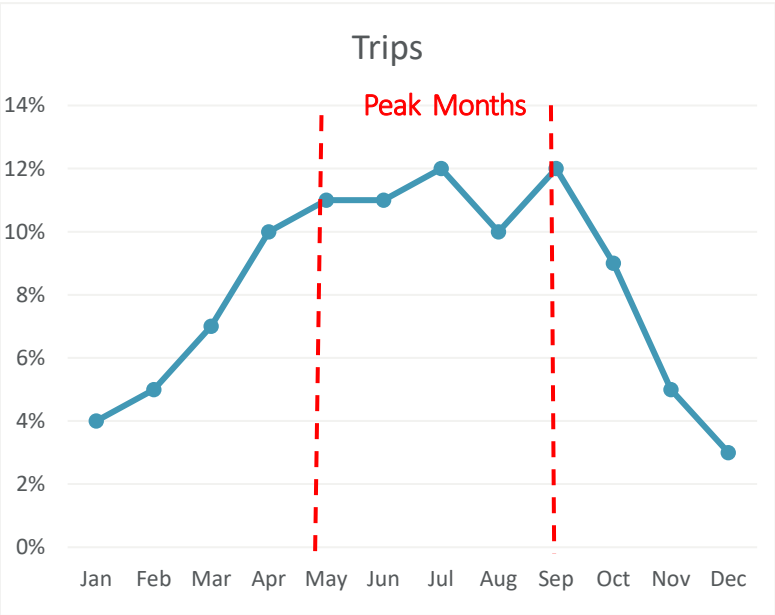
From **April 2020 to December 2020** there have been **52** respondents from the **Byllesby Boat Launch**. Overall, **37%** of the responses came from this location.

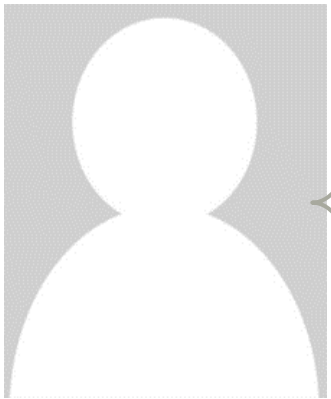
These respondents answered questions about their use of the recreation facilities. This data is collected to support the Federal Energy Regulatory Commission (FERC) relicensing process.

Predominately **49%** of the survey respondents come from three zip code locations, which averages about **16** miles away from the Project. **93%** of respondents consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being **4** hours.

Males made up **90%** of the respondents, **51%** in their thirties and forties.

The most frequent months visited are May through September with June and July being the highest visited months.



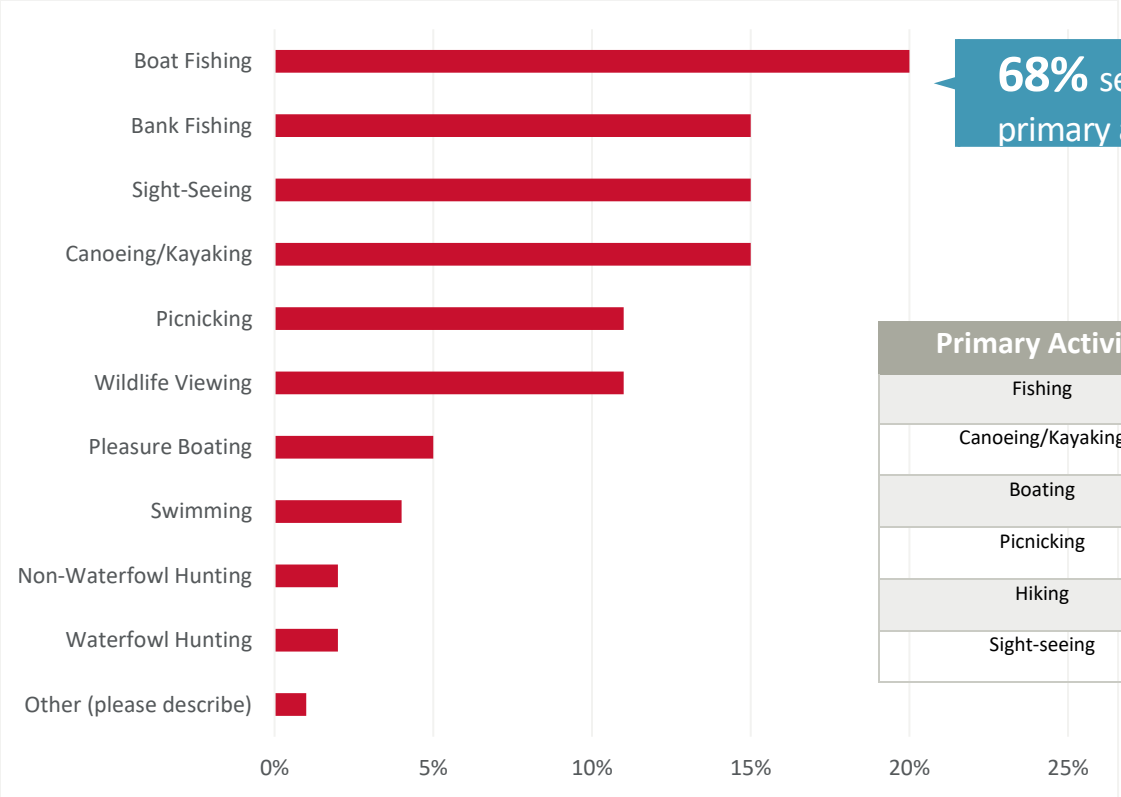


- Zip codes of most frequent visitors: **24330, 24333 & 24381**
- Average # of visits per year are **19**
- Average miles traveled: **23**

88% of respondents were not staying overnight in the Byllesby-Buck Project area. Of the **12%** that were staying, accommodations were made up of: **40%** RV/tent camping and **60%** staying at a vacation/rental home.

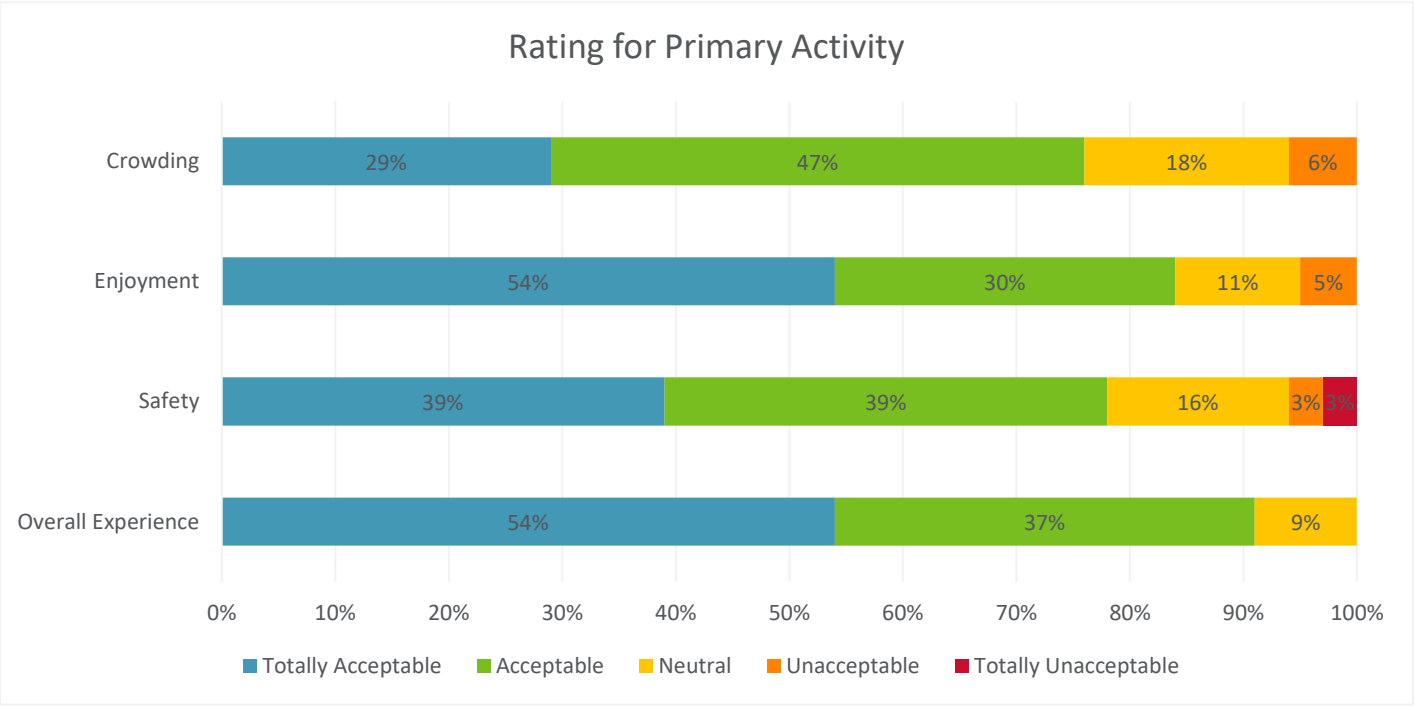
Byllesby-Buck Recreation – *Cumulative Results for Byllesby Boat Launch*

Activities Participated on Trip:

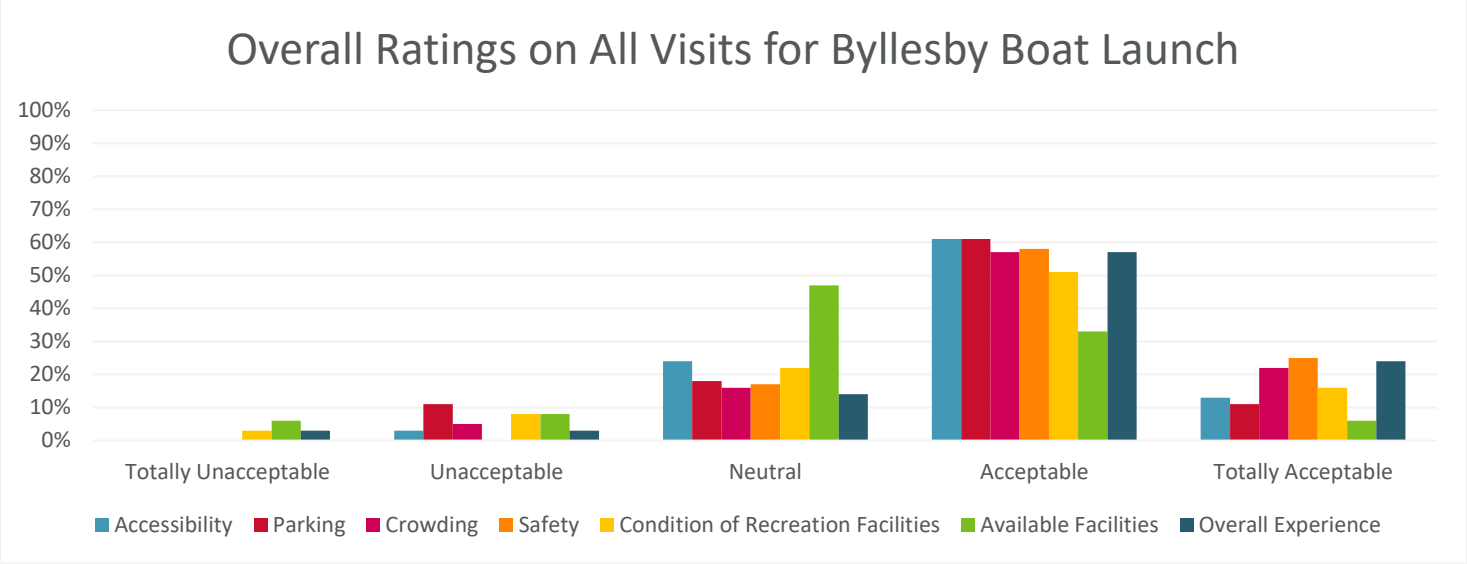


68% selected fishing as the primary activity

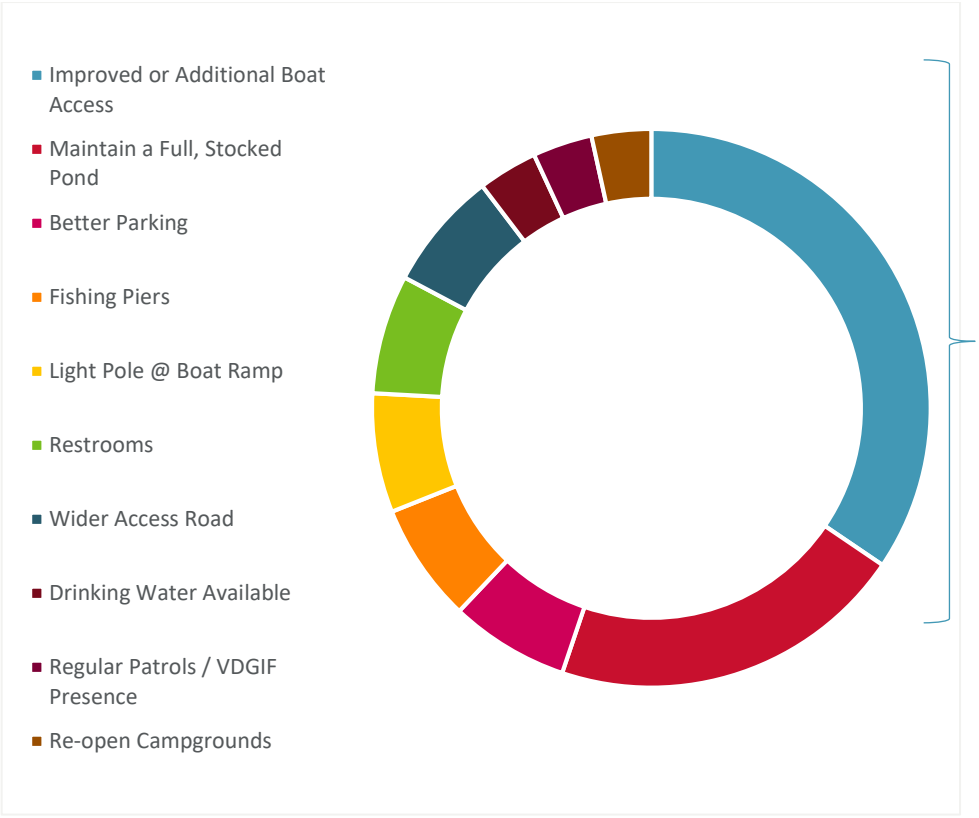
Primary Activity	Percent
Fishing	68%
Canoeing/Kayaking	20%
Boating	3%
Picnicking	3%
Hiking	3%
Sight-seeing	3%



Byllesby-Buck Recreation – *Cumulative Results for Byllesby Boat Launch*



Suggested Improvement Responses from Byllesby Boat Launch:



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-Buck Recreation – *Cumulative Results for Byllesby Boat Launch*

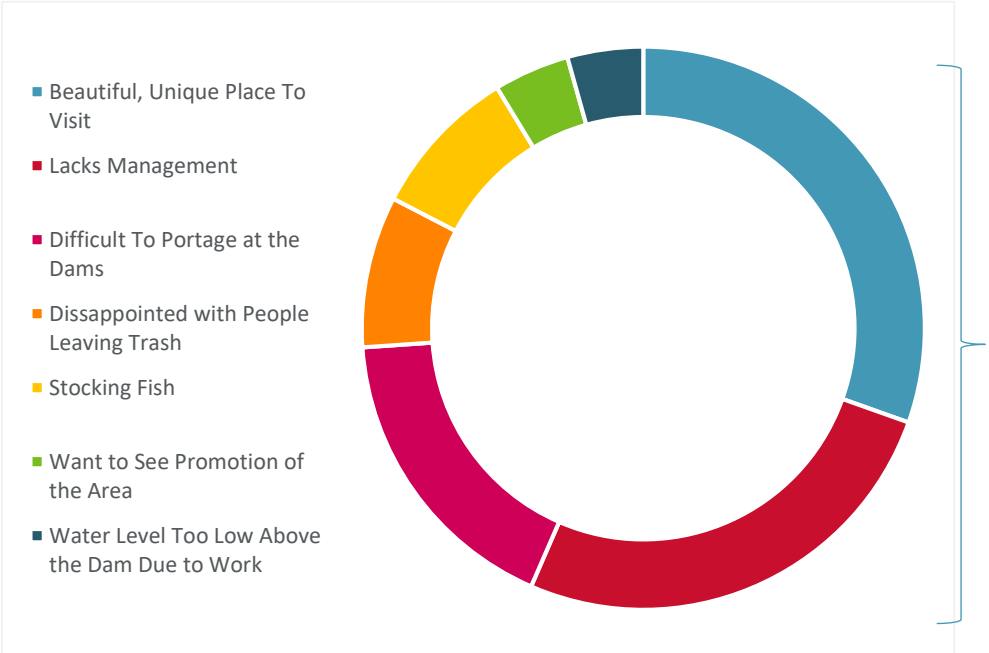
Type(s) of recreation facilities or improvements respondents believe are needed and at what specific location(s) at the Byllesby-Buck Project: *(verbatim responses)*

• Better parking area, more police patrol
• Better parking, more places that are cleared to fish from the bank, more picnic areas for family activities. More trash receptacles so possibly the riverbanks wouldn't be so trashed up. Campgrounds like there used to be would be great. All along the byllesby-buck project area
• Boat Dock/pier
• Boat ramp between dams.
• Boat ramp needs a light pole set up at the launch for us night fisherman
• Boat ramp on the Buck Dam pool.
• Byllesby need more stocking of fish!
• Fishing piers at tail raise
• I wish the campground that was started there would be completed. This would bring people and revenue to the area.
• lighting at byllesby boat launch
• more canoe/kayak launches are always a good idea
• My wife and I love fishing below both dams. Below the dams is the absolute best place we find to catch big carp and all species on a regular basis. We were sad to see signs moved further toward the parking area saying no trespassing at byllesby dam below the dam at the canoe launch. A couple years back we could access that small pool and it was good fishing but now they've moved the signs and we couldn't access that part for fear of trespassing. I pay more for fishing license and get less fishing space year to year. Doesn't seem fair.
• Need to maintain full pond as much as possible. Recreation has suffered due to the many years of low flows. Feel it has effected the fishing.
• None needed at this time
• Portage at Dam could use some improvement
• Restroom facilities
• wider access road to boat ramp along with regular police patrols due to the location of facility
• Water quality is terrible in terms of the amount of mud coming down river from the dam. Totally unacceptable...
• Stop equipment from working in the river causing muddy water throughout the seasons.
• Excellent area. Frequent for hiking and cycling.

