E-file Submission

March 10, 2020

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

Subject: Swinging Bridge Hydroelectric Project (FERC No. P-10482-117)
Mongaup Falls Hydroelectric Project (FERC No. P-10481-067)
Rio Hydroelectric Project (FERC No. P-9690-112)
Updated Study Report Meeting Summary

Dear Secretary Bose:

Eagle Creek Hydro Power, LLC, Eagle Creek Water Resources, LLC, and Eagle Creek Land Resources, LLC (collectively "Eagle Creek") are the owners and operators of the Swinging Bridge, Mongaup Falls, and Rio Hydroelectric Projects (collectively "Mongaup River Hydroelectric Projects" or "Projects"). The Mongaup River Hydroelectric Projects are located on the Mongaup River in Sullivan and Orange Counties, New York, and are licensed by the Federal Energy Regulatory Commission ("FERC" or "Commission").

The FERC licenses for the Mongaup River Hydroelectric Projects expire on March 31, 2022, and Eagle Creek is pursuing new licenses for each of the Projects. On March 30, 2017, Eagle Creek filed with FERC Notices of Intent (NOIs) to file a license application for new licenses for the Projects under the Commission's Integrated Licensing Process (ILP).

In accordance with 18 CFR §5.15(f), Eagle Creek filed the Updated Study Report (USR) with the Commission on February 10, 2020. The USR provided details regarding the study activities performed by Eagle Creek following the Commission's Study Plan Determinations issued on February 9, 2018 and June 10, 2019, which were not previously provided in the Initial Study Report. Subsequent to the filing of the USR, Eagle Creek held the USR Meeting with Commission staff and other relicensing participants on February 19-20, 2020 in Monticello, New York. In accordance with 18 CFR §5.15(c)(3) and the schedule provided in the Commission's Scoping Document 2 (issued September 12, 2017), Eagle Creek is filing the enclosed USR Meeting Summary with the Commission.

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A copy of the USR Meeting Summary may be obtained electronically through FERC's eLibrary system at: https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket numbers P-10482, P-10481, and P-9690. In addition, a copy of the USR Meeting Summary may be obtained through Eagle Creek's website at: https://www.eaglecreekre.com/mongaup-river-relicensing.

If there are any questions regarding this letter or the USR Meeting Summary, please do not hesitate to contact Michael Scarzello with Eagle Creek at (973) 998-8400 or Jim Gibson with HDR at (315) 414-2202.

Sincerely,
Eagle Creek (Licensees)

Mr. Michael Scarzello
Director

cc: Distribution List

Enclosure: Updated Study Report Meeting Summary

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Mongaup Falls Hydroelectric Project (FERC No. 10481)
Rio Hydroelectric Project (FERC No. 9690)
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Mongaup Falls Hydroelectric Project (FERC No. 10481)
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Meeting Date: February 19-20, 2020

Meeting Location: Monticello Fire Station, 23 Richardson Avenue, Monticello, NY

Subject: FERC Relicensing - Updated Study Report (USR) Meeting
Mongaup River Hydroelectric Projects:

- Swinging Bridge Hydroelectric Project (FERC No. 10482)
- Mongaup Falls Hydroelectric Project (FERC No. 10481)
- Rio Hydroelectric Project (FERC No. 9690)

Meeting Purpose

The purpose of the Updated Study Report (USR) meeting was to present and discuss the results of the post-Initial Study Report (ISR) study activities performed in support of the on-going relicensing of the Mongaup River Projects.

Meeting Participants:

The following individuals participated in the ISR meeting.

Nick Ettema, FERC
Michael Davis, FERC*[1]
Colleen Corballis, FERC*[2]
Laura Washington, FERC*[1]
John Wiley, USFWS
Don Hamilton, NPS
Jessica Newbern, NPS[2]
Kevin Mendik, NPS*[2]
Brian Drumm, NYSDEC
Mike Disarno, NYSDEC
Mike Flaherty, NYSDEC
Chris Hogan, NYSDEC[1]
Sara Pawliczak, NYSDEC[2]
Bob Nasdor, AW[2]
Mark Zakutansky, AMC*
Jim Booker, SBPOA/HOOT
Rebecca Baldwin, SBPOA*
Ralph Cheney, SBPOA
Steve Wilson, SBPOA*[1]
Hal Teitelbaum, HOOT[1]
Roger Olson, NYTU
Kevin Noble, NYTU
Bob Gates, Eagle Creek[2]
Mike Scarzello, Eagle Creek
Matt Nini, Eagle Creek
Matt Ocwieja, Eagle Creek
Tony Butler, Eagle Creek
Tom O'Connor, Eagle Creek
Jim Gibson, HDR
Cate Russell, HDR
Scott Jones, HDR
Joe Cassone, HDR[1]
Brian Krolak, HDR[2]

*participated by phone
[1]Participated on February 19, 2020 only.
[2]Participated on February 20, 2020 only.

Federal Energy Regulatory Commission (FERC)
U.S. Fish and Wildlife Service (USFWS)
National Park Service (NPS)
New York State Department of Environmental Conservation (NYSDEC)
American Whitewater (AW)
Appalachian Mountain Club (AMC)
Swinging Bridge Property Owners Association (SBPOA)
Homeowners of Toronto (HOOT)
New York Chapter Trout Unlimited (NYTU)

Approved Studies

The Study Plan Determinations (SPDs) issued by the Federal Energy Regulatory Commission (FERC or Commission) on February 9, 2018 and June 10, 2019, directed Eagle Creek to conduct the following 18 studies in support of obtaining new licenses for the Projects.

1. Operations Model/Delaware River Flow Study
2. Aquatic Habitat Assessment Study
3. Fisheries Survey Study
4. Alewife Study
5. Fish Entrainment/Turbine Survival Study
6. Water Quality Study
7. Macroinvertebrate and Mussel Survey Study
8. Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area Assessment Study
9. Whitewater Boating Assessment Study
10. Whitewater Boating Flow Assessment Study
11. Shoreline Management Assessment Study
12. Cultural Resources Study
13. Black Brook Dam Decommissioning Study
14. Special-Status Species Study
15. Bald Eagle Survey Study
16. Bypass/Base Flow Transect Evaluation Study
17. Wetland Study
18. Fish Passage and Protection Study

Meeting Summary

The following provides a summary of the information and general discussions associated with the USR meeting, which were presented via PowerPoint slides. The USR Meeting PowerPoint presentation is provided in Attachment A.

1.0 Introduction, Schedule, and Project Overview

Mike Scarzello welcomed the group and asked participants in the room and on the phone to introduce themselves. Jim Gibson (HDR - relicensing consultant for Eagle Creek) presented the meeting objectives as well as the ongoing Integrated Licensing Process (ILP) schedule for the Projects. Mike Scarzello presented the meeting agenda and a brief overview of the Projects, which included a brief description of the Projects' facilities and operations.

2.0 Study Presentations (in order of presentation)

2.1 Cultural Resources Study

Jim Gibson provided a summary of the methodology and the results of the work completed to date for the Cultural Resources Phase IB Study via the PowerPoint slides provided in Attachment A. Jim said this study was on-going in order to finish the field work required within the reservoir fluctuation zone at Swinging Bridge and Cliff Lake reservoirs.