Byllesby-Buck Recreation – *cumulative results by Byllesby Boat Launch*

• In meeting I attended. there was some thought of lowering pond during n winter.. we need to be able to access boat ramp.. kayaking/fishing boats ..
• Better availability about the dam on power house side
• Canoe and kayak access at the beginning of byllesby lake (end of rapids) so you don't have to paddle 2 miles to get to
• Bathrooms at bylledby pool boat ramp.
• Boat launch at buck dam.
• I fish from byllesby boat landing on average twice a week. Enjoy the fact that its ussually not over crowded.
• water clarity has been really murky this year with a lot of debris in the water

Additional Comment Responses from Byllesby Boat Launch:



Comments	#
Beautiful, Unique Place To Visit	7
Lacks Management	6
Difficult To Portage at the Dams	4
Dissappointed with People Leaving Trash	2
Stocking Fish	2
Want to See Promotion of the Area	1
Water Level Too Low Above the Dam Due to Work	1

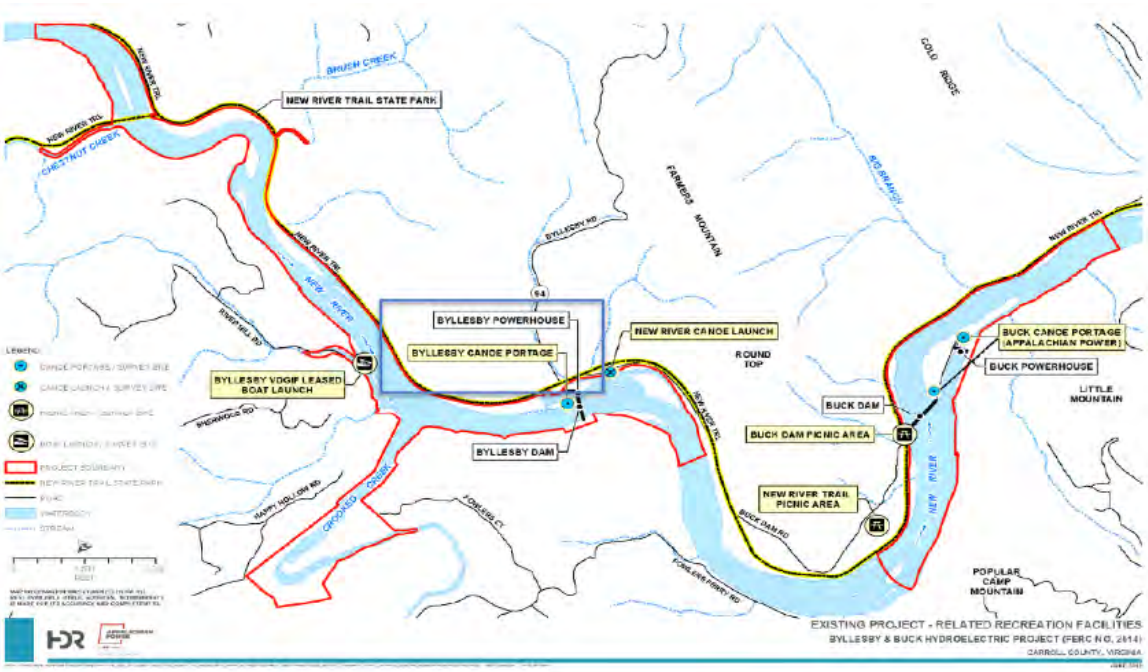
Byllesby-Buck Recreation – *cumulative results by Byllesby Boat Launch*

Additional comments: *(verbatim responses)*

• Beautiful place to visit and show off to visitors
• Due to dam work the water level above the dam is too low to be used for boating/kayaking and fishing.
• Fishing has dropped off over the past few years between the dams. What can AEP do to improve this.
• I just love it there and go every chance I can.
• If this area was helped and marketed correctly I believe it would flourish. I own New River Outdoor Adventures and I would help promote the area for families, fishermen, and nature lovers. Timmy Dixon 2762378823
• Ive lived in this area my whole life and enjoyed everything it has to offer please let the younger generation enjoy it also give them something to do in a place with not much else to do
• More visibility of park officials to help patrol the area so maybe people wouldn't leave so much trash and things
• My biggest complaint is the way some people leave their trash all over the ground. There's not much you can do about that. There could be twice as many trash cans and some people would be too lazy to walk five extra steps
• Portage above buck dam so we dont have to go below buck dam
• This is a unique part of the river in our area. I often bring my out of state guests here.
• This is by far, the best recreation area of its kind!
• Please do some thing about the muddy condition of the river. It is killing the fishing,
• Muddy water conditions that are made by AEP is unacceptable.
• Preserve what you can.
• Parking
• A beautiful area
• Solar lights for night safety.
• Only comments i have are positive. Enjoy fishing the area. Would be nice to have a small dock at the landing to make more accessible getting in and out of the boat. Nothing big as i feel it would attract the wrong groups of people and become a hangout instead of a boat launch. Just a suggestion, but i am happy i have a place close to home to enjoy time at.

Byllesby-Buck Recreation – *Cumulative Results for Byllesby Canoe Portage*

Survey Locations:



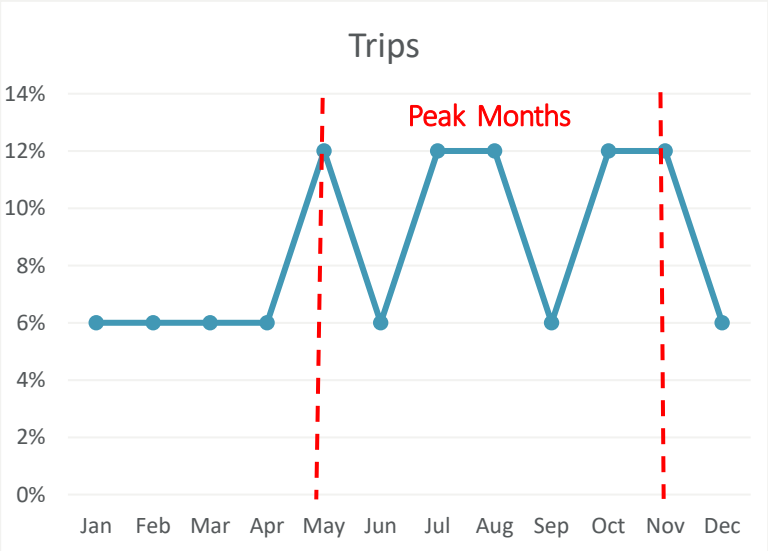
From **April 2020 to December 2020** there have been **4** respondents from the **Byllesby Canoe Portage**. Overall, **3%** of the responses came from this location.

These respondents answered questions about their use of the recreation facilities. This data is collected to support the Federal Energy Regulatory Commission (FERC) relicensing process.

Predominately **50%** of the survey respondents come from one zip code location, which is **40** miles away from the Project. **67%** of respondents consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being **2** hours.

Males made up **75%** of the respondents, **50%** in their thirties.

The months most visited are May, July, August, October & November.

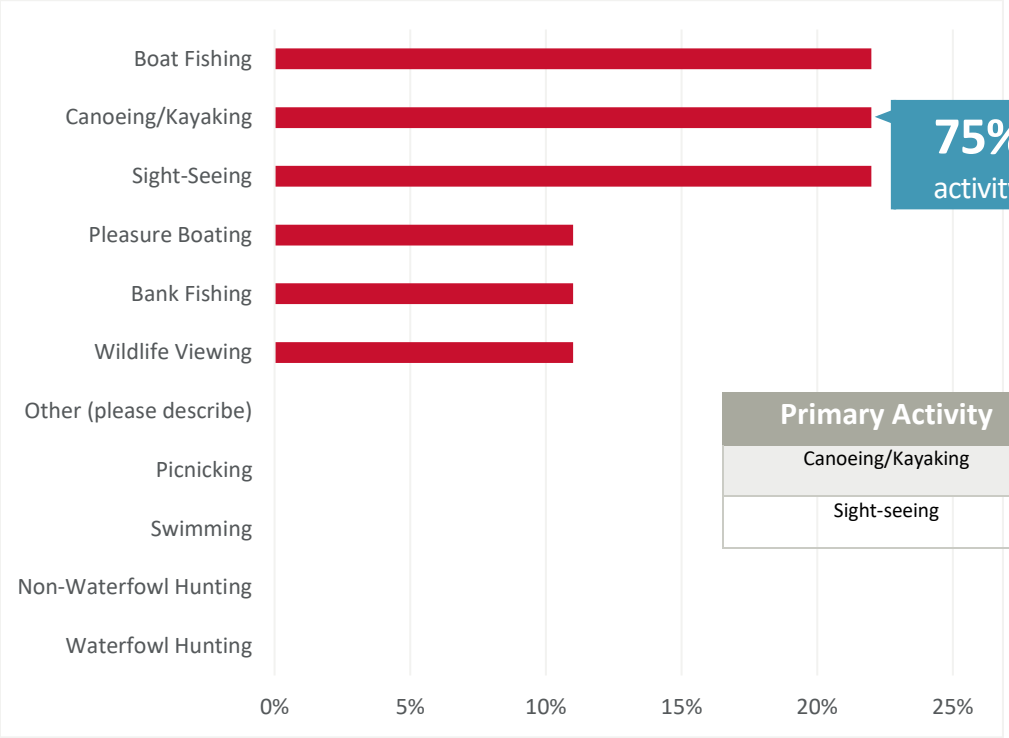


- Zip code of most frequent visitors: **24312**
- Average # of visits per year are **36**
- Average miles traveled: **83**

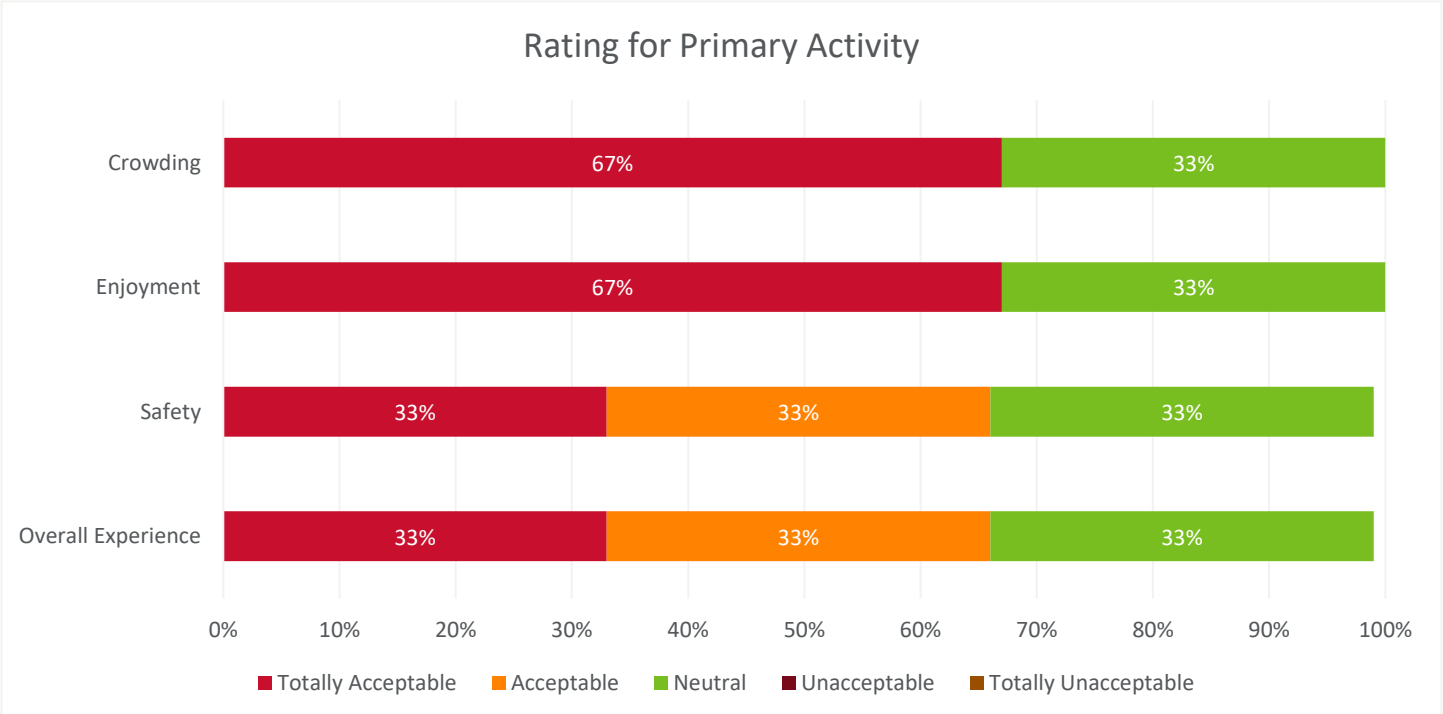
100% of respondents were not staying overnight in the Byllesby-Buck Project area.

Byllesby-Buck Recreation –*Cumulative Results for Byllesby Canoe Portage*

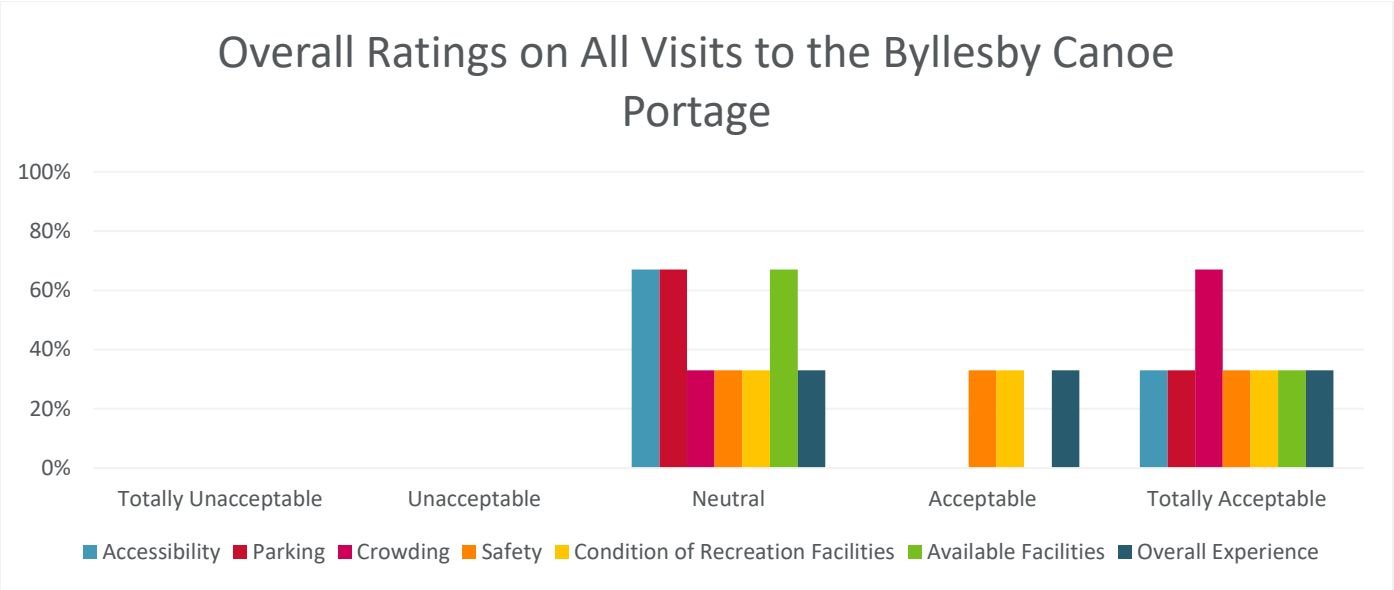
Activities Participated on Trip:



Primary Activity	Percent
Canoeing/Kayaking	75%
Sight-seeing	25%



Byllesby-Buck Recreation – *Cumulative Results for 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)*

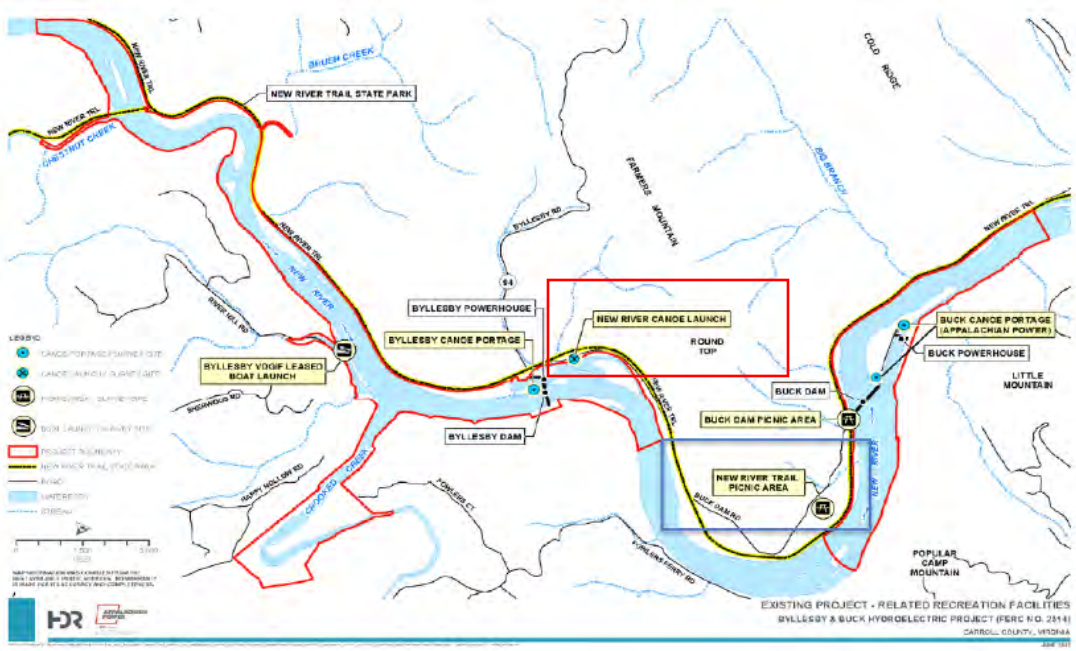
- Easier public access and Portage options for kayak/canoe around both dams.
- A good boat launch on the power plant side of the river would be awesome.

Additional Comments: *(verbatim responses)*

No responses given

Byllesby-Buck Recreation – *Cumulative Results for New River Canoe Launch*

Survey Locations:



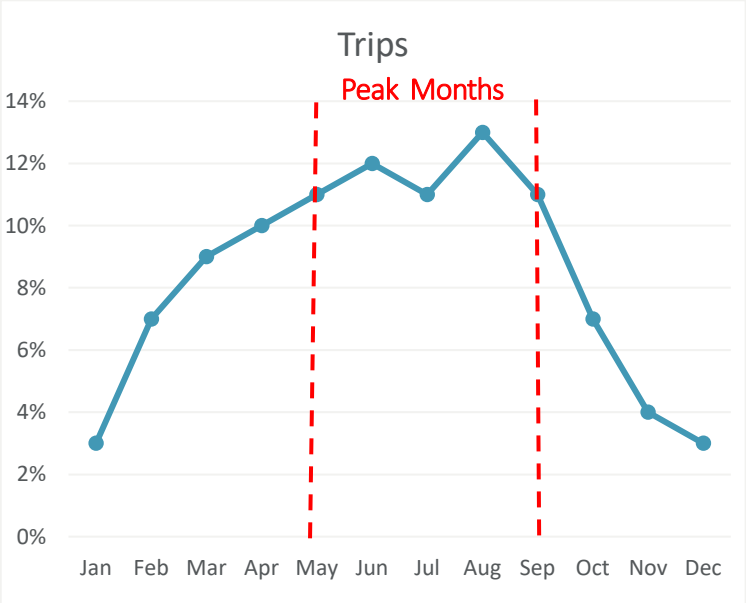
From **April 2020 to December 2020** there have been **19** respondents from the **New River Canoe Launch**. Overall, **17%** of the responses came from this location.

These respondents answered questions about their use of the recreation facilities. This data is collected to support the Federal Energy Regulatory Commission (FERC) relicensing process.

Predominately **48%** of the survey respondents come from two zip code locations, which average about **21** miles away from the Project. While **100%** consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being **3.6** hours.

Males made up **67%** of the respondents, with **47%** in their forties.

The most frequent months visited are May through September with a slight dip in July.

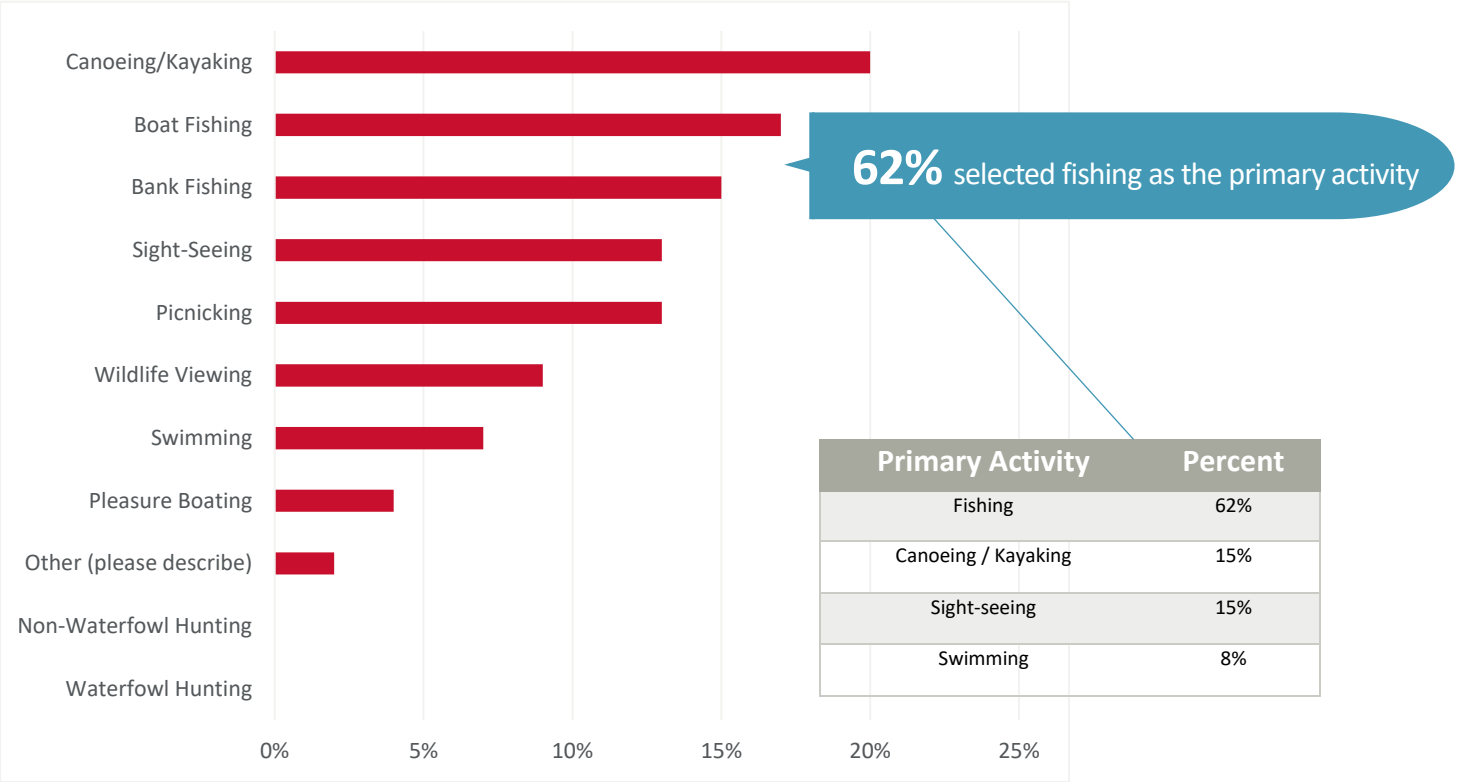


- Zip codes of most frequent visitors: **24330 & 24382**
- Average # of visits per year are **29**
- Average miles traveled: **39**

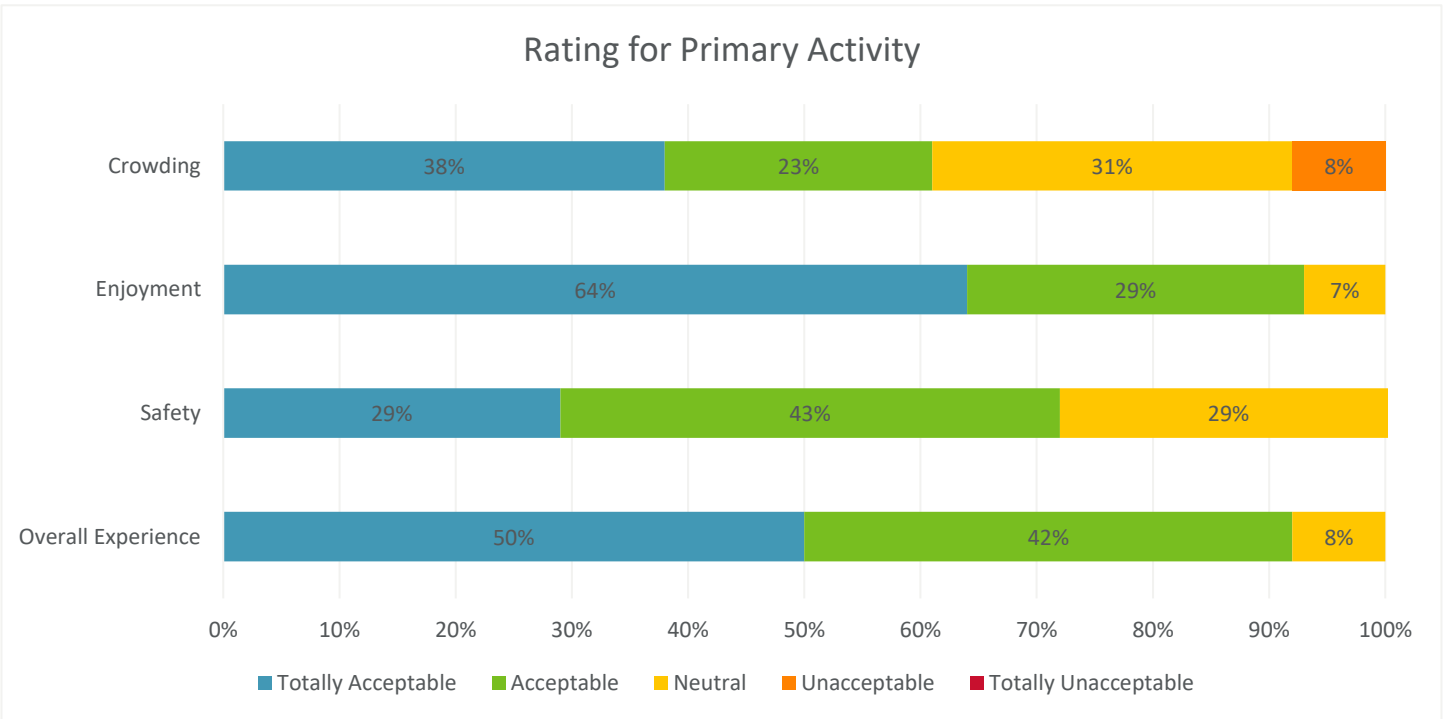
88% of respondents were not staying overnight in the Byllesby-Buck Project area. Of the **12%** that were staying overnight **100%** were staying in either an RV/Auto/Tent campground.

Byllesby-Buck Recreation – *Cumulative Results for New River Canoe Launch*

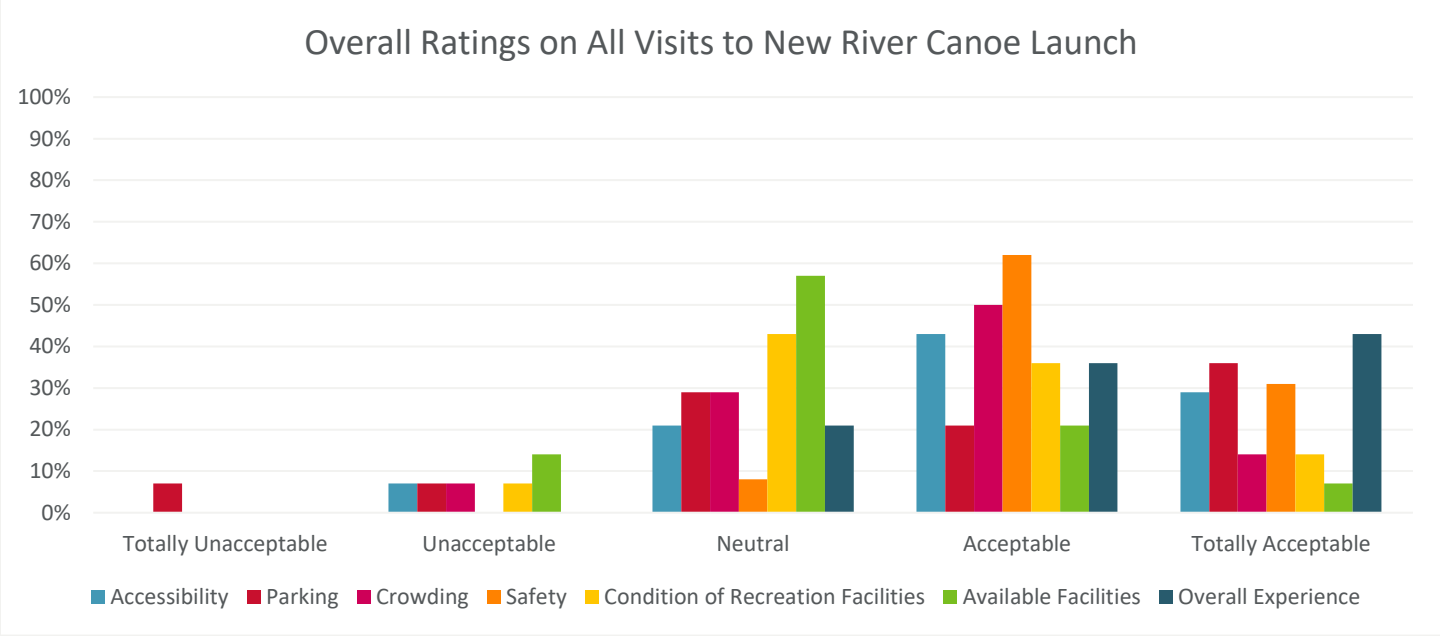
Activities Participated on Trip:



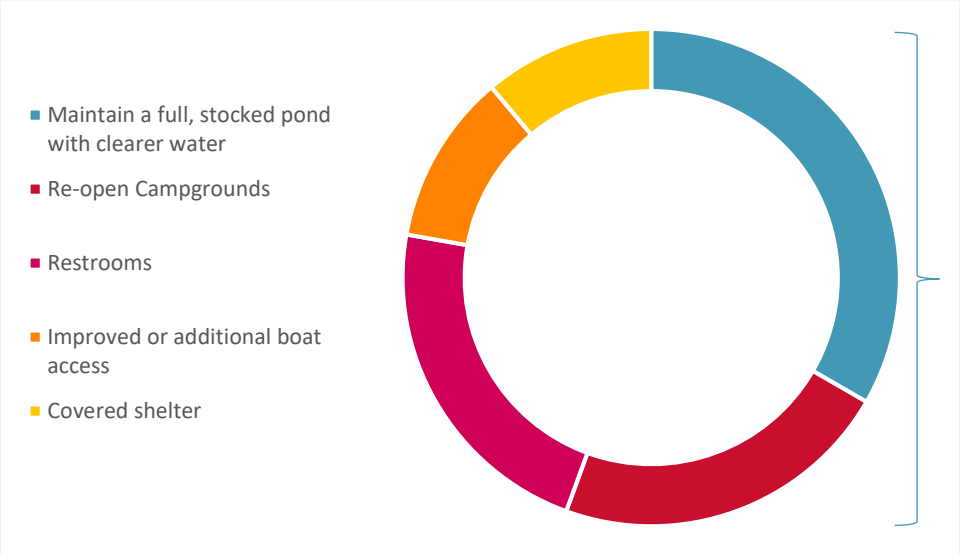
Primary Activity	Percent
Fishing	62%
Canoeing / Kayaking	15%
Sight-seeing	15%
Swimming	8%



Byllesby-Buck Recreation – *Cumulative Results for New River Canoe Launch*



Suggested Improvement Responses from New River Canoe Launch:



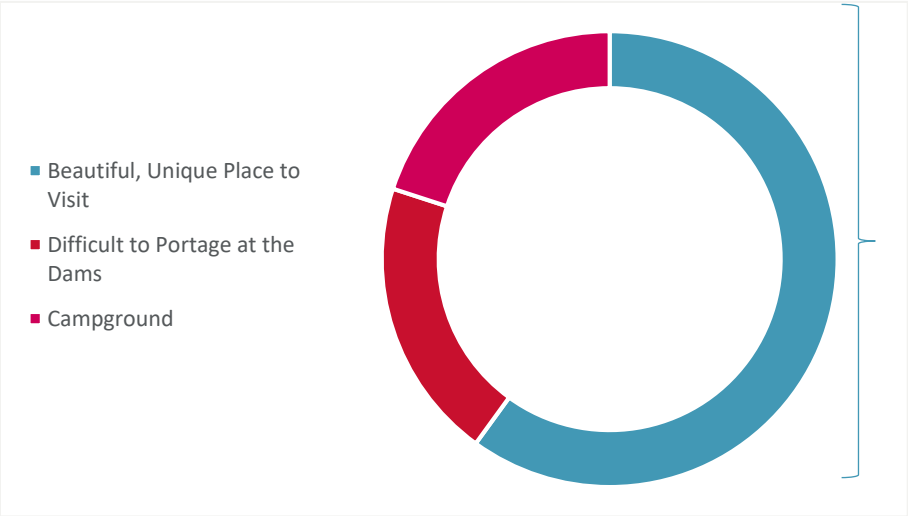
Improvement Suggestions	#
Maintain a full, stocked pond w/ clearer water	3
Re-open Campgrounds	2
Restrooms	2
Improved or additional boat access	1
Covered shelter	1