Michael Davis asked when this study is expected to be complete. Cate Russell said the field work will be complete when the ground is thawed and surface water elevations are low enough to perform the remaining work at Swinging Bridge and Cliff Lake reservoirs. Matt Ocwieja said that surface water elevations at Swinging Bridge and Cliff Lake reservoirs may be low enough to complete the work between mid-March and mid-May unless it is a wet spring. In addition, given that a number of the locations must be accessed by boat, the remaining field work will need to occur following ice out on the Swinging Bridge and Cliff Lake reservoirs. As of the date of this filing, the remaining field work is scheduled to be performed in March 2020.

2.2 Special-Status Species Study Update

Cate Russell provided a summary of the methodology and results of the Updated Special-Status Species Study via the PowerPoint slides provided in Attachment A.

John Wiley and Michael Flaherty asked that Eagle Creek provide them with a full copy of the Study Report filed with FERC, since it was filed with FERC as non-public, privileged information. On February 19, 2020, Cate Russell emailed John Wiley and Michael Flaherty a copy of the requested report.

2.3 Bald Eagle Study

Cate Russell provided a summary of the methodology and results of the Bald Eagle Study via the PowerPoint slides provided in Attachment A.

Similar to the Special-Status Species Study Report, John Wiley and Michael Flaherty asked that Eagle Creek provide them with a full copy of the Study Report filed with FERC, since it was filed with FERC as non-public, privileged information. On February 19, 2020, Cate Russell emailed John Wiley and Michael Flaherty a copy of the requested report.

2.4 Aquatic Habitat Assessment Study

Scott Jones provided a summary of the methodology and results of the Aquatic Habitat Assessment Study via the PowerPoint slides provided in Attachment A.

John Wiley asked what type of DEM data was used for interpolating between the upper limits of the side scan sonar data and the upland contour data in the study. Scott Jones reported to John Wiley, Mike Flaherty, and Mike DiSarno that the 2-meter DEM data was used for overbank areas which was derived from bare earth and LIDAR data.

John Wiley questioned the steepness category of the downstream portion of Cliff Lake in association with the documented erosion. Mike Flaherty and Scott Jones provided photographs of the area in question, and Scott Jones provided a description of the slope categories and substrate and an explanation that the survey for erosion was qualitative in nature.

John Wiley said he was surprised that the Centrarchid nests were observed in Zone 3 at the Mongaup Falls Reservoir. HDR reviewed the data and confirmed that the Centrarchid nests observed during the study occurred in Zone 2 and not in Zone 3. This information will be updated for any future reports/ presentations.

Mike Flaherty asked what the rate of drawdown was in the days preceding the field observations of the fish stranding. The field observation of fish stranding in the northern portion of Swinging Bridge Reservoir occurred between May 13 and 15, 2019. From May 1 through May 12, 2019, Swinging Bridge Reservoir elevation decreased steadily at a rate of approximately 0.6 feet per day (0.3 inches per hour). The fish were observed swimming in a water-filled depression in Swinging Bridge Reservoir that had lost connectivity to the larger water body and, therefore, is not considered a result of the rate of drawdown.

Rebecca Baldwin asked what time of year the fluctuation zone is used by aquatic species. Scott Jones said it is primarily used by spawning fish species. Michael Flaherty said the Centrarchid spawning period primarily occurs between May and June.

Rebecca Baldwin asked what drawdown rate is conducive to mitigate impacts to fish. Michael Flaherty said it is variable based on topography and substrate/bottom habitat.

Rebecca Baldwin asked about the timing of the growth of the submerged aquatic vegetation (SAV) in Toronto Reservoir and whether it is affected by exposure to air. Scott Jones indicated that any effects are dependent on the magnitude, duration, and length of the exposure.

2.5 Water Quality Study Update

Cate Russell presented the methodology and results of the Updated Water Quality Study via the PowerPoint slides provided in Attachment A. Cate reminded the meeting participants that consistent with FERC's SPD, the water quality data presented in the USR is the 2016 and 2017 data collected in support of the ongoing compliance monitoring, as compared to the data collected specifically in support of the relicensing process.

Michael Flaherty asked about the typical duration of generation at the Projects. Matt Ocwieja said the typical duration of generation at the Project is about 4 hours, but is sometimes 6-8 hours based on power demand from the electrical grid.

John Wiley said that during times of generation at the Swinging Bridge Powerhouse, the water quality data shows that water temperatures increase and dissolved oxygen concentrations decrease in the Mongaup River below the powerhouse. Matt Ocwieja said that during generation Unit No. 2 pulls from a larger cone of water from the reservoir, and depending on the time of the year, this results in a combination warmer waters from closer to the surface, as well as water with lower dissolved oxygen content from deeper depths.

John Wiley and Mike Flaherty asked why there were downward spikes in dissolved oxygen concentrations in the data collected from below the Mongaup Falls Powerhouse in September and October 2017. Matt Ocwieja noted that this is not data collected in support of the relicensing process, but from Eagle Creek's annual monitoring requirements and that the downward spikes may have been caused by an issue with the monitoring device since the data appears to be an anomaly. Jim Gibson noted that the compliance data will be further reviewed to determine if any such indications of issues with the equipment were documented or indicated by the data. Dissolved oxygen concentrations were in compliance with the applicable instantaneous water quality standard (5 milligrams per liter) throughout the 2017 monitoring season, with the exception of short-term excursions that occurred on July 8 and September 23, 24, 25, 27 and 28, 2017. Per review of the data and field notes from the 2017 monitoring season, it appears that the excursions were a result of fouling of the monitoring equipment deployment tube. The Mongaup Falls Powerhouse was not generating during any of the days in which an excursion occurred in 2017.

John Wiley asked if the USGS gage downstream of the Swinging Bridge Powerhouse is active and if the data is available online. Matt Ocwieja replied yes.

John Wiley said that in late September 2017 below Rio Main Powerhouse, the data indicates there was a deviation in the required minimum flow when the facility started spilling, which also caused a rise in water temperatures in the Mongaup River (due to the release of warmer surface water from Rio Reservoir).

John Wiley asked why the minimum flow in the Rio Bypassed Reach dropped below 100 cfs in early August 2019. Matt Ocwieja said that consistent with established procedures, Eagle Creek consulted with the NYSDEC to temporarily reduce flows below 100 cfs in the Rio Bypassed Reach based on low inflows in the Mongaup River upstream of the Swinging Bridge Project (i.e., less than 30 cfs). Mike Flaherty confirmed the reduction in flow was performed in consultation with the NYSDEC and that this is an established practice during low inflow periods.

2.6 Water Quality Study - Delaware River Water Temperature Monitoring

Cate Russell presented the methodology and results of the Delaware River Water Temperature Monitoring portion of the Water Quality Study via the PowerPoint slides provided in Attachment A.

John Wiley asked if the data presented on slide #67 was based on a daily average. The figure presented on slide #67 used continuous sub-hourly data from the USGS gages.