Byllesby-Buck Recreation – *Cumulative Results for New River Canoe Launch*

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

• Open the campground back up
• Bathroom facilities at the Byllesby canoe put in and at the picnic area at the bend in the river. More marked hiking trails. More history information. Tours of the dam. An established camping area with water and bathrooms AND the old ticket booth and century old modular home restored as a history of the new river museum. (I would be happy to help manage these, living less than a mile from the dam!) Regular litter clean up. The fisherman frequently leaves bait trash everywhere.
• Prohibit overnight camping along the riverbank. Campers block access to the river.
• Restrooms, picnic shelter

Additional Comment Responses from New River Canoe Launch:



Comments	#
Beautiful, Unique Place to Visit	3
Difficult to Portage at the Dams	1
Campground	1

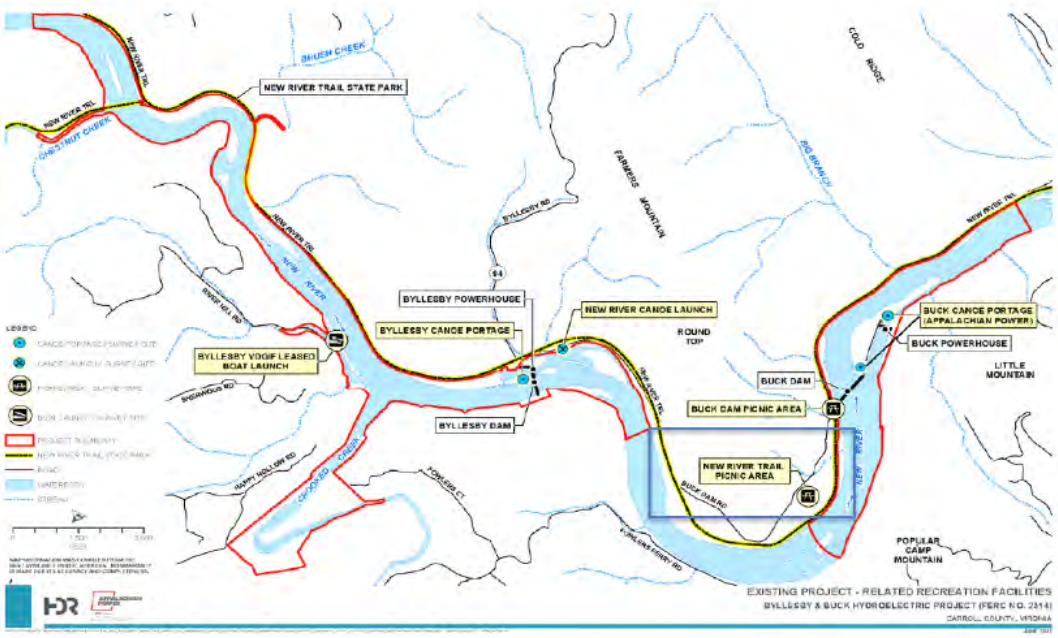
Byllesby-Buck Recreation – *Cumulative Results for New River Canoe Launch*

Additional comments: *(verbatim responses)*

• Beautiful place to visit.
• Fishing has dropped off over the past few years between the dams. What can AEP do to improve this.
• My family lives on Byllesby Rd. We walk down to the river and the trails every single day. Some days we hike around in the forest. Some days we walk the trail. Some days we bike the road or trail. In warmer months we sit on the bank and play in the sand and swim and tube and kayak. We picnic. We bird watch. We track animal prints. My husband and I go there for date night. We camp. We just exist with nature. I can think of few things we do not do there (except fishing, which we do not enjoy.) My 3 children's entire lives has transpired between our house and Byllesby/Buck Dam. It is our favorite place on Earth and is heaven on earth. We know just about every square inch. If you would like more information on our experience along this stretch of river... please email or call. I would love to discuss further our experience.

Byllesby-Buck Recreation – *Cumulative Results for the New River Trail Picnic Area*

Survey Locations:



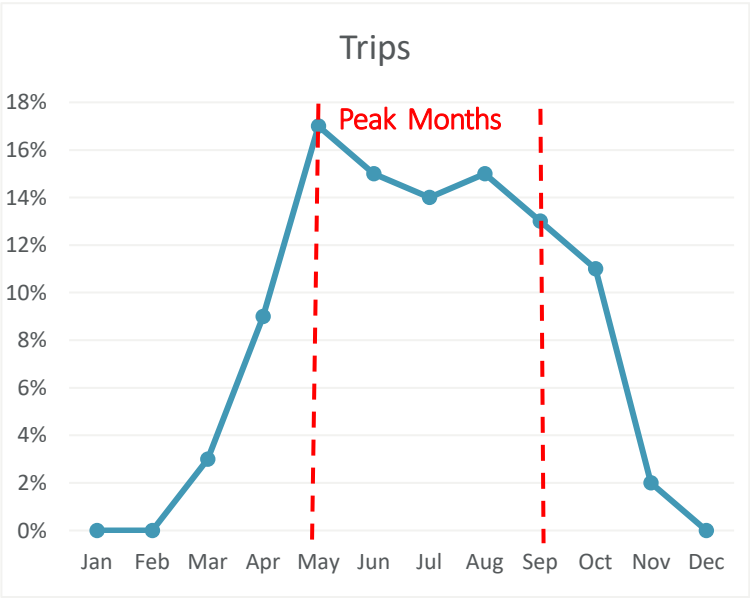
From **April 2020 to December 2020** there have been **24** respondents from the **New River Trail Picnic Area**. Overall, **14%** of the responses came from this location.

These respondents answered questions about their use of the recreation facilities. This data is collected to support the Federal Energy Regulatory Commission (FERC) relicensing process.

Predominately **46%** of the survey respondents come from two zip code locations, which average about **20** miles away from the Project. **79%** consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being **5** hours.

Males made up **67%** of the respondents, with **75%** in their forties, fifties, and sixties.

The most frequent months visited are May through September. May was the most popular month for this location.

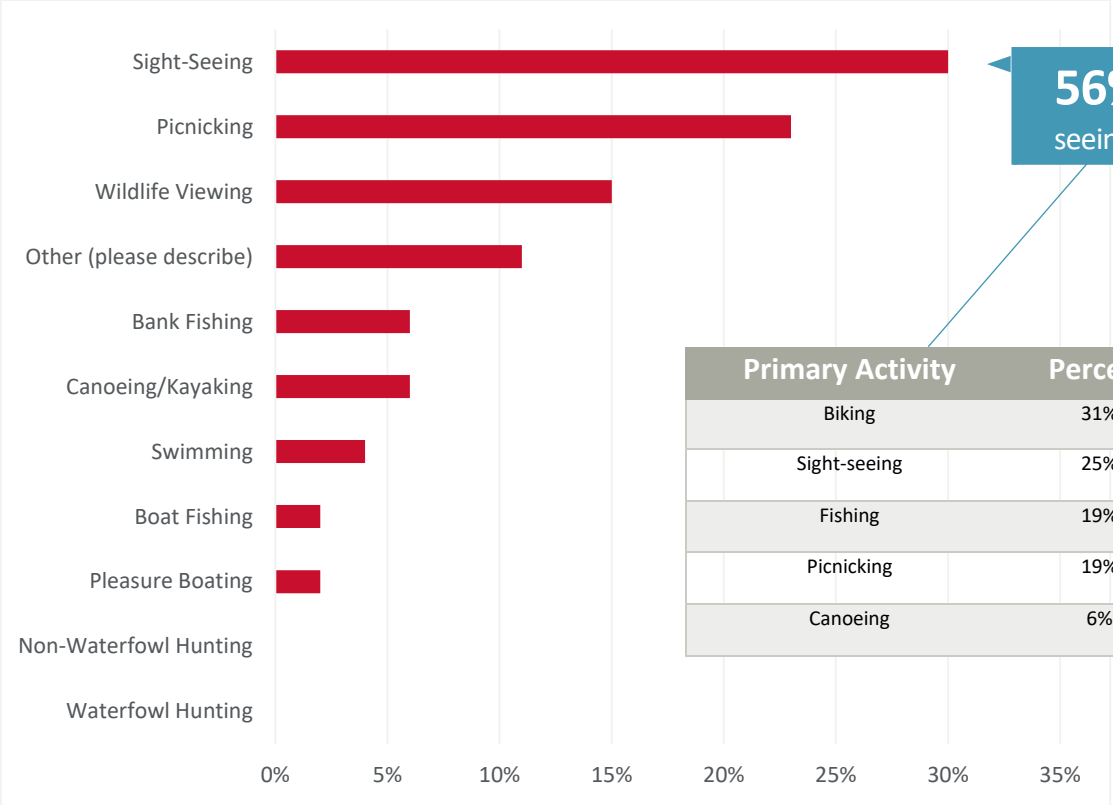


- Zip code of most frequent visitors: **24330 & 24382**
- Average # of visits per year are **10**
- Average miles traveled: **48**

74% of respondents were not staying overnight in the Byllesby-Buck Project area. Of the **26%** that were staying overnight, they stayed in either a motel/hotel, at a vacation/rental home or at another place.

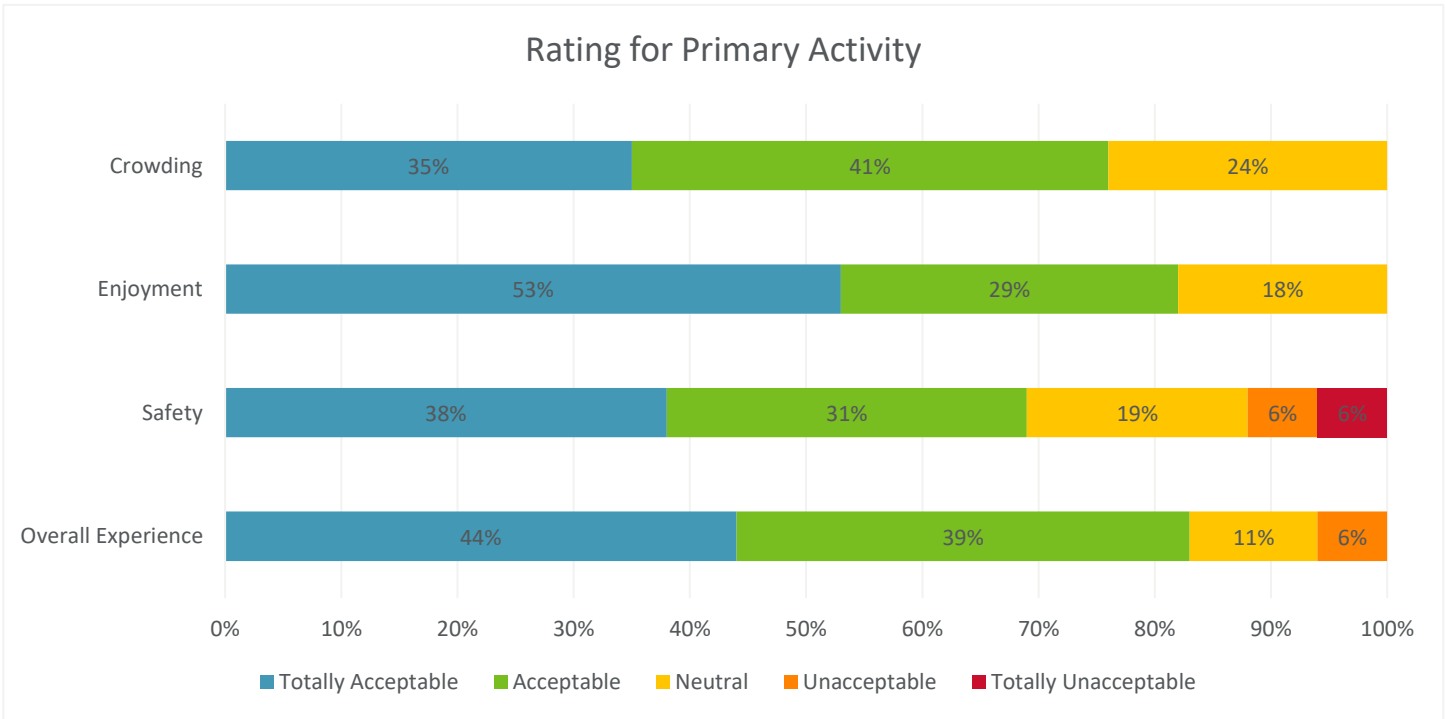
Byllesby-Buck Recreation – *Cumulative Results for the New River Trail Picnic Area*

Activities Participated on Trip:

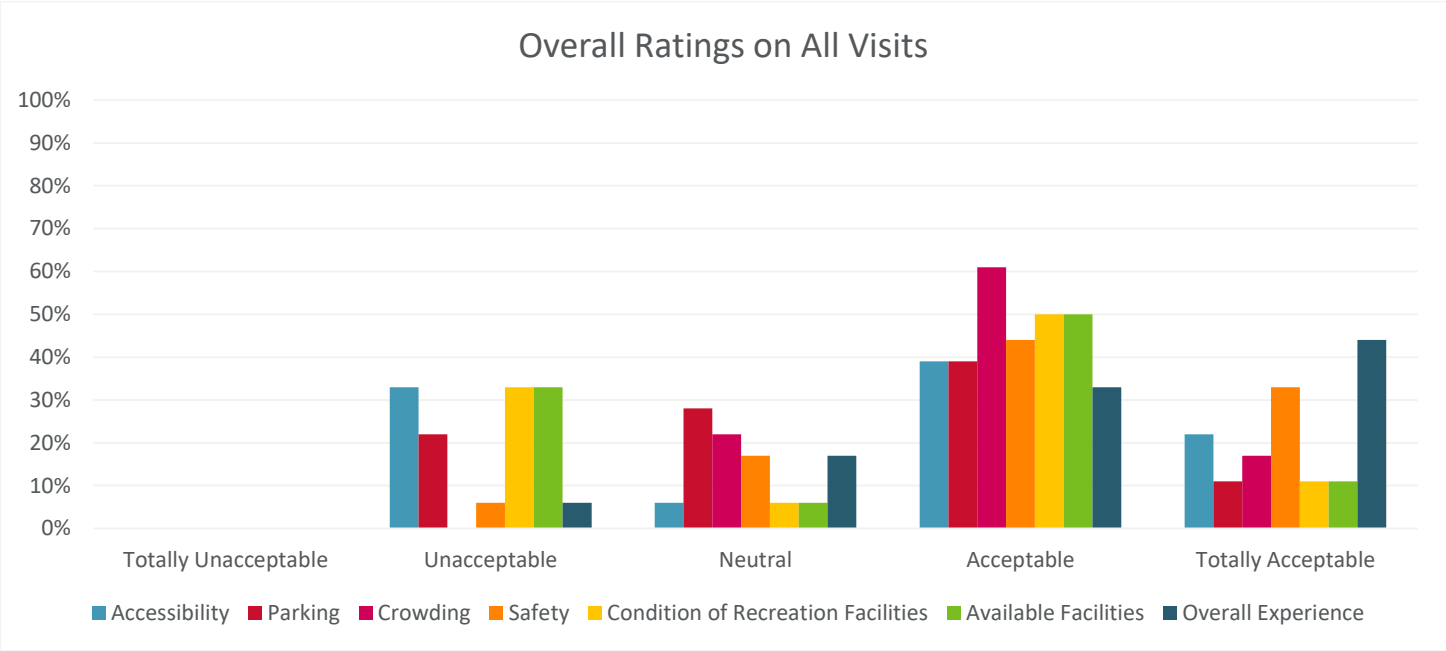


56% selected biking and sight-seeing as the primary activity

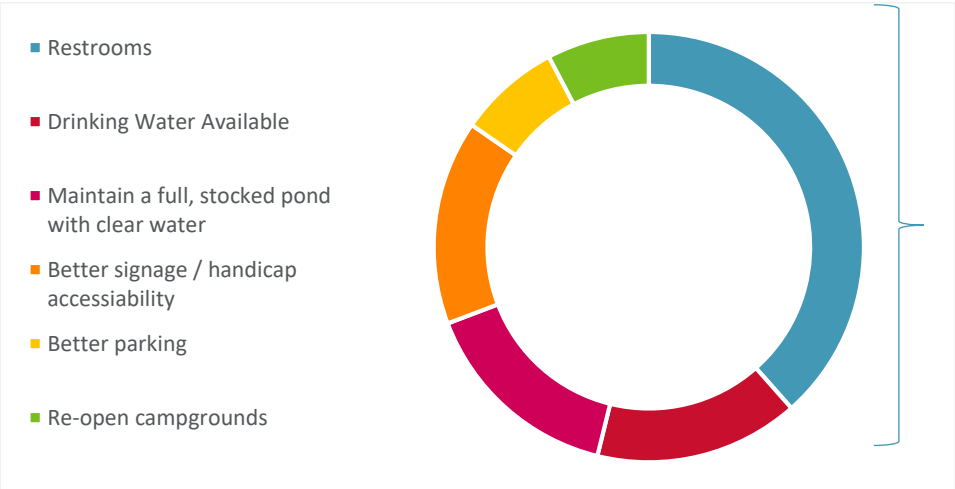
Primary Activity	Percent
Biking	31%
Sight-seeing	25%
Fishing	19%
Picnicking	19%
Canoeing	6%



Byllesby-Buck Recreation – *Cumulative Results for the New River Trail Picnic Area*



Suggested Improvement Responses from New River Trail Picnic Area:



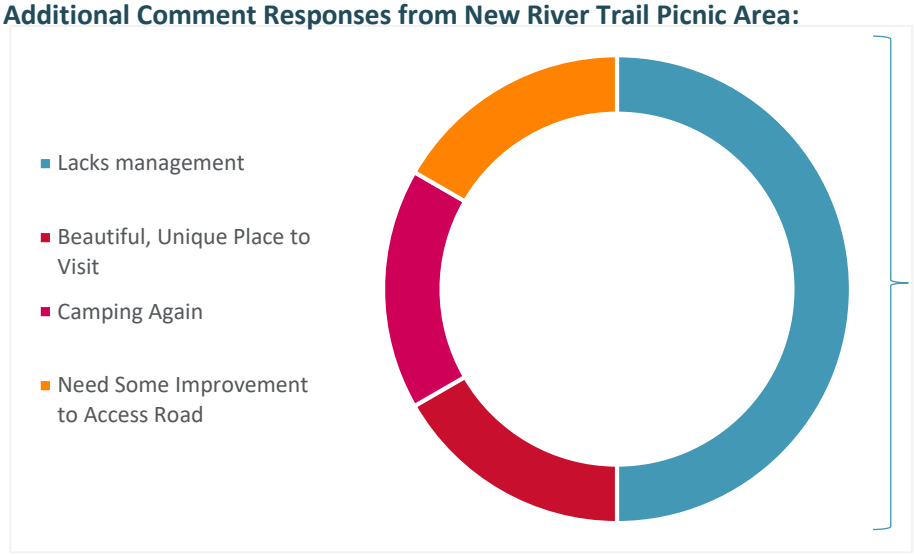
Improvement Suggestions	#
Restrooms	5
Drinking Water Available	2
Maintain a full, stocked pond with clear water	2
Better signage / handicap accessibility	2
Better parking	1
Re-open campgrounds	1

Byllesby-Buck Recreation – *cumulative results by New River Trail 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):*

• Repairs to bike trail
• restroom at boatlanding
• Parking area, drinking water availability, water usage for kayaking.
• Better signage
• River needs cleaned and water level is too low
• Better bathrooms and cleaner areas
• boat access to the river needs to be improved greatly and the water quality no longer supports a good fishing population
• faster access to byllesby dam from main roads, drinking water at more locations
• Camping between the dams would be amazing. I have great memories of camping when I was younger.
• More areas for picnics, off road parking, handicap access, more areas for river enjoyment
• Restroom facilities
• Better handicap friendly access
• Loved to picnic table by the river. Amazing.
• Bathroom at Byllesby.

Additional Comment Responses from New River Trail Picnic Area:



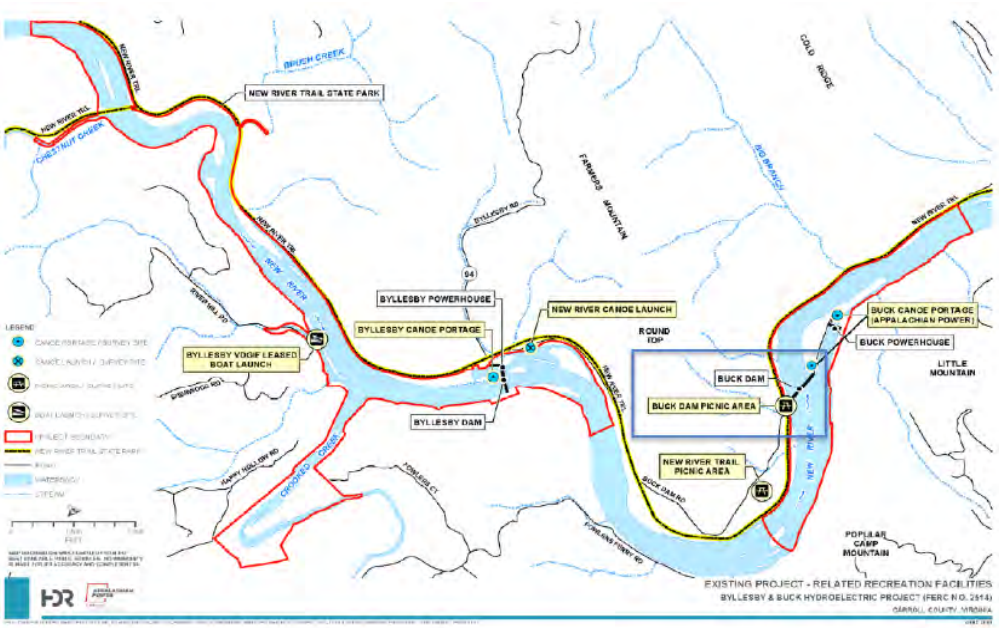
Comments	#
Lacks management	3
Beautiful, Unique Place to Visit	1
Camping Again	1
Need Some Improvement to Access Road	1

Additional comments: *(verbatim responses)*

- Some improvements to the access road going to the boat landing would be nice.
- Its absolutely beautiful there!
- Need to make improvements to enhance the river area and fishing experience
- There are many low income residents in the area that rely on fishing the New River as an important food source. Habitat quality needs to be improved. I am an infrequent visitor due to the current conditions of the river in this area. I would use the river much more frequently if it were to improve. It is also an economic development issue for this area. We are trying to build the number of visitors who stay overnight in our hotels and campgrounds.
- Needs camping facilities again.
- Give old Forest Service campground to New River Trail and reopen.

Byllesby-Buck Recreation – *Cumulative Results for Buck Dam Picnic Area*

Survey Locations:



From **April 2020 to December 2020** there have been **10** respondents from **Buck Dam Picnic Area**. Overall, **7%** of the responses came from this location.

These respondents answered questions about their use of the recreation facilities.

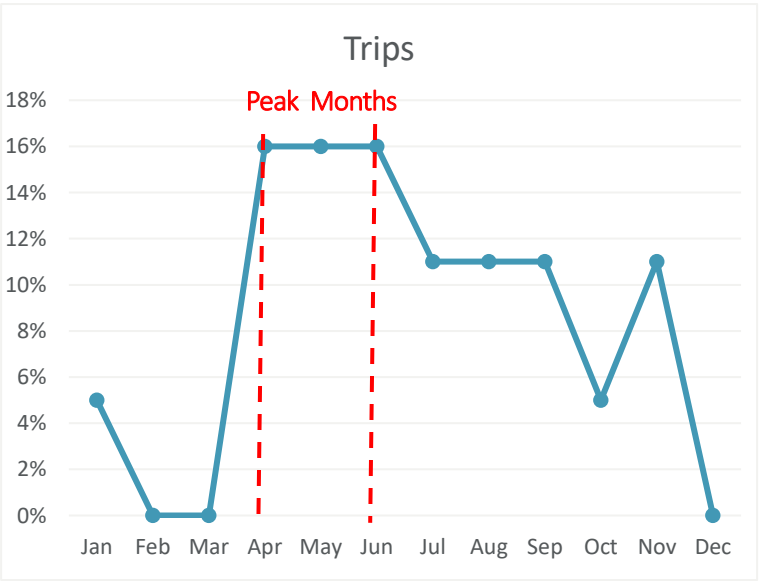
This data is collected to support the Federal Energy Regulatory Commission (FERC) relicensing process.

Predominately **25%** of the survey respondents come from one zip code location, which is about **12.5** miles away from The Project.

100% consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being **6** hours.

Males made up **56%** of the respondents, with **22%** split between being in their thirties, forties, fifties, and sixties.

The most frequent months visited are April through June.

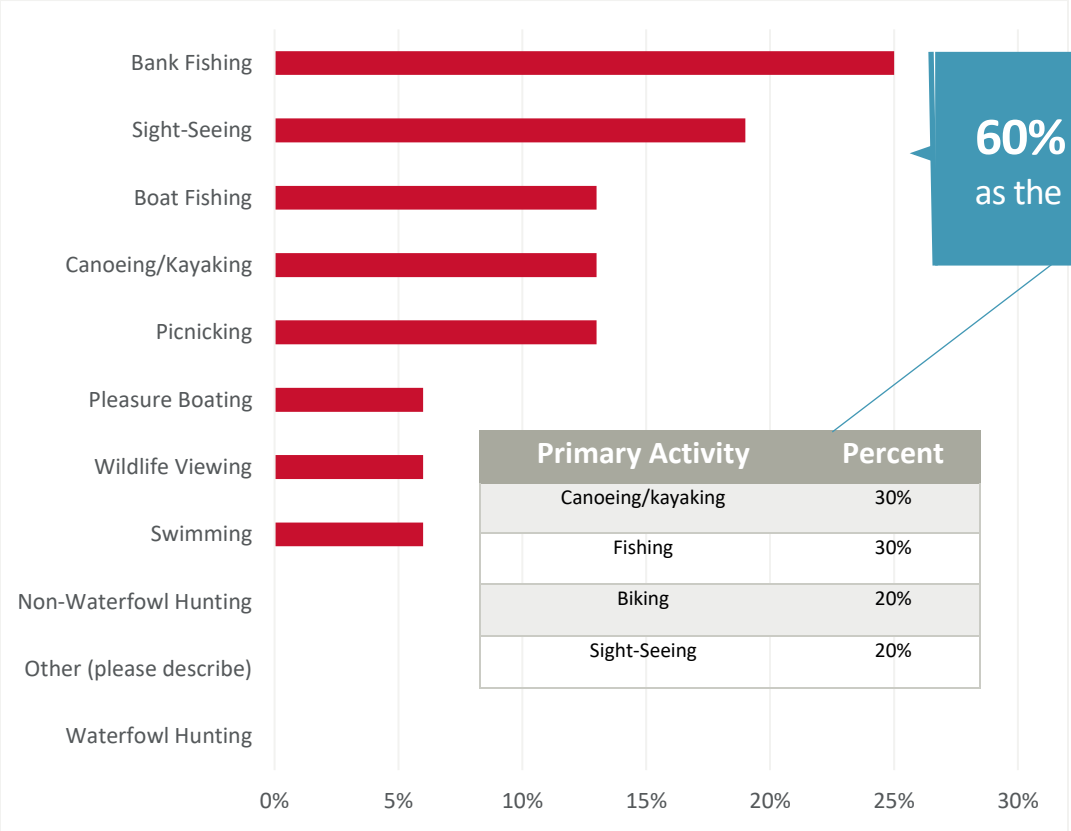


- Zip code of most frequent visitors: **24330**
- Average # of visits per year are **10**
- Average miles traveled: **23**

80% of respondents were not staying overnight in the Byllesby-Buck Project area. 100% of those that stayed overnight stayed in a RV/Auto/Tent Campground.

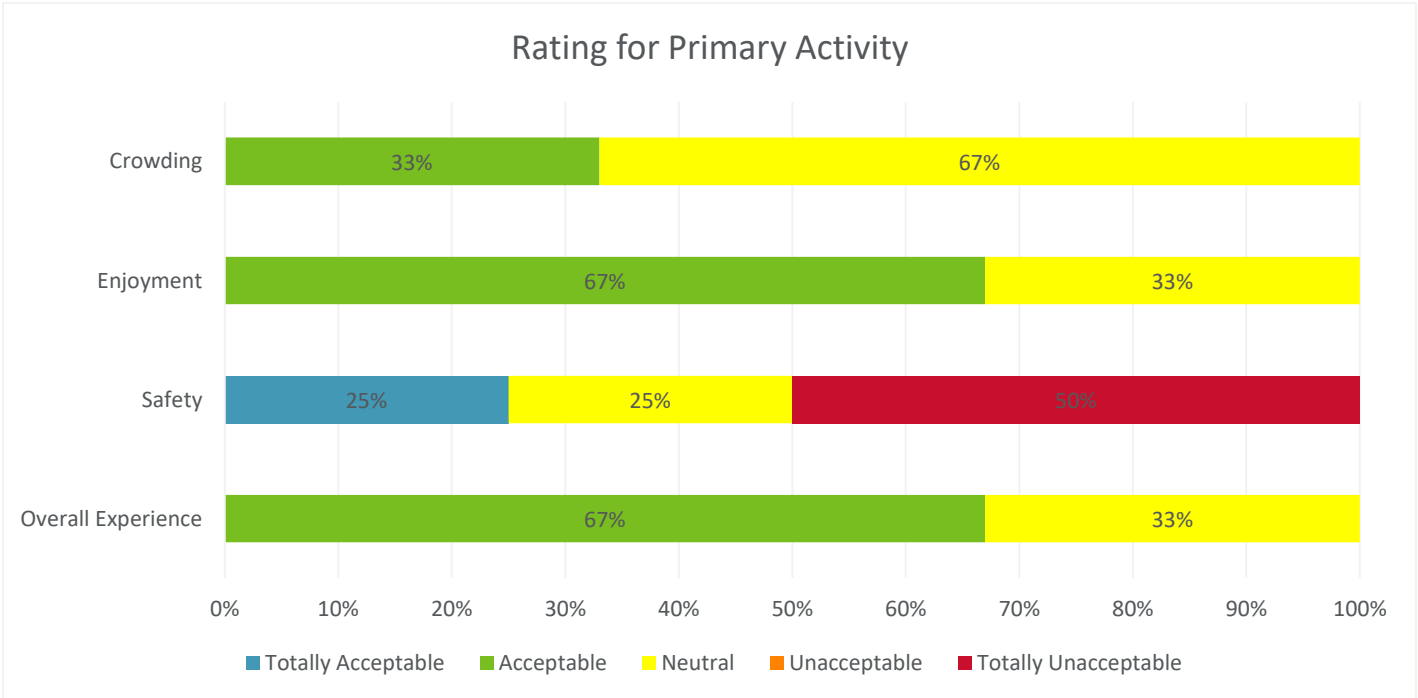
Byllesby-Buck Recreation – *Cumulative Results for Buck Dam Picnic Area*

Activities Participated on Trip:

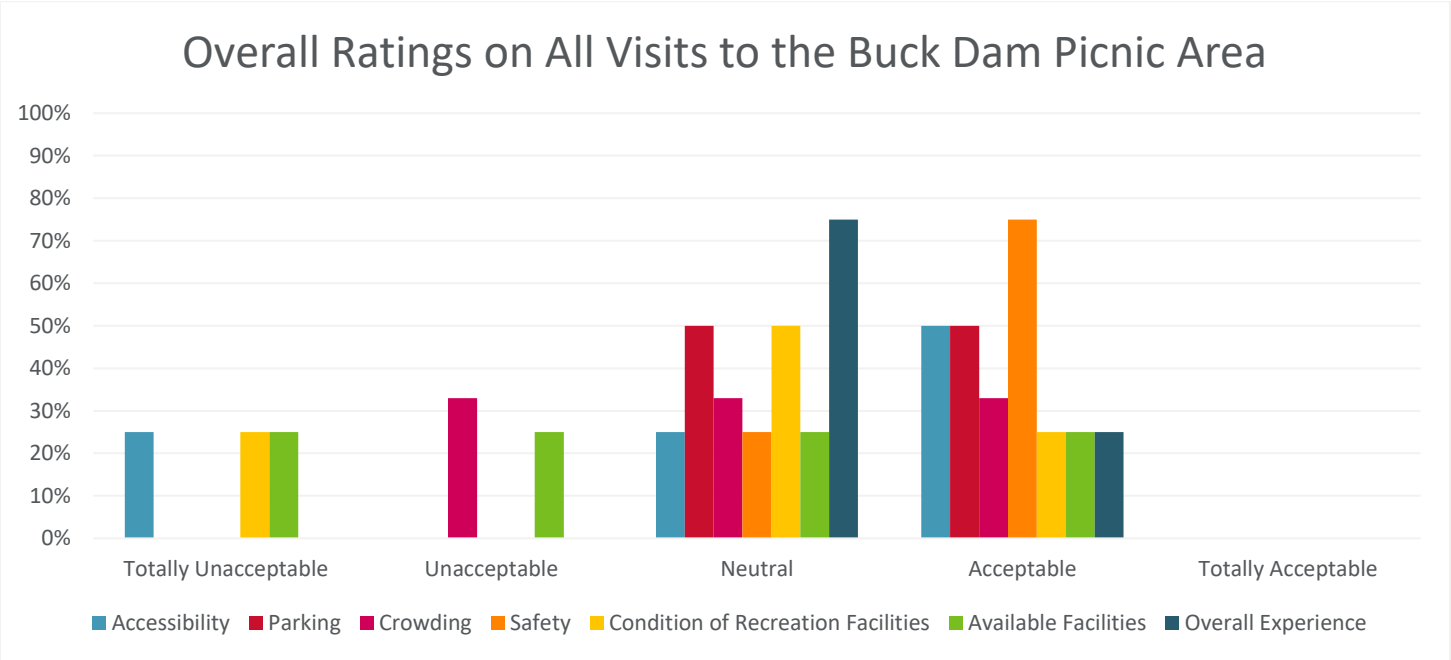


60% selected fishing and canoeing as the primary activity

Primary Activity	Percent
Canoeing/kayaking	30%
Fishing	30%
Biking	20%
Sight-Seeing	20%



Byllesby-Buck Recreation – *Cumulative Results for 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)*

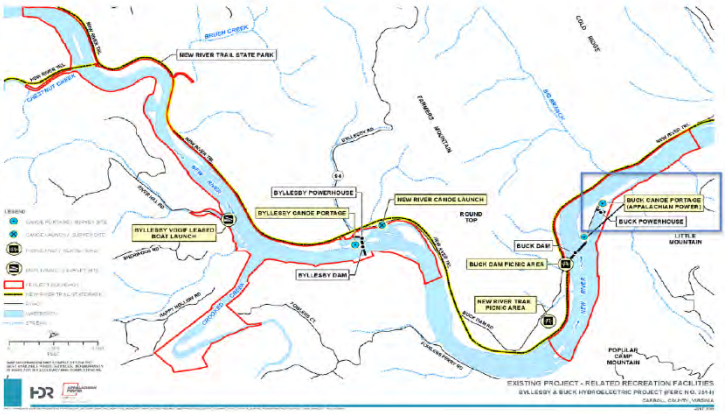
• more public parking at the Byllesby dam canoe portage
• We need to be able to float from below Byllesby dam to above buck without having to go below buck dam Need to be a Portage above buck so you dont have go below
• Campgrounds need mowed and maintained. we used to camp there weeks at a time
• More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

Additional comments: *(verbatim responses)*

• Beautiful area, love the remoteness, quality of fishing could improve by stockings of different species of all the current fish there.
• Please take down all the no trespassing and no fishing signs below the dams. My father and I fished below buck dam for years and never got hurt or drowned. It's ridiculous that you can put up a concrete dam and then keep people from gaining from its fish collections by placing signs further and further from the dams that say no trespassing. I want to be able to access any part of the area dangerous or not that should be my choice.
• Some improvements to the access road going to the boat landing would be nice.
• Spend many days camping and hiking

Byllesby-Buck Recreation – *Cumulative Results Buck Dam Canoe Portage*

Survey Locations:



From **April 2020 to December 2020** there have been **24** respondents from **Buck Dam Canoe Portage**. Overall, **17%** of the responses came from this location.