The group confirmed that water temperatures can vary by as much as 2 to 7 degrees Fahrenheit over the course of a 24-hour period.

Don Hamilton asked if the data presented on slide #71 was based on an average of the water temperature data collected across each river transect. The data used to develop the figure presented on slide #71 is based on the data collected from the monitors deployed on river left (RL) at each transect since the monitors deployed in river center (RC) could not be retrieved and only a portion of the monitors were retrieved from river right (RR).

John Wiley and Don Hamilton said they would like additional analyses of the Delaware River water temperature impacts to define the conditions when the greatest level of impact to water temperatures in the Delaware River result from flows from the Mongaup River.

With regard to how temperature mitigation may be performed, John Wiley made the comment that generation from the Projects could be curtailed (thus minimizing flows from the Mongaup River).

2.7 Delaware River Flow Study

Cate Russell presented the methodology and results of the Delaware River Flow Study via the PowerPoint slides provided in Attachment A.

John Wiley asked how the percent contributions were determined. For each year evaluated (2016-2019), a low, normal, and high flow period (as defined in the FERC SPD) was identified during which time the Rio Project provided minimum flow, one-unit, and two-unit releases. Each period was approximately one week long with the exception of the low flow periods identified in 2016 and 2019, which were two weeks long in order to represent a period with a minimum flow, one-unit, and two unit release. During the each period identified, the percent contribution from the Mongaup River was calculated at 15-minute intervals at each gage in the study on the Delaware River and, then the 15-min interval calculations were averaged to depict the contribution during the duration of the minimum flow release, the one-unit release, and the two-unit release.

John Wiley said the analysis should include a consideration of the flows at the USGS gage on the Delaware River in Calicoon in relation to the downstream data.

Don Hamilton asked if Eagle Creek could provide him with historic recreation flow release dates. Matt Ocwieja said yes, but may not have data available prior to Eagle Creek ownership and operation. Eagle Creek obtained ownership and operation of the Rio Hydroelectric Project in January 2011. Recreation flow release dates from 2011 through 2019 are provided in Attachment B.

The group reviewed various graphs showing flows within the Delaware River.

Roger Olson said that on September 14, 2019, representatives from NYTU were walking Black Lake Creek below the Toronto Dam and observed high flows being discharged into Black Lake Creek. Roger said that high flows this time of year are considered bad for fisheries and their habitat due to the fish redds. Matt Ocwieja said the flow being released from Toronto Dam that day was 100 cfs in order to provide additional water to Swinging Bridge Reservoir.

2.8 Fish Entrainment/Turbine Survival Study Update

Joe Cassone presented the methodology and results of the Updated Fish Entrainment/Turbine Survival Study via the PowerPoint slides provided in Attachment A.

John Wiley asked Eagle Creek to confirm the different head shown for Units 2 and 3 at the Swinging Bridge Development. Eagle Creek confirmed that the information presented is correct.

Michael Flaherty asked if there is data in the EPRI database on survival of alewife or a comparable surrogate, and if not, whether Eagle Creek should consider data from the previous entrainment studies performed during the last relicensing. There is data in the EPRI database on survival of alewife; however, the data are from projects with site and operational characteristics outside of the parameters of the three Mongaup Projects. The 1992-1993 entrainment studies provided entrainment rates based on tailrace netting and survival/mortality rates were based on a literature review of the EPRI database available at that time. The literature review indicated an 88 percent survival rate during summer months for juvenile American shad (Alosa sapidissima) that passed the Holtwood project (62 ft of head and 95 rpm Francis turbine) on the Susquehana River. The study deemed American shad as a suitable surrogate for alewife based on their similarity in body shape and swimming ability.

2.9 Fish Passage and Protection Study

Joe Cassone presented the methods and results of the Fish Passage and Protection Study via the PowerPoint slides provided in Attachment A.

Roger Olson said NYTU would like a fish ladder installed for trout at the Black Brook Dam if it is not breached or removed.

John Wiley noted that Jesus Morales (USFWS) has performed a review of Black Brook dam and believes that prior to installation of Black Brook dam, trout would be able to move upstream over the natural falls located at the site.

John Wiley said that the current USFWS minimum criteria for downstream fish passage attraction flow is ≥5% of the hydraulic capacity of the powerhouse(s).
John Wiley asked why the study did not evaluate micro screens. Jim Gibson noted the concern of debris management and plugging of the screens.

Don Hamilton said that the NPS supports passage of American eel at the Projects since American eel are a fish host for *Eastern ellipito* mussels, which could result in an increase in mussels in the system. Don also indicated that eels are known to contribute ocean nutrients to the system, and prey on rusty crayfish, which prey on native crayfish.

End of discussion on February 19, 2020.

2.10 Recreation Study

Cate Russell presented the methodology and results of the Recreation Study via the PowerPoint slides provided in Attachment A.

Kevin Mendik asked if the same form was used to evaluate the amenities at the privately-owned recreation facilities and Project-related recreation facilities. Recreation inventory forms were not used to assess the amenities at the privately-owned marinas on Swinging Bridge Reservoir. Section 6.0 of the Recreation Study Report indicates the following: "The owners of the privately-owned marinas were contacted to obtain information on the site's available amenities and services, as well as hours of operation. A field visit to the private recreation sites was conducted on June 2, 2019 to record additional information. Generally, the recreations sites and facilities were in good condition and meeting their intended function."

Kevin Mendik asked if cameras or counters were employed in the recreational survey counts, and Bob Nasdor asked if the surveys were provided via the internet. Jim Gibson said that these devices and means were not used and noted that the methodology used in support of the study was developed in consultation with the relicensing parties and approved by FERC.

Bob Nasdor asked how the whitewater boater user counts were entered into the overall user spot counts. Spot counts were performed on two days (May 26 and October 28) that coincided with the 2018 whitewater boating releases at the Rio Project. As indicated in Section 5.2.1.1 of the Recreation Study Report, recreation use was estimated based on use data collected via spot counts and user surveys. Actual use records from sign-in sheets at the Rio Hand Boat Launch / Fishing Access / Whitewater site and the Mongaup Eagle Viewing Station were also used to develop use.

Bob Nasdor asked how the whitewater boaters were incorporated into the survey administered to recreationists. If whitewater boaters were encountered during the spot counts performed at the Rio Hand Boat Launch / Whitewater site, they were asked to complete a survey for the Recreation Study Report. A total of three recreationists encountered at the Rio Hand Boat Launch / Whitewater site completed surveys as part of the Recreation Study. A total of 738 whitewater boaters used the sign-in sheet at the Rio launch and 104 whitewater boaters at the Rio Project completed surveys administered as part of the 2018 Whitewater Boating Assessment Study.

Rebecca Baldwin asked if boats on the water were counted or if people in the boats were surveyed during the study. Cate Russell indicated that surveyors did not use boats to intercept boaters on the reservoirs; instead boaters were intercepted at the public launches. Additional information about the Projects was collected from homeowners with shorefront property or right-of-way to the Swinging Bridge and Toronto reservoirs via the Shoreline Management Assessment Study in the ISR filed with the Commission on February 8, 2019 and presented during the ISR Meeting on February 13-14, 2019.

Rebecca Baldwin asked how the percentages of use per recreation activity were determined in Table 5-4 of the report. The user contact survey instrument was designed to determine the nature of recreation use of the Projects and users' perceptions with respect to their recreation use of the formal and informal recreation sites. Among other things, the survey asked recreationists to identify the recreational activities they were participating in at the Project that day and during the past five years. The activity type by season (% participating in X activity in each season) was calculated by finding the weighted average of the observed activity during spot counts for each season and site and the responses to the recreation use survey for each season and site. The weighted average (% participating in X activity in each season) was multiplied by the estimated seasonal use for each site to get seasonal use by activity type (number of persons participating in X activity). The use by site was calculated by summing the seasonal activity and then finding the average % use for each activity.

John Wiley said there appears to be an error or inconsistency in the report where it indicates that the average distance travelled by recreationists to the Project sites is 30 miles since the survey data indicates recreationists often travelled greater than 30 miles to the sites. As indicated in the Recreation Study Report, the average or median distance traveled by recreationists to the sites was at times greater than 30 miles; however, the majority of the survey respondents indicated that they traveled 30 miles or fewer to recreate at the Projects.

Jim Booker asked how the 1.3% growth value was derived. The sources/methods used to estimate the total percent change across the six counties is provided in Table 5-159 in the Recreation Study Report.

Roger Olson asked if the inventory evaluated access according to the Americans with Disabilities Act (ADA). Yes, as described in Section 4.1 of the Recreation Study Report, the information collected included identification of ADA-related amenities at formal recreation sites, with results presented in Section 5.1 of the report.

Roger Olson said NYTU would like additional access to Black Lake Creek for persons with disabilities and/or with limited mobility (e.g., fishing platforms).

2.11 Whitewater Boating Flow Assessment Study

Cate Russell presented the methodology and results of the Whitewater Boating Flow Assessment Study via the PowerPoint slides provided in Attachment A.

Michael Flaherty said higher flows in the Rio Bypassed Reach may negatively affect fishing/wading opportunities.

John Wiley said that downed trees in the Rio Bypassed Reach may provide good habitat for fish.

Bob Nasdor asked why the flow from the Rio Main Powerhouse was only about 410 cfs instead of the normal 435 cfs. Matt Ocwieja said the lower flow from the Rio Main Powerhouse could have been caused by head loss due to the operation of the minimum flow valve and the Rio Minimum Flow Unit to provide flows into the Bypassed Reach.

Bob Nasdor complemented Eagle Creek with the immediate follow-up to let him know that the flows on the day of the study were lower than expected and to provide an explanation as to why the lower flows occurred.

Colleen Corballis asked if boaters who participated in the study were contacted after the study to inform them that the flow they experienced in the Bypassed Reach was lower than the target flow and ask them to provide their opinion on the optimal flow in the Bypassed Reach. Cate Russell said that during the study, boaters were notified that the flow in the Bypassed Reach was likely slightly lower than the target flow of 250 cfs, but they were not contacted after the study to provide additional input to the surveys.

John Wiley asked if 250 cfs would be considered the minimum acceptable boating flow in the lower Mongaup River reach. Bob Nasdor, who participated in the study and has boated the lower Mongaup River reach in the past, said that based on his experience and information from other boaters, he believes the minimum acceptable boating flow in the lower Mongaup Reach is approximately 535 cfs (i.e., 100 cfs from the Bypassed Reach combined with a one-unit release from the Rio Main Powerhouse).

2.12 Operations Model Study

Cate Russell and Brian Krolak presented the methodology and results of the Operations Model Study via the PowerPoint slides provided in Attachment A.

John Wiley said the USR did not include a description of the recently installed Unit No. 3 at the Swinging Bridge Development and asked if that unit was considered during the model scenario runs. Brian Krolak said the model did incorporate operation of Unit No. 3 at the Swinging Bridge Development.

John Wiley asked if the HOOT/SBPOA-requested scenarios are based on homeowners' perceptions of reservoir levels or other factors. Jim Booker said that the reservoir elevations in their requested scenarios are based on experiences living on the reservoirs.

John Wiley asked about the difference in dollar value between peak and off-peak power. Matt Ocwieja said it can vary based on time of day and time of year, but generally, the difference between peak and off-peak power is approximately $20-$30 per megawatt hour.

Don Hamilton asked how much of the average annual generation is considered peak. This information will be provided in the Final License Application.

Don Hamilton asked Eagle Creek to provide the table used to define peak and off-peak periods in the model. Matt Ocwieja and Jim Gibson indicated that the table will be filed in the Final License Application.

John Wiley asked how often the recreation flow releases have been cancelled over the 30-year period of record (1988-2017). Whitewater release dates since 2011 (subsequent to Eagle Creek ownership and operation of the Rio Hydroelectric Project) are provided in Attachment B. Since 2011, whitewater recreation flow releases have occurred as scheduled unless precluded by availability of the powerhouse equipment (i.e., an outage or mechanical issue with Units 1 and/or 2 in the Rio Main Powerhouse). During times that an equipment outage or issue precluded the recreation flow release, Eagle Creek rescheduled the release for another day/weekend within the season.

Jim Booker said it is very important to SBPOA and HOOT for the Toronto and Swinging Bridge reservoirs to reach full pond by Memorial Day. Matt Ocwieja said Eagle Creek would like to better understand the basis for that request and what is considered full pond, since Eagle Creek typically does not target full pond since that could result in an uncontrolled spill over the sacrificial flashboards and could cause a rapid reduction in the pond elevations if the flashboards were to fail as well as significantly larger uncontrolled spillage flows into Black Lake Creek.

Roger Olson said NYTU has concerns related to identifying the appropriate flows for Black Lake Creek to enhance trout habitat and also wants a trail to be established along all of Black Lake Creek for fishing access.

2.13 Additional USR Comments

Nick Ettema said that comments on the USR and new study requests are due within 30 days of the due date for the USR Meeting Summary. Nick also indicated that any new study requests are held to a higher bar than previous requests and filers should reference the applicable regulations to be sure they are meeting the requirements to demonstrate why new studies are needed.

Attachment A

USR Meeting PowerPoint Presentation


Updated Study Report Meeting

February 19-20, 2020

Mongaup River Hydroelectric Projects

Swinging Bridge Project (FERC No. 10482)

Mongaup Falls Project (FERC No. 10481)

Rio Project (FERC No. 9690)

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Meeting Agenda

Wednesday, February 19 (8:30 – 5:00)

1. Cultural Resources Study (to date)
2. Special-Status Species Study Update
3. Bald Eagle Study
4. Aquatic Habitat Assessment Study
5. Water Quality Study Update

Lunch (12:00-12:45 on your own)

6. Delaware River Water Temperature Study Update
7. Delaware River Flow Study Update
8. Fish Entrainment/Turbine Survival Study Update
9. Fish Passage and Protection Study

Thursday, February 20 (8:30 – 5:00)

1. Recreation Study
2. Whitewater Flow Assessment Study
3. Operations Model Study

Lunch (12:00-12:45 on your own)

4. Operations Model Study (cont.)
5. Preliminary Settlement Schedule Overview

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

ILP Schedule – through March 2020

Responsible Party	Activity	Date
Eagle Creek	Filed Notices of Intent (NOIs) and Pre-Application Document (PAD)	March 30, 2017
FERC	Issued Notice of Commencement of Proceeding & Scoping Document 1 (SD1)	May 30, 2017
FERC	Conducted Scoping Meetings and Site Visit	June 21-22, 2017
Stakeholders	Filed Comments on PAD, SD1, and Study Requests	July 29, 2017
Eagle Creek	Filed Proposed Study Plan (PSP)	September 12, 2017
FERC	Issued Scoping Document 2 (SD2)	September 12, 2017
Eagle Creek	Conducted PSP Meeting	October 4, 2017
Stakeholders	Filed Comments on PSP	December 11, 2017
Eagle Creek	Filed Revised Study Plan (RSP)	January 10, 2018
Stakeholders	Filed Comments on RSP	January 25, 2018
FERC	Issued Study Plan Determination	February 9, 2018
Eagle Creek	Conducted First Season of Studies	2018
Eagle Creek	Filed Study Progress Reports	May 1, Aug 1, Nov 1, 2018
Eagle Creek	Filed Initial Study Report (ISR)	February 11, 2019
Eagle Creek	Conduct ISR Meeting	February 13-14, 2019
Eagle Creek	File ISR Meeting Summary	March 11, 2019*
Stakeholders	File Comments on ISR, ISR Meeting Summary, Study Requests	April 10, 2019*
Eagle Creek	Conduct Second Season of Studies (if necessary)	2019
Eagle Creek	File Draft License Application	November 4, 2019
Stakeholders	Comments on Draft License Application	February 3, 2020
Eagle Creek	File Updated Study Report (USR)	February 10, 2020
Eagle Creek	Conduct USR Meeting	February 19-20, 2020
Eagle Creek	File Updated Study Report Meeting Summary	March 10, 2020
Eagle Creek	File Final License Application	March 31, 2020

*Pursuant to SD2 Issued by FERC on September 12, 2017.

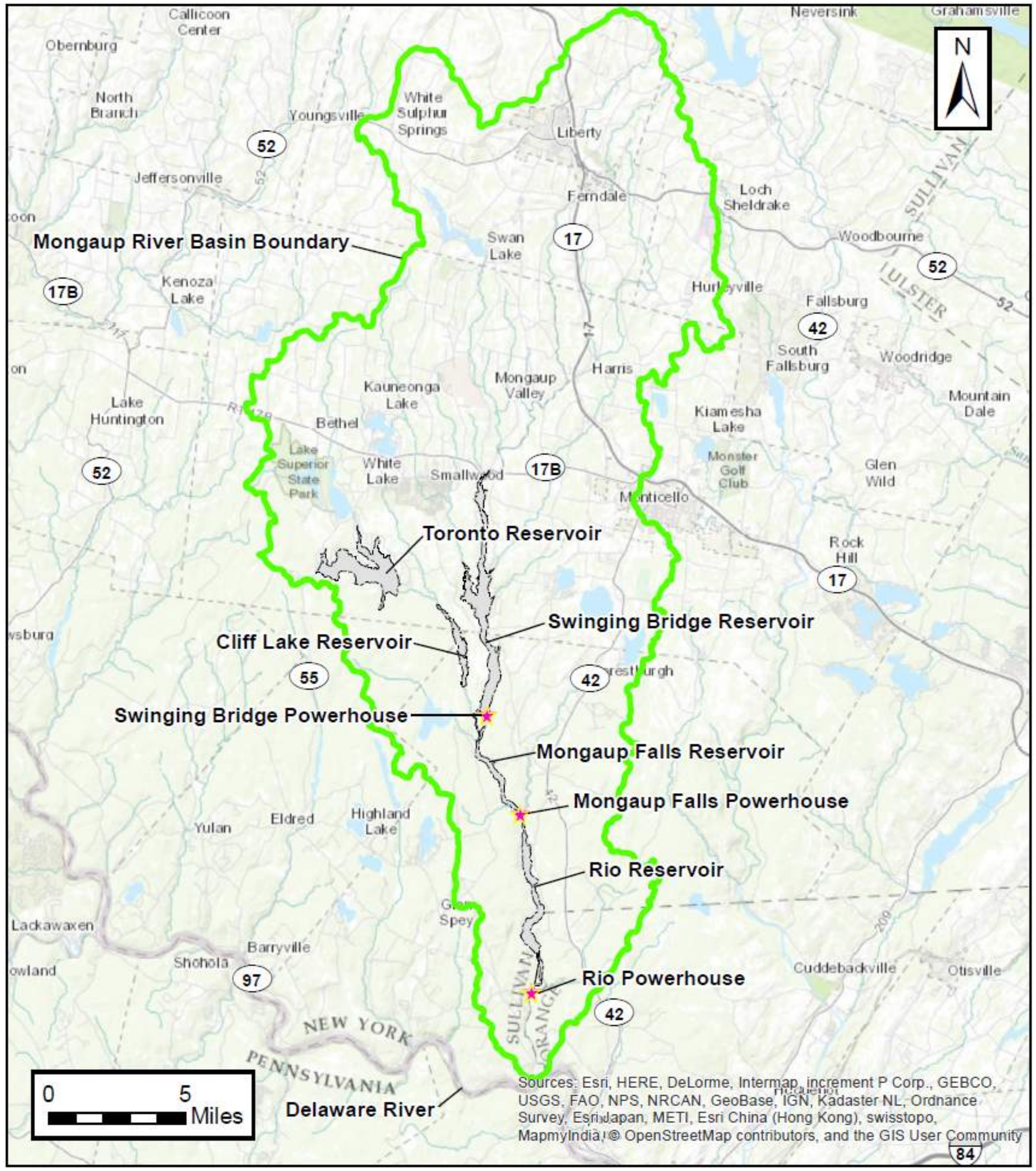
Project Overviews

Mongaup River Hydroelectric Projects

- Three separate FERC-licensed projects
  - Swinging Bridge – 10482
    - Toronto Development (storage)
    - Cliff Lake Development (storage)
    - Swinging Bridge Development
  - Mongaup Falls – 10481
  - Rio – 9690
- Licenses issued April 14, 1992
- Licenses expire March 31, 2022
- Three co-licensees (collectively Eagle Creek Hydro)
  - Eagle Creek Hydro Power, LLC
  - Eagle Creek Water Resources, LLC
  - Eagle Creek Land Resources, LLC

General Location

- Located in Sullivan and Orange Counties
- Toronto and Cliff Lake Reservoirs are located on Black Lake Creek
- Swinging Bridge, Mongaup Falls, and Rio Reservoirs are located on Mongaup River



EAGLE CREEK
RENEWABLE ENERGY
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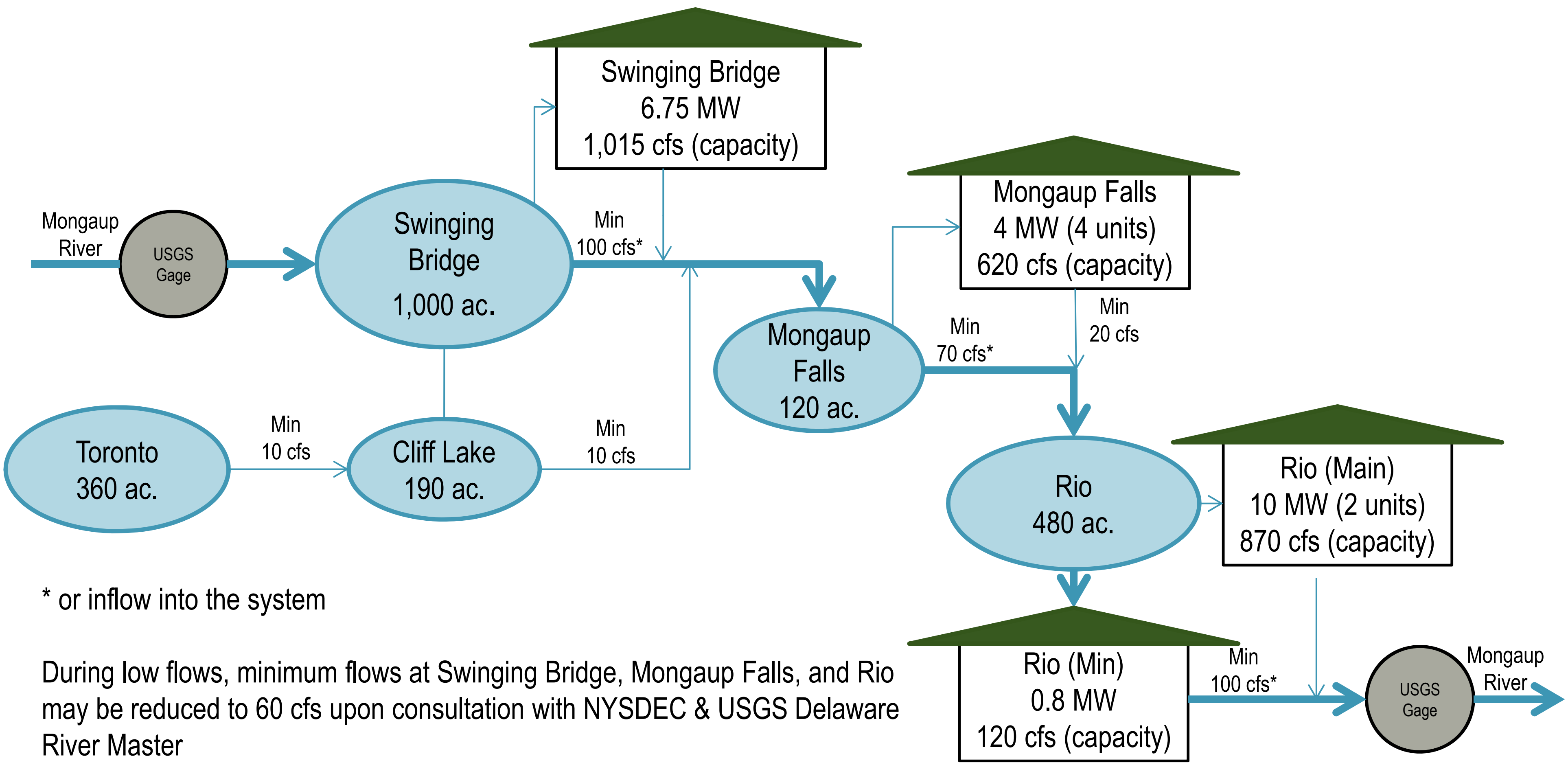
Current Operations



* or inflow into the system

During low flows, minimum flows at Swinging Bridge, Mongaup Falls, and Rio may be reduced to 60 cfs upon consultation with NYSDEC & USGS Delaware River Master

Studies

Cultural Resources Study – Phase 1B (to date)

Cultural Resources Study

Goals and Objectives

- Identify properties eligible for or listed on the NRHP and may be affected by Project operations and maintenance within the APE.
- Assess specific project-related effects to any historic property within each Project’s APE.
- Conduct comprehensive cultural resources survey consisting of a systematic pedestrian survey within all accessible areas of the APE for each Project.

Cultural Resources Study

Methodology

Phase IA Literature Review and Sensitivity Assessment

- Review CRIS and NRHP to confirm no new/additional data since 2018.
- Conduct site visit to view existing conditions, land use, evidence of soil disturbance/ erosion along impoundments.
- Complete geoarchaeological assessment of Projects.
- Assess archaeological sensitivity and potential locations for Phase IB testing.

Phase IB Archaeological Field Reconnaissance

- Conduct shovel tests in areas where soils have the potential to be impacted by operation of Projects, as identified during Phase IA activities.
- Examine soils for precontact and historic artifacts.
- If found, record archaeological structural remains.

Cultural Resources Study

Results

- Reviewed CRIS/NRHP
- Site visit performed mid-Oct 2019 to view shoreline of each impoundment via boat.
- A total of 290 shovel tests completed in Oct-Nov 2019 at Rio, Mongaup Falls, Toronto and the northern portion of Swinging Bridge reservoirs.
- Shovel testing is complete at Rio, Mongaup Falls, and Toronto reservoirs.
- To date, three potential archaeological sites have been identified:
  - Two at Swinging Bridge Reservoir
  - One at Mongaup Falls Reservoir
- Shovel testing is ongoing at Swinging Bridge and Cliff Lake reservoirs; anticipated to be completed in 2020 upon thawed ground and lower reservoir elevations.

Special-Status Species Study Update

Special-Status Species Study Update

Goals and Objectives

- Supplement the existing information necessary to address the potential effects of the Projects' operations and maintenance, land management activities, and recreation use on the presence of special-status wildlife and plant species and their habitat.

Study Area

- Areas influenced by Project operations and formal Eagle Creek-owned recreation facilities within the Projects' FERC project boundaries, as well as downstream river and stream reaches that are outside of the established FERC project boundaries.
- These reaches consisted of Black Lake Creek (from Toronto Dam to the confluence with the Mongaup River), Black Brook (from the upstream end of the Black Brook Dam impoundment to the confluence with the Mongaup River), and the portions of the Mongaup River from Swinging Bridge Dam to the Delaware River that are not included in the project boundaries.

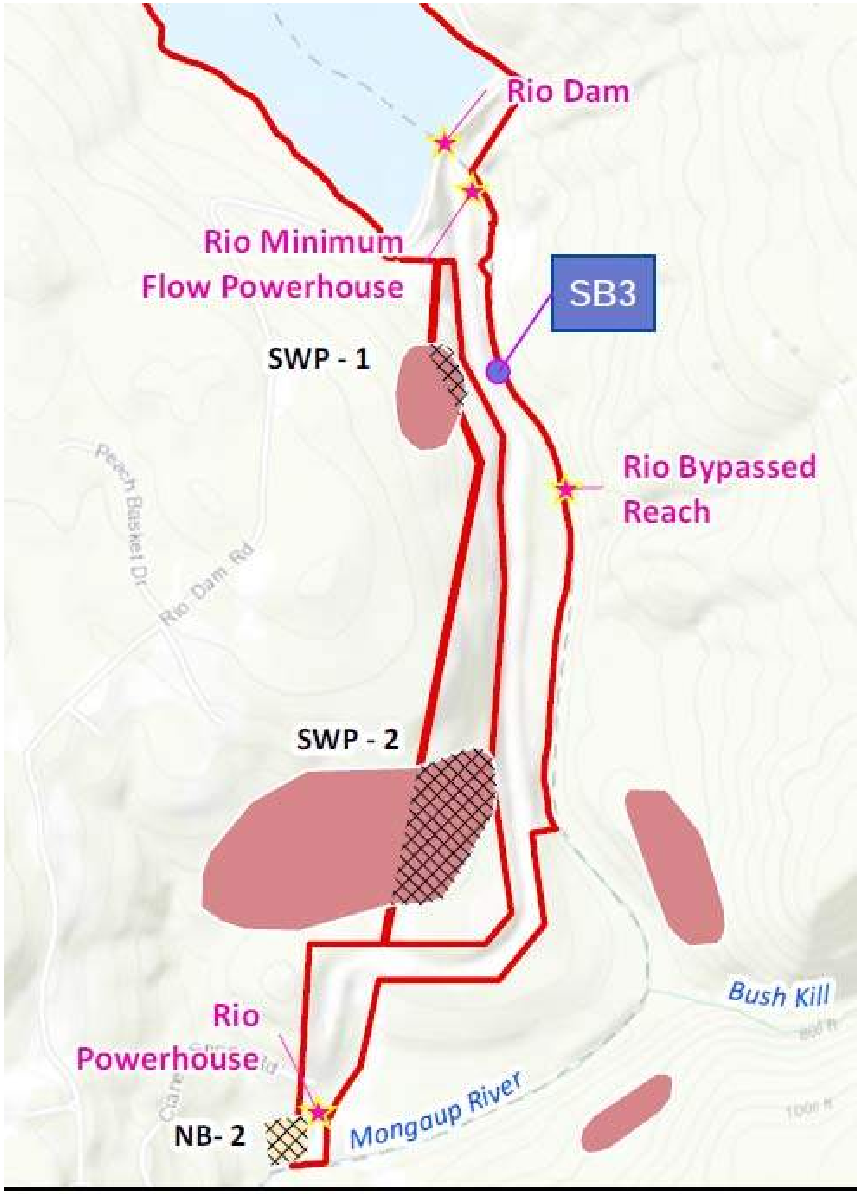
Special-Status Species Study Update

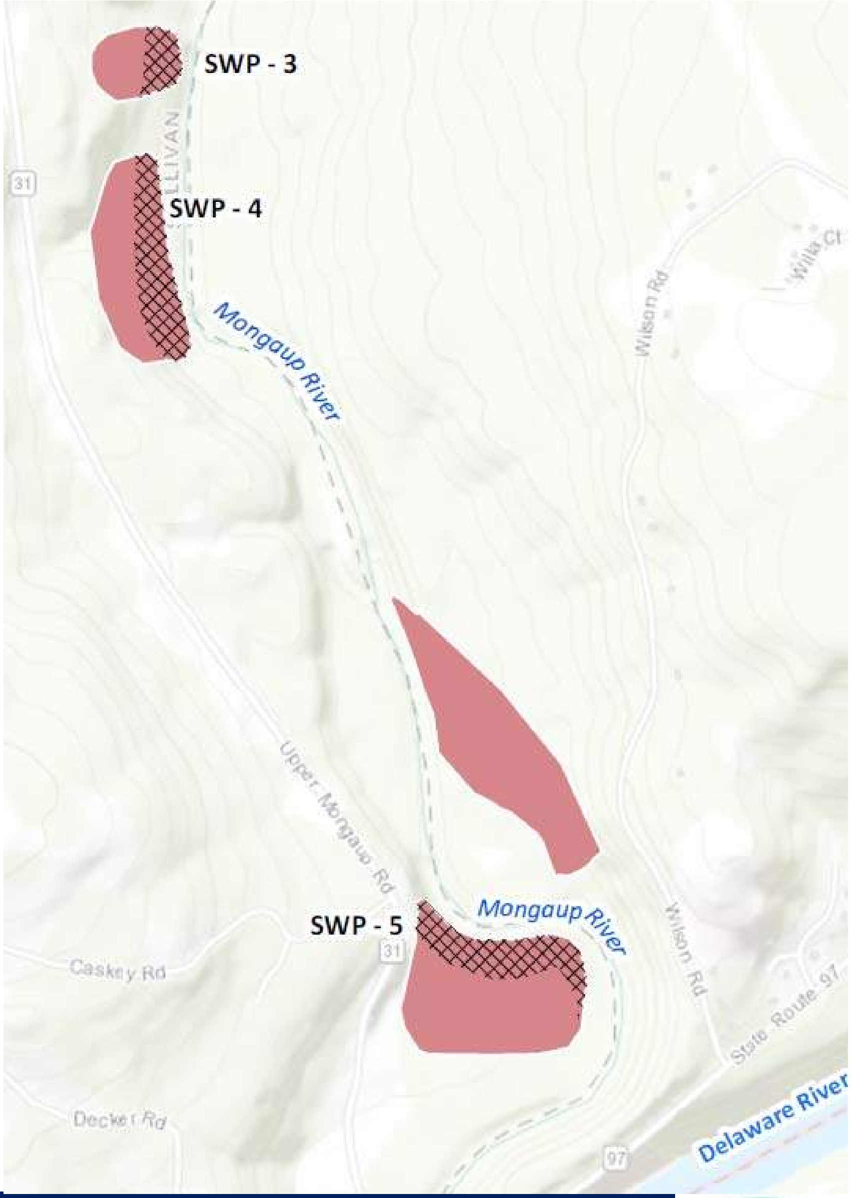
Results

<u>Field Surveys</u>

- Subsequent to filing the ISR with the Commission on February 8, 2019, the USFWS issued comments on the ISR requesting Eagle Creek perform additional field surveys for small whorled pogonia during the plant's blooming season (e.g., May to mid-June).
- Accordingly, on May 30 and June 12, 2019, surveys were performed on a total of 19.77 acres across three sites (SWP-2, 3, and 5) based on the estimated percentage of habitat determined to be potentially suitable for small whorled pogonia during the 2018 survey. The survey dates were chosen based on a consideration of the weather that occurred in May 2019 (i.e., above average rainfall and below average temperatures).
- During the 2019 surveys, no specimens of small whorled pogonia were observed; although, suitable habitat for the species was present on all three sites surveyed.

Special-Status Species Study Update





Bald Eagle Study

Bald Eagle Study

Goals and Objectives

- The goals and objectives of this study are to summarize existing information regarding bald eagle nesting and winter foraging activities associated with the Projects'.
- Document the location and status of bald eagle nests and overnight roost sites occupied by bald eagles, as well as foraging behaviors in the immediate vicinity of the Projects.

Study Area

- The study area includes the areas in the immediate vicinity of the Projects' reservoirs (Toronto, Cliff Lake, Swinging Bridge, Mongaup Falls, and Rio) and powerhouses (Swinging Bridge, Mongaup Falls, and Rio).

Bald Eagle Study

Methodology

Review of Existing Information

- Compiled existing information associated with bald eagles in the Mongaup River system.
- Consulted with the Delaware Highlands Conservancy (DHC) to obtain information related to their volunteer bald eagle viewing program in the Mongaup River system.
- Requested information related to bald eagles in the vicinity of the Projects including:
  - Nest locations and status;
  - Winter roost site locations;
  - Breeding Summary Reports (since 2010); and
  - Other relevant information from the USFWS, NPS, and NYSDEC.
- NYSDEC and NPS provided known nest locations in the vicinity of the Projects and Delaware River.
- USFWS indicated they had no additional information related to bald eagle location or nesting sites.

Bald Eagle Study

Methodology (cont.)

Field Surveys

- Bald eagle nest locations within the study area were mapped using information obtained from the NPS, NYSDEC, and NYNHP.
- Field surveys consisted of nest surveys and winter surveys.
- Field biologists also noted bald eagle activity and nest observations during other relicensing studies performed in 2018 and 2019.

Nest Surveys

- Performed during the early breeding (mid-December 2018), mid-nesting (early March 2019), and late nesting (mid-May 2019) season in New York.
- Identify/confirm the location and status (presence/absence, active/inactive) of eagle nests identified in the immediate vicinity of the Projects' reservoirs or powerhouses.
- The mid-December and early March nest surveys were performed via an established standard vehicle survey route along accessible areas of the Project area.
- The mid-May nest survey was performed via boat on the Projects' reservoirs.

Winter Surveys

- The winter surveys were performed in mid-January and early-February 2019.

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Bald Eagle Study

Methodology (cont.)

Surveys during Swinging Bridge Project Minimum Flow Powerhouse Construction

- From February 20, 2019 through March 27, 2019, Eagle Creek conducted bald eagle observations at the Swinging Bridge Dam to observe and document the potential effects of construction activities (e.g., effects of noise) on bald eagles within the local area.
- These surveys were conducted by at least two trained volunteers from the Delaware Highlands Conservancy who were located on the crest of the Swinging Bridge Dam.

Bald Eagle Study

Results

Review of Existing Information

- For more than 30 years, significant information associated with bald eagles in the vicinity of the Mongaup River Projects has been collected from varying sources including O&R, USFWS, NPS, NYSDEC, NYNHP, and DHC.
- From 1979 to 2010, NYSDEC performed a combination of aerial and ground surveys to count adult and immature individuals in the Mongaup River Basin, with results provided in annual reports through 2010.
- Based on the data collected to date, the Mongaup River system provides important over-wintering habitat for northern migrants and New York's resident eagles.
- During the previous licensing, studies and analyses of bald eagle habitat and foraging in the vicinity of the Projects were completed. As a result, PM&E measures were implemented as part of the existing license for the protection of bald eagles.
- During the 2010 winter survey conducted by the NYSDEC, 82 bald eagles were observed within the Mongaup River system, 42 adults and 40 immatures, compared to only 24 eagles counted in the area during the 2009 survey.
- There are 10 previously documented bald eagle nests located within the Projects' vicinity.

Bald Eagle Study

Results

Nest Surveys

- Nest surveys were performed on December 19, 2018, January 14, February 5, March 20, and the week of May 13, 2019
- Surveyors located 9 bald eagle nests.
  - Of those, 7 (T-1, SWB-1, CL-1, CL-2, MF-2, R-1, and R-2) had been previously documented by the NYSDEC, NYNHP, and NPS, and 2 are considered to be new or previously undocumented by the NYSDEC, NYNHP or NPS.
  - The two new/undocumented nests are located: 1) on the Toronto Reservoir approximately 3,500 feet northeast of nest T-1 on the peninsula in the Toronto Reservoir bisected by Homestead Trail; and 2) on the Swinging Bridge Reservoir approximately 2.13 miles southwest of SWB-1 near the mouth of White Lake Brook.
  - Of the 9 nests documented during the nest surveys in 2019, 4 were found to be occupied by either a single adult or pair of adults tending to eggs.
  - On Toronto Reservoir, the surveyors observed an adult bald eagle bringing a small dead fish to the nest (T-3) on May 16, 2019.
  - Three of the historic nests (T-2, MF-1, and R-3) reported by the NYSDEC, NYNHP, and NPS were not located, but are thought to be the same data points for nearby nests as a result of obtaining bald eagle nest location data from multiple data sources.

Bald Eagle Study

2018-2019 Nest Survey Results

Eagle Creek Identification Code[1]	NYNHP Identification Code	Status of Nest in 2018[2,3]	Status of Nest in 2019[2]
T-1	Bald Eagle #20	Not occupied, unrepaired	Not occupied, unrepaired
T-2	Bald Eagle #21	Nest no longer exists	Nest no longer exists
T-3	N/A	Nest not observed in 2018	Occupied
SWB-1	Bald Eagle #18	Not occupied	Occupied
SWB-2	N/A	Occupied, success unknown (observed 2 chicks)	Not occupied
CL-1	Bald Eagle #2	Occupied, success unknown (observed 2 chicks)	Not occupied
CL-2	Bald Eagle #1	Not occupied, unrepaired	Not occupied, unrepaired
MF-1	N/A	Nest no longer exists	Nest no longer exists
MF-2	Bald Eagle #7	Occupied	Occupied
R-1	Bald Eagle #15	Occupied, success unknown	Occupied
R-2	Bald Eagle #14	Occupied	Occupied
R-3	Bald Eagle #13	Nest no longer exists	Nest no longer exists

[2] Occupied - two adults present in a territory containing a nest during the breeding season: or one adult observed incubating, with young, or near a recently used nest.
Not occupied – no nesting activity observed at nest.
Occupied, success unknown - occupied territory not adequately monitored to determine success.
Unrepaired – remnant of nest still visible, but no repairs have been made and the nest appears dilapidated.
Nest no longer exists – no nest visible at indicated site.
[3] Status of nest information obtained from 2018 bald eagle surveys as well as incidental observations collected while conducting other relicensing studies.

Bald Eagle Study

Results

Winter Surveys

- In addition to the Nest Survey performed on December 19, 2018, two targeted bald eagle winter surveys were conducted at the Projects on January 14 and February 5, 2019.
- On December 19, 2018, 30 adults and 7 immature bald eagles were observed along the Mongaup River downstream of the Swinging Bridge Powerhouse. The majority of the eagles were perched on trees along the Mongaup River.
- On January 14, 2019, along the Mongaup River downstream of the Swinging Bridge Powerhouse, 26 adults and 5 immature bald eagles were observed. The majority of the eagles were perched on trees along the Monguap River.
- On February 5, 2019, 8 adult and 13 juvenile