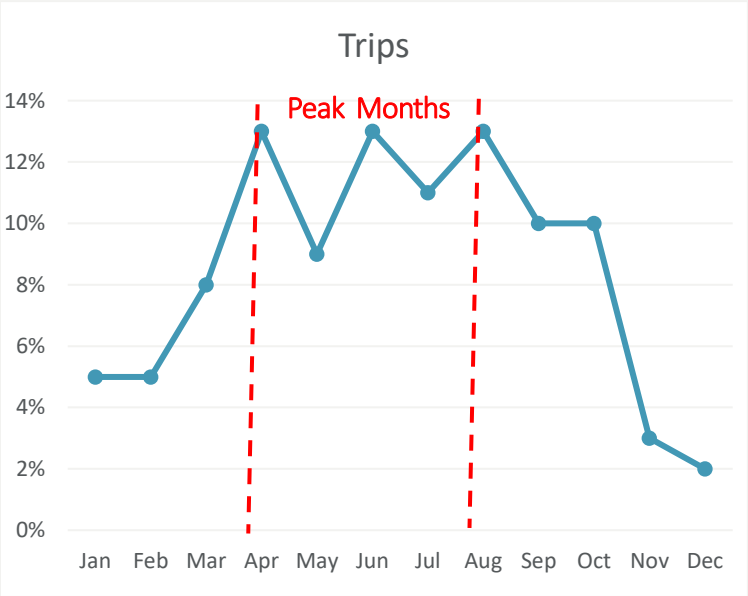
These respondents answered questions about their use of the recreation facilities. This data is collected to support the Federal Energy Regulatory Commission (FERC) relicensing process.

Predominately **52%** of the survey respondents come from four zipcode locations, which are **20** miles away from the Project. **100%** consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being **7** hours.

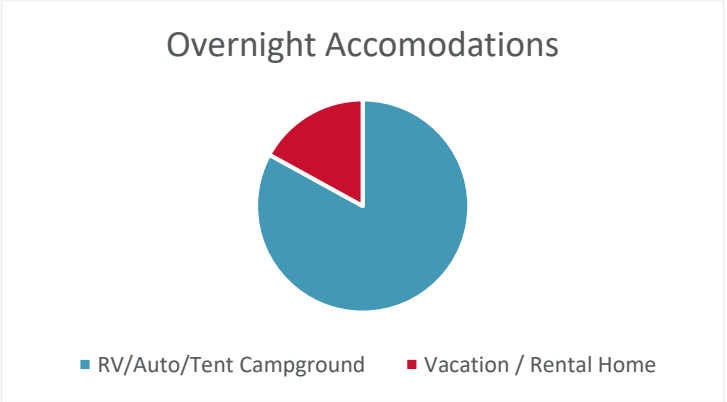
Males made up **63%** of the respondents, **62%** in their thirties and forties.

The most frequent months visited are from April to September, with April, June, and August being the peak months.

- Zip codes of most frequent visitors: **24333, 24348, 24350, and 24382**
- Average # of visits per year are **16**
- Average miles traveled: **33**

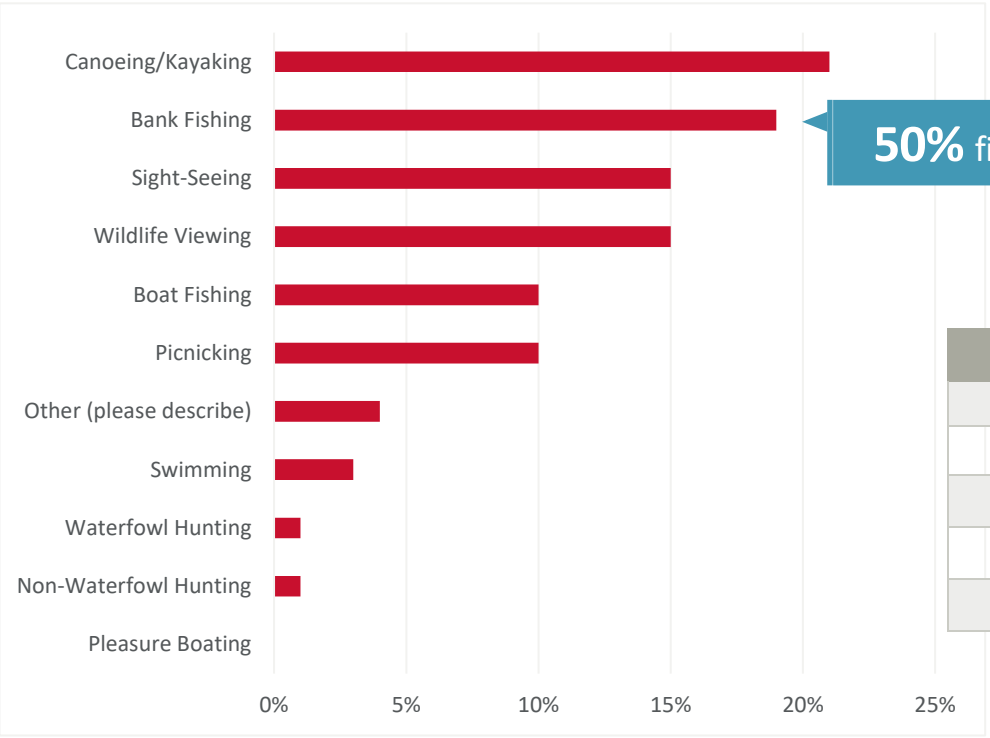


68% were not staying overnight in the Byllesby-Buck Project area. Of the **42%** that were staying overnight a breakdown of the accommodations used is shown:



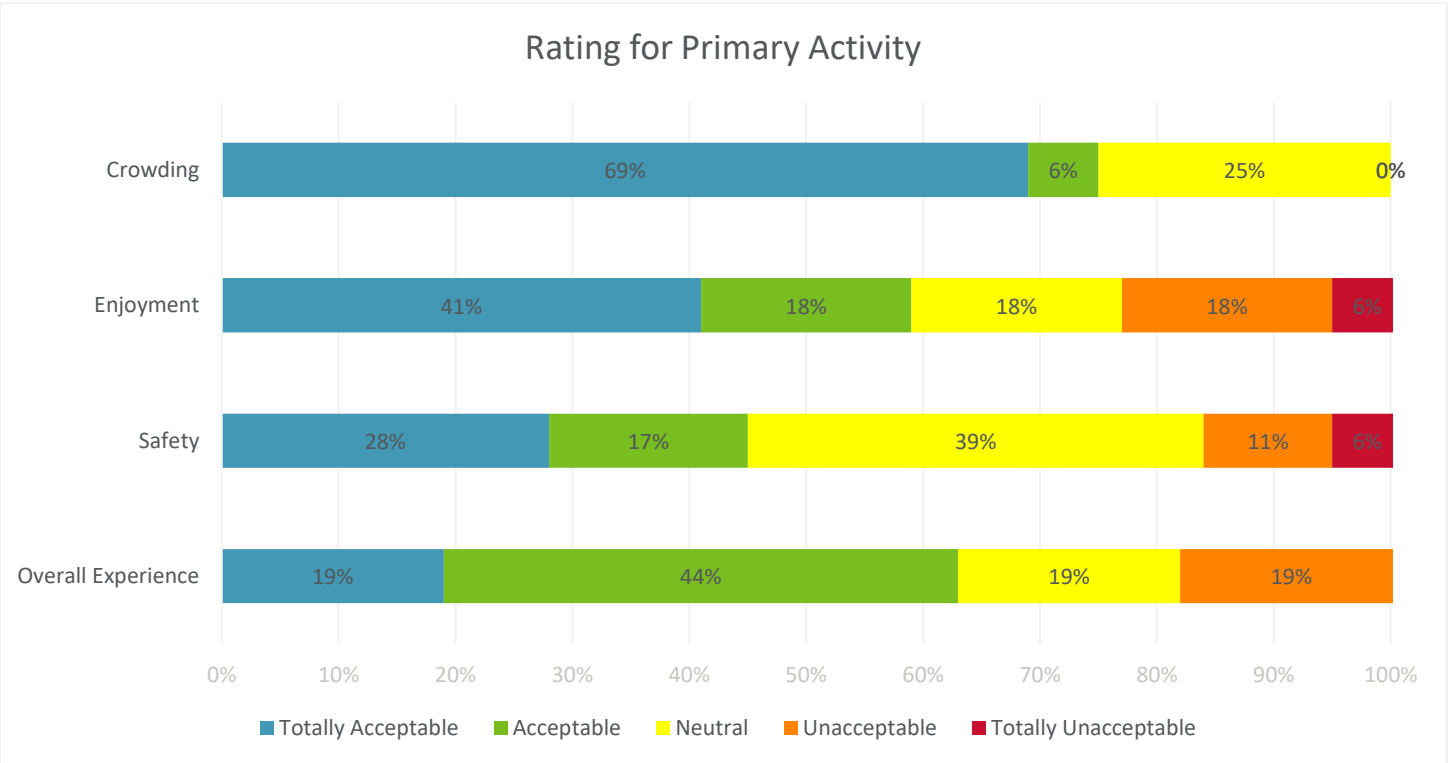
Byllesby-Buck Recreation – *Cumulative Results Buck Dam Canoe Portage*

Activities Participated on Trip:

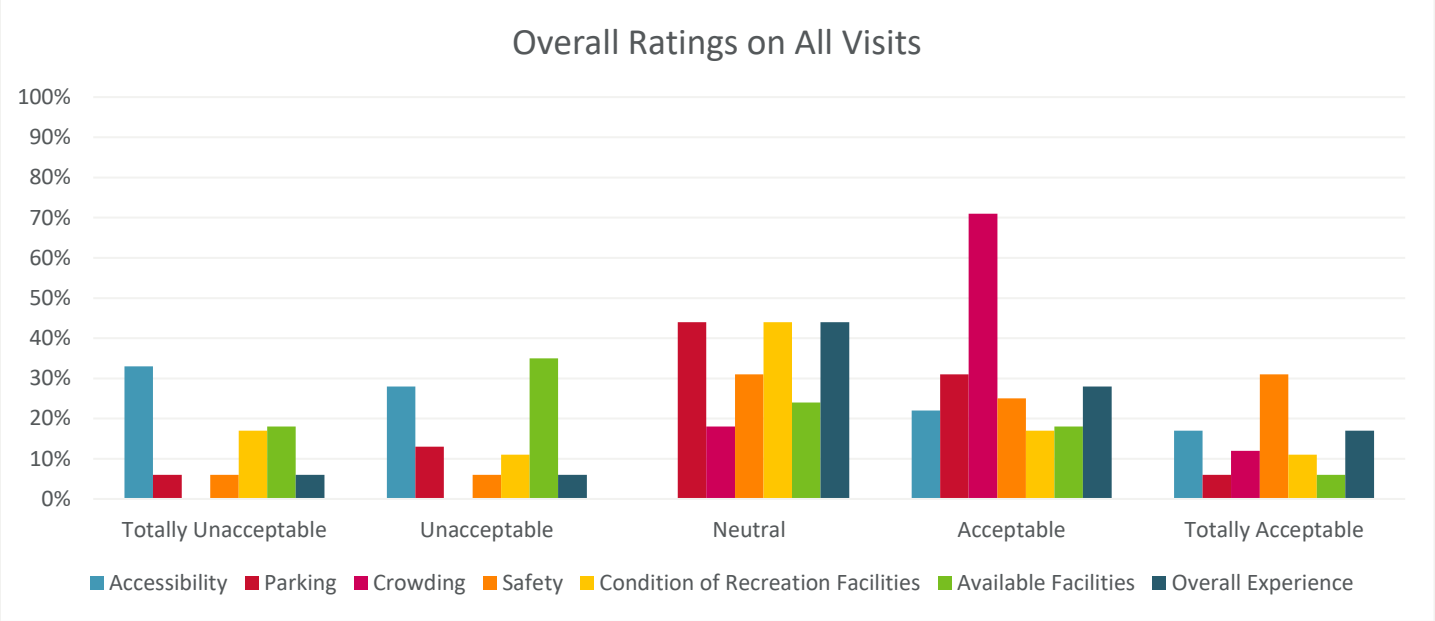


50% fishing is the primary activity

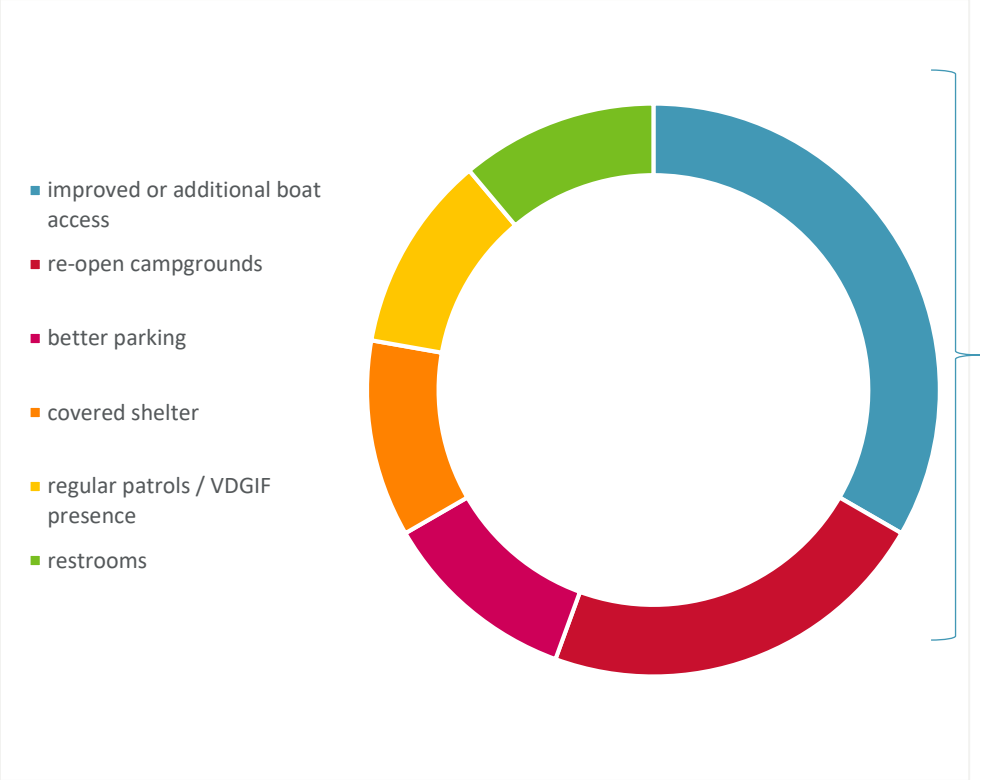
Primary Activity	Percent
Fishing	50%
Canoeing/kayaking	30%
Biking	6%
Hiking	6%
Waterfowl Hunting	6%



Byllesby-Buck Recreation – *Cumulative Results Buck Dam Canoe Portage*



Suggested Improvement Responses from Buck Dam Canoe Portage:



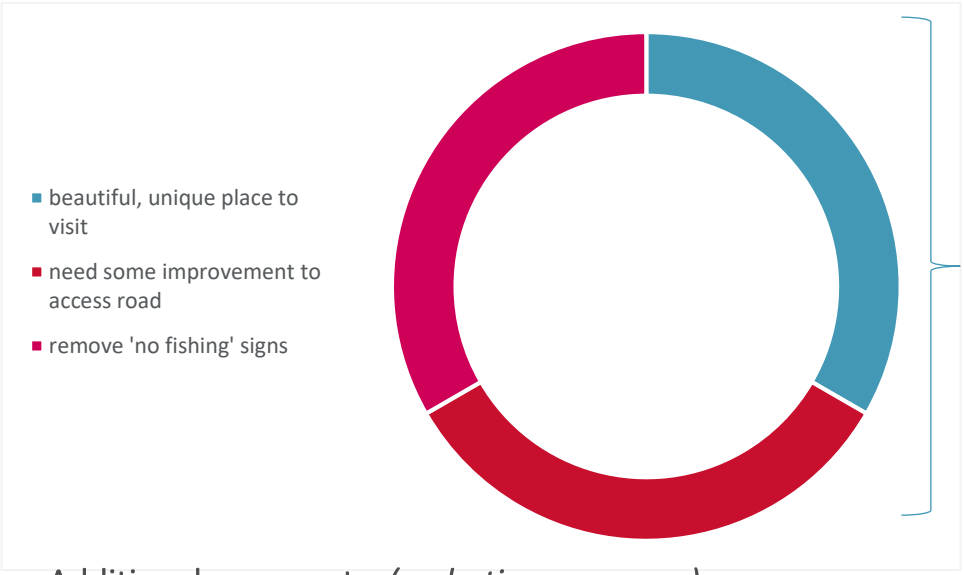
Improvement Suggestions	#
improved or additional boat access	3
re-open campgrounds drinking water available	2
better parking	1
covered shelter	1
regular patrols / VDGIF presence	1
restrooms	1

Byllesby-Buck Recreation – *Cumulative Results Buck Dam 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)*

• access below buck dam on opposite side from Ivanhoe. As I am getting older, it is much more difficult to drag canoe/ kayak from parking lot to put in area. Put in area is also terrible. You should be able ate drive down to the put in area, unload, and then park back in parking lot. The wildlife biologist from Va dept of game use my boat ramp further down stream for access when shocking fish. Also, trying to get around dams is very difficult and dangerous. There is no easy portage!!!
• Better access to the Buck Dam tail race.
• Better canoe and kayak launches, better areas to park and have better access to the water. Need to have more VDGIF presence between the dams.
• Better parking and facilities. I would like to see better access to the river. The long carry from the parking area to the water through the sand is a bit much. A better portage system.
• Boat launches and vehicle access to them
• Easier portage, steep muddy banks are dangerous. Porta Johns would be great, covered shelter
• I would like to see a more secure boat ramp in order to get to the buck dam pool. Right now the only way I know to get to that water is to run the large Rapids above it. Then to Portage the dam and float to the ivanhoe public boat landing.
• Make access for fishing at buck dam
• Maybe a port-a-john at Byllesby
• More access
• More Camping areas and bathrooms and boat launches
• My family and friends have used public access for Buck Dam area located off of Loafers Rest Rd. for over 10 years. We have enjoyed Floating/fishing and kayaking down the river up until 3-4 years ago when the water has been so murky and low. Which unfortunately we have used less and less.We really depended on this recreation for fun, relaxation , stress release , comradery and even sometimes supper, even more important now in this Covid 19 environment! The input has always been challenging, The waxing and waining entrance trail to get to the river put in is not people friendly. Carrying boats of all kinds, single file, thru the tick infested area down a significant slope "thus the waxing and waining" trail to arrive at a dangerous put in at the river.One boat put in at a time and if there is anybody fishing from the bank they have to move, and we all know that the fisherman does not want to move and at times won't move. I challenge some of your 50, 60 and 70 year old employees to take a couple boats down the trail.
• Needs boat launch on loafers rest side.
• Parking area, drinking water availability, water usage for kayaking.
• Would like to see clear water in the river.

Additional Comment Responses from Buck Dam Canoe Portage:



Comments	#
beautiful, unique place to visit	1
need some improvement to access road	1
remove 'no fishing' signs	1

Additional comments: *(verbatim responses)*

- Allow fishing against the wall of the Buck Dam tail race.
- I have always enjoyed putting in on Fowler's ferry road and fishing in between the dams. I have always had good luck and the view of stoots mountain with its rock outcroppings is amazing. Especially when there is a little river mist in the air.
- I have not spent much time on the river for the past 5 years. the river is always muddy, flood waters not controlled by the dams. Everywhere has become a sandy bottom for all the clean up of the dams. It seems like buck dam is always out of control.

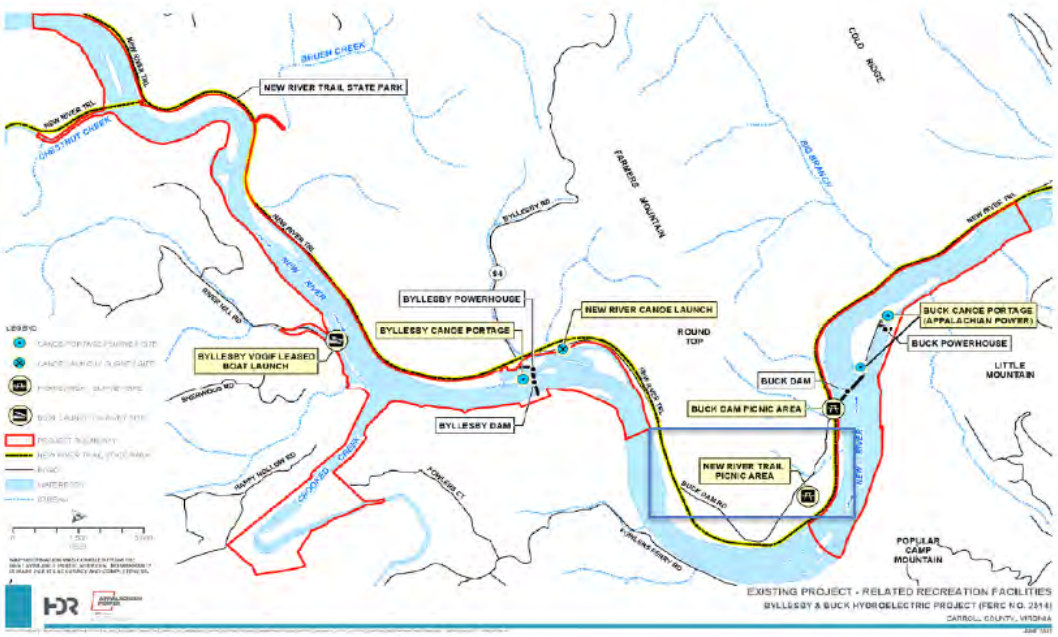
  Fishing this section of the river is terrible. Fish count is way down. Spawns are terrible. This use to be a great section to fish. It has been 5 years since there were any good fishing. According to VGIF, the fish count is lowest in 5 years.
- I just love it there and go every chance I can.
- I think better access to the river, parking, and information in the parking area are key. It would be nice to see some type of workaround for the portage as well. The portage around the dam is a nightmare, especially if you are overnighting and have loaded canoes. It is dangerous.

  Ideally, for recreation, the dams would not be there. I think the gradient of the area and double shoals between Fries and the dam are a good indicator that there is some excellent whitewater under the reservoir. I know a lot of paddlers who love to paddle double shoals but don't because they hate the 2-mile flatwater paddle to the next access point to get out.
- If this area was helped and marketed correctly I believe it would flourish. I own New River Outdoor Adventures and I would help promote the area for families, fishermen, and nature lovers.

• Ive lived in this area my whole life and enjoyed everything it has to offer please let the younger generation enjoy it also give them something to do in a place with not much els to do
• Man made muddy water throughout the year is just unacceptable.
• Re open the camp ground
• The boat put in that is maintained by AEP is in my opinion unacceptable and dangerous. There has been no improvements ,only maintenance over the years. The parking is good and room to expand if needed. There is an access with a gate used only by AEP, this site could be a much better access to drop off boats. It would take us up to 45 minutes to drive around to Ivanhoe to put in at that wonderful access, even handicap people can use that put in! After all we are South West Virginia with a lot of poverty and a lot of families rely on the river for recreation and dinner(fishing the last couple of years has been horrible !!) I suspect do to the murky and low waters since the work on the dams, This has not changed much at all for the better even though work on the dams have been complete. So in the Covid 19 pandemic when we are all encouraged to get out side, get some vitamin D, yes we can but cannot enjoy the river or fish for supper, I am a dreamer and I really would like to see this area in South West Virginia develop some seasonal "river rapids" that would be a huge economic impact for Carole County, Wythe County, Galax, Fries and Wytheville. This area needs a project to really boost our economy, open up more jobs, more recreation , help with poverty and substance abuse. I am asking that AEP take a leap of faith, trust and believe in our communities ,for the well being in all these localities and make these improvements and highly consider the "seasonal water Rapids" that can put several Counties and Towns on the map. Thank you for reaching out.
• This is by far, the best recreation area of its kind!
• We kayak fish this area every chance we get. We will sleep in our vehicles or tent camp depending on how many go fishing with our group. We see so many people and the biggest complaints I hear are how hard it is to portage the dams.

Byllesby-Buck Recreation – *Cumulative Results for "Other" Areas*

Survey Locations:



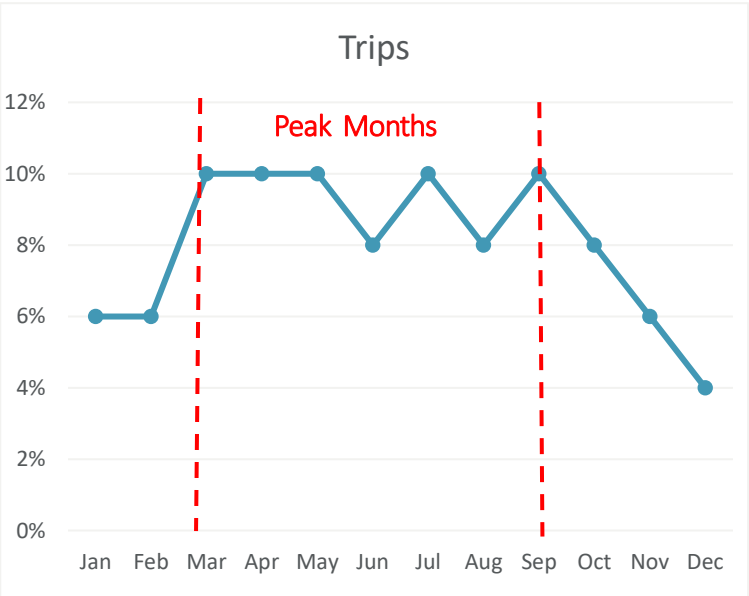
From **April 2020 to December 2020** there have been **9** respondents from "**Other" Areas**. Overall, **6%** of the responses came from this location.

These respondents answered questions about their use of the recreation facilities. This data is collected to support the Federal Energy Regulatory Commission (FERC) relicensing process.

Predominately **33%** of the survey respondents come from one zip code location, which is about **20** miles away from the Project. **86%** consider themselves to be regular visitors to the area with at least 3 or more times a year with an average length of stay being **6** hours.

Males made up **63%** of the respondents, with **72%** in their forties.

The most frequent months visited are March through September with a decline in the fall months.

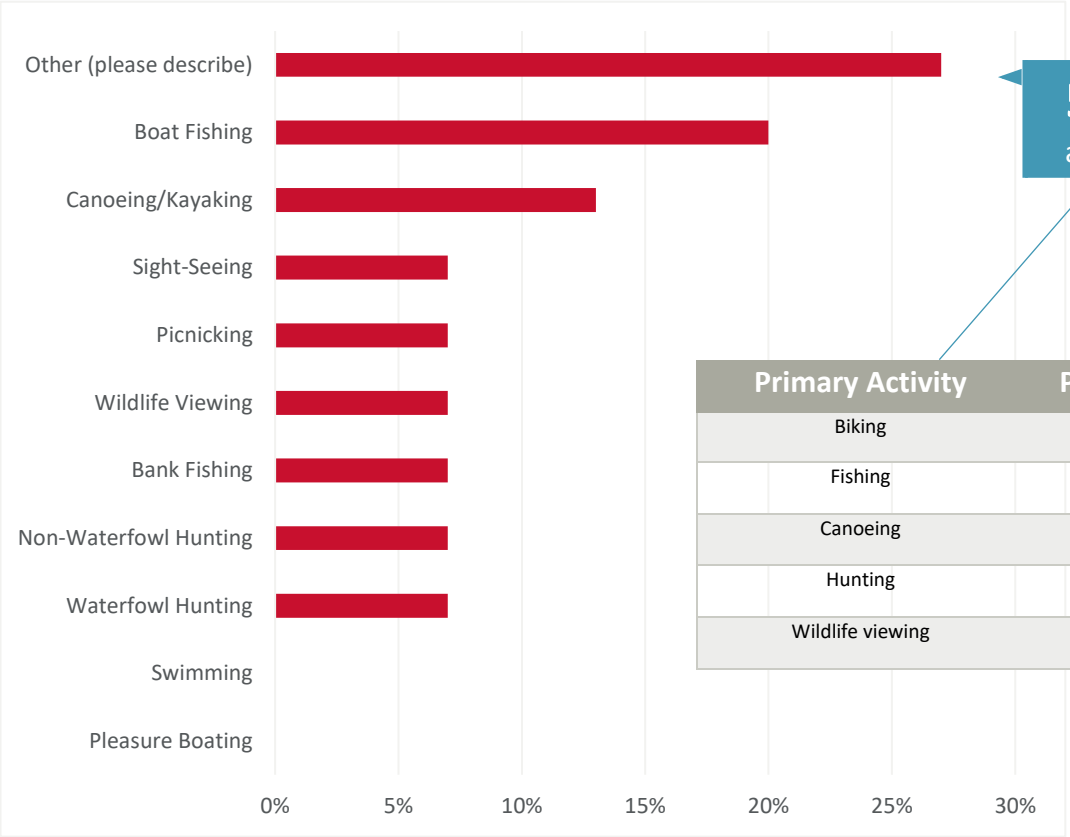


- Zip code of most frequent visitors: **24382**
- Average # of visits per year are **19**
- Average miles traveled: **40**

100% of respondents were not staying overnight in the Byllesby-Buck Project area.

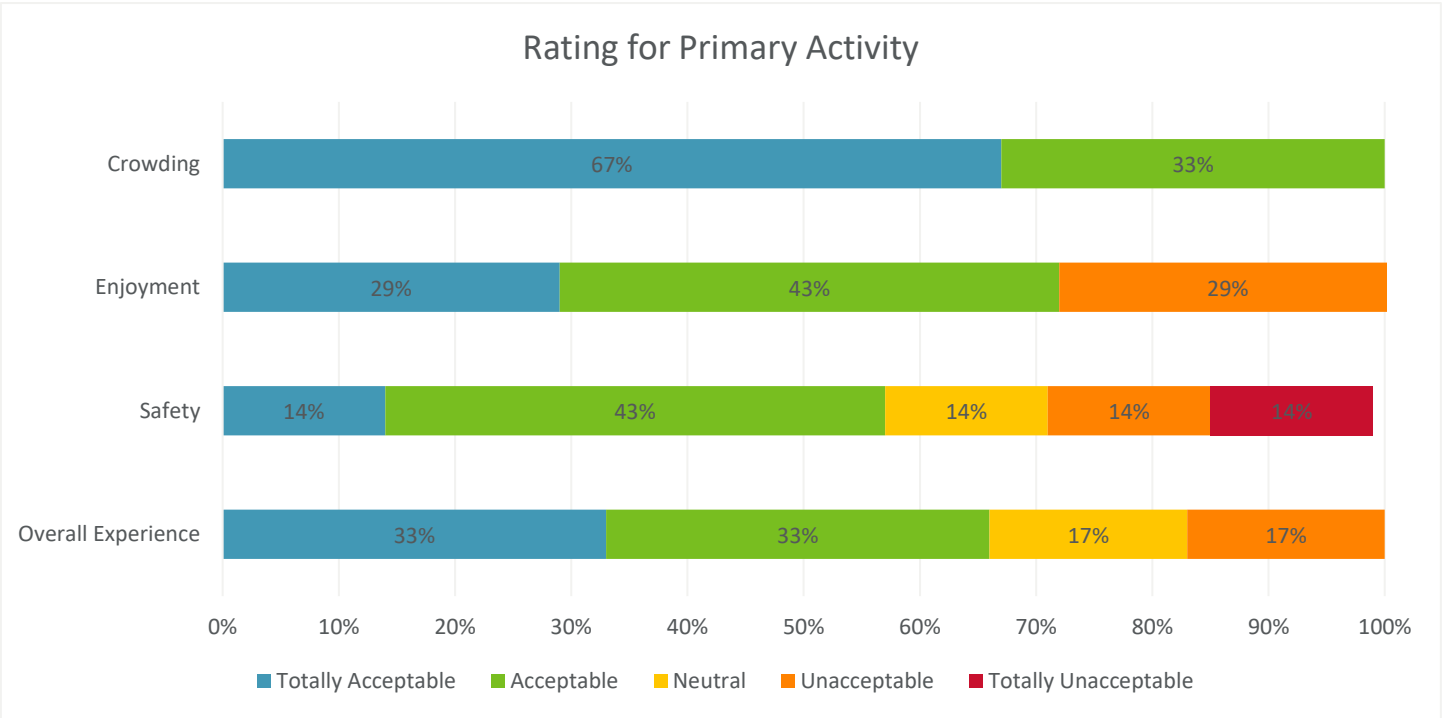
Byllesby-Buck Recreation – *Cumulative Results for "Other" Areas*

Activities Participated on Trip:

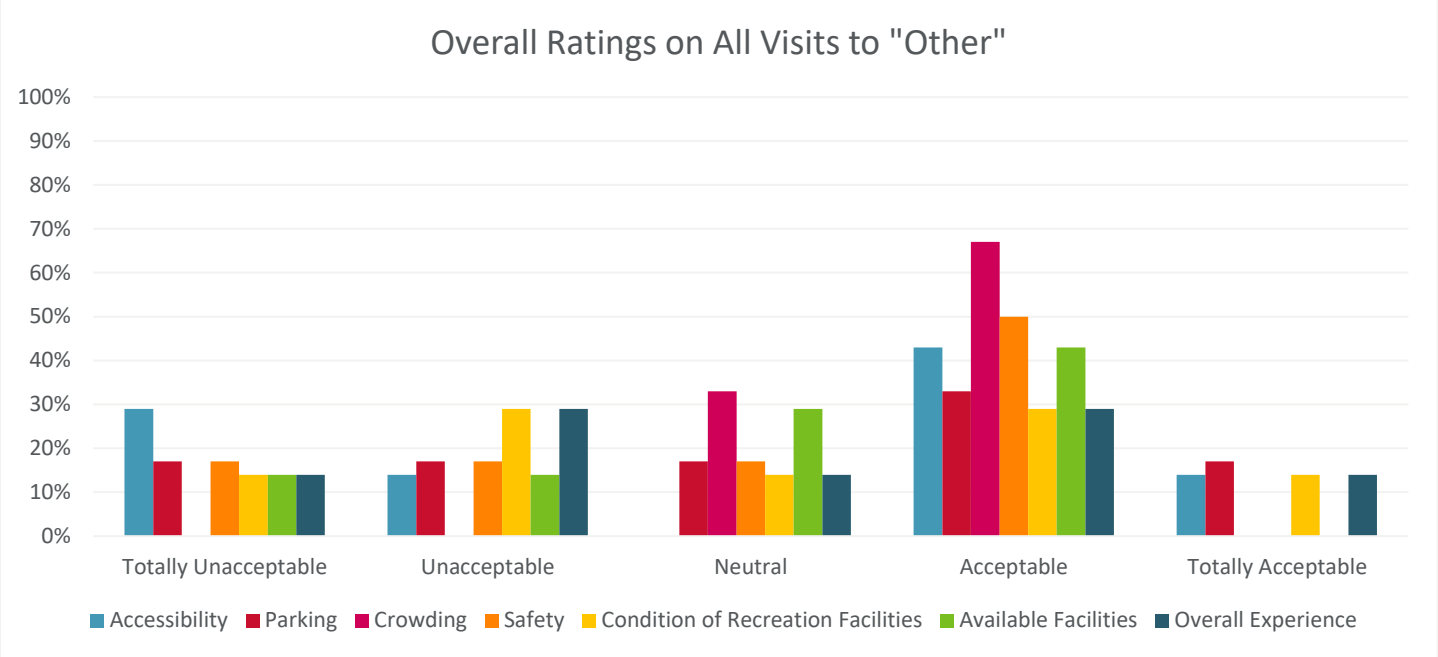


58% selected biking and fishing as the primary activity

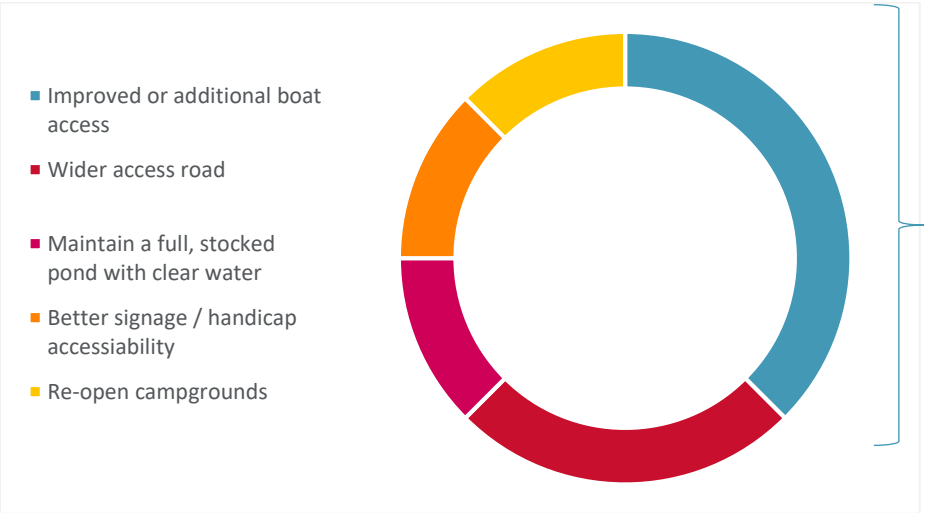
Primary Activity	Percent
Biking	29%
Fishing	29%
Canoeing	14%
Hunting	14%
Wildlife viewing	14%



Byllesby-Buck Recreation – *Cumulative Results for "Other" Areas*



Suggested Improvement Responses from New River Trail Picnic Area:



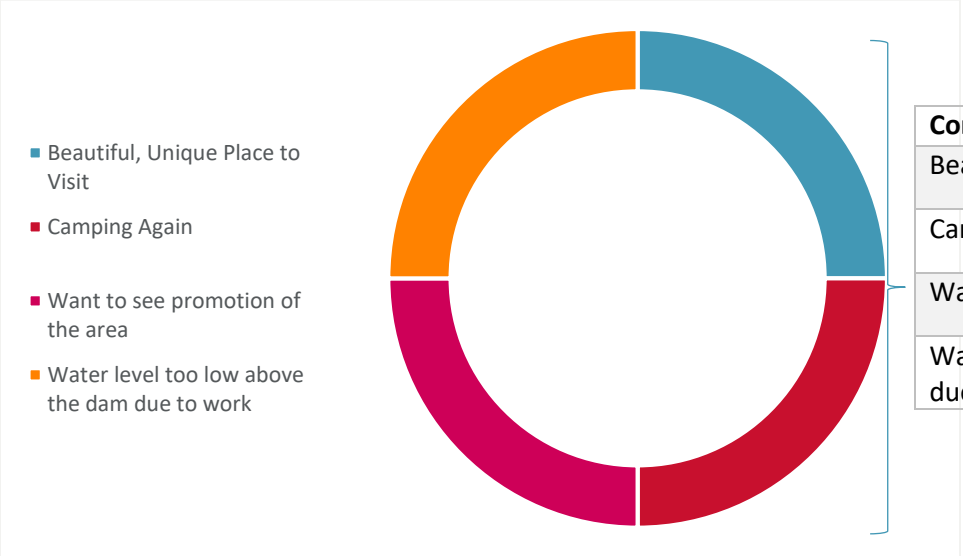
Improvement Suggestions	#
Improved or additional boat access	3
Wider access road	2
Maintain a full, stocked pond with clear water	1
Better signage / handicap accessibility	1
Re-open campgrounds	1

Byllesby-Buck Recreation – *Cumulative Results for "Other" Areas*

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

• Boat launch below buck dam
• For Wythe County residents on Loafer's Rest Rd and Van Lue Rd the VDGIF fishing access and canoe launch is in need of significant repair, for older individuals and others their needs to be accessible access for both bank fishing and canoe/kayak drop off. The Access at the Horse Park in Ivanhoe is too far by road for those of us on river right near the Buck Dam to readily access.
• I would like to see better access to the river, scheduled release dates and improved water quality for fishing
• Road down to Kayak Launch at Loafers Rest.
• The access point off of Loafers Rest needs a tremendous amount of improvement. The parking is very acceptable, The the access is defiantly not accessible for most people, a long hale down narrow winding path that empties into a field with a very narrow path. It is difficult to no navigate these paths without getting into the tall grass that is ladened with tics. Once you arrive at the put in it is about 6-8 feet wide. Heaven forbid there be someone attempting to fish from the non-existing bank, and you have to interrupt that person to get boat in the water, and if you have 2,4, or 6 boats makes for a miserable experience for all parties. It would be a much better experience if a"boat put in" could be at the area that AEP has gated. This would be a game changer and you can add ADA access that now-a-days is a must. Thank you for your consideration
• water quality and fish habitat
• We used to camp many many years ago. It would be nice for the facilities to be reopened

Additional Comment Responses from New River Trail Picnic Area:



Comments	#
Beautiful, Unique Place to Visit	1
Camping Again	1
Want to see promotion of the area	1
Water level too low above the dam due to work	1

Byllesby-Buck Recreation – *Cumulative Results for "Other" Areas*

Additional comments: *(verbatim responses)*

• As a property owner on the New River in Wythe County which is is very close to Bucks Dam, and a citizen and elected official of the Town of Wytheville I ask you all to please take all suggestions serious. The citizens that live in the Towns, County"s and Cities near or on the new area in South West Virginia are affected in many ways by the New River. To include recreation, boating, fishing, both recreational and for sustainability. Sustainability includes environmental, social and economic impacts. The people and families in South West Virginia are usually forgotten, and pushed aside!!! I would ask you to consider making it possible to use Buck Dam to our advantage. It would be a HUGE ECONOMIC BOOST to many Towns, Cities and County"s in the region to have the ability to release the waters on a schedule to provide rapids and thus a huge Tourism destination, that would be a HUGE economic impact for all the Families and Citizens in this section of South West Virginia. This would increase self-esteem, increase employment and help us fight drug abuse. For once, it would be welcome to be treated as if we were Northern Virginia and not treated a certain way because we are SWV. This is a once in a lifetime opportunity not just for the citizens but also for all that are making this decision, and I say this because this relicensing for AEP is what 40 -50 years, and this opportunity won't come again anytime soon. These request, the change in the put-in and providing rapids, is not that costly for AEP and you can be proud that these changes will have a huge impact and will change this area for the better for decades to come and we would have AEP to thank for believing in us and given us not just a chance but a new life stile for people in this part of SWV. The year 2020 mostly with have bad memories for all, especially in areas such as SWV, But I hope you will give us something to hold on to and remember for our lifetime, that we were all part of a huge improvement in so many lives right here in SWV. Think about all that will be gained for comparatively low monetary outlay. Thank you for your time and patience. Be Safe.
• Campground
• Great place for waterfowl and goose hunting. Good access and plenty of game. I hope it stays around
• The turbidity during the work on the dams has been unacceptable. All year the New River has been so turbid as to make it impossible to safely paddle. The number of paddlers and floating fisherman has been significantly reduced this year. Publicly available water quality monitoring should be readily available to residents using the River. Most visitors accessing the Byllesby- Buck Project area do so by travelling through Wythe County even though the project is located in Carroll County.

Attachment 4

Attachment 4 – Trail Camera Representative Photographs

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Trail Camera Documentation

Byllesby VWDR Boat Launch

Sunday, May 10, 2020

Friday, July 24, 2020

Saturday, October 24, 2020

Byllesby Canoe Portage – Parking Lot

Sunday, May 10, 2020

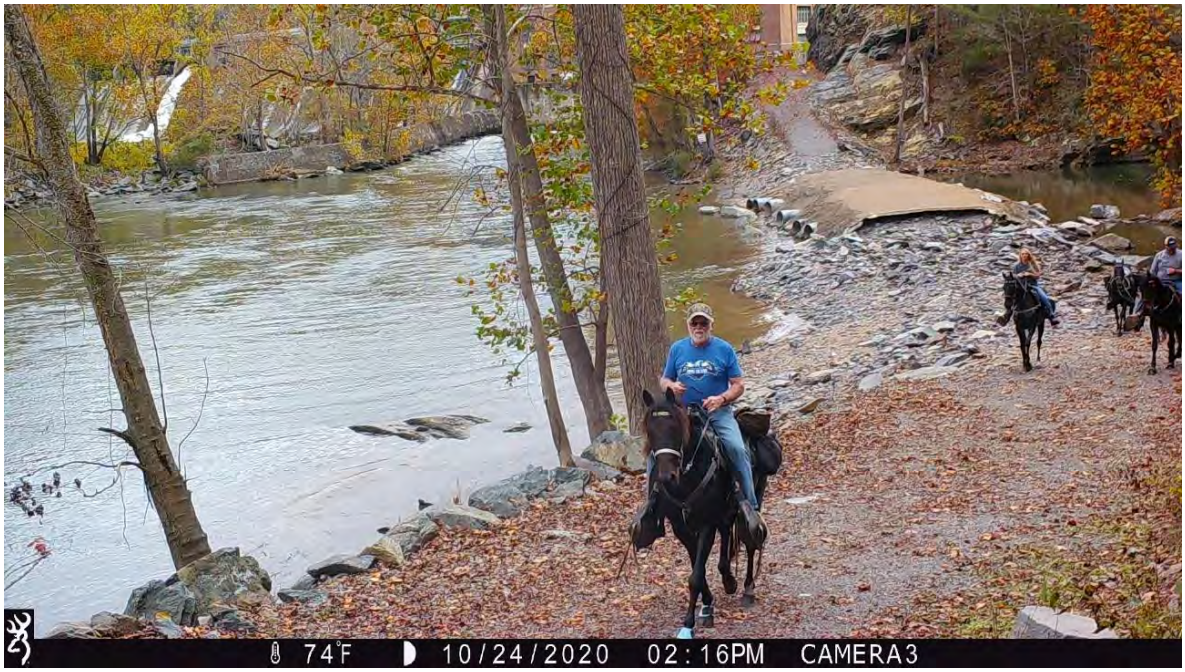
Friday, July 24, 2020

Saturday, October 24, 2020

New River Canoe Launch

Sunday, May 10, 2020

Friday, July 24, 2020



Saturday, October 24, 2020

New River Picnic Area - Upper

Sunday, May 10, 2020

Friday, July 24, 2020

Saturday, October 24, 2020

New River Picnic Area - Lower

Sunday, May 10, 2020

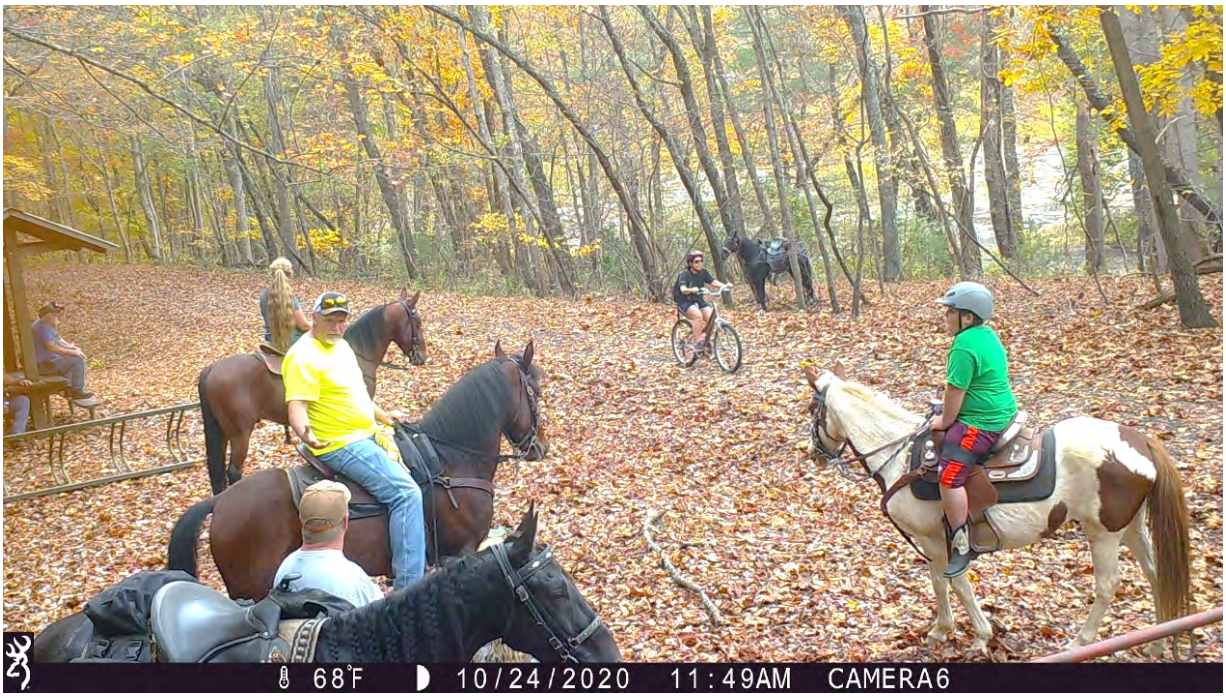
Friday, July 31, 2020

Saturday, October 24, 2020

Buck Dam Picnic Area

Sunday, May 10, 2020

Friday, July 31, 2020



Saturday, October 24, 2020

Buck Dam – Fishing Access Trail Camera View:

Buck Dam Canoe Portage (Put-In) Trail Camera View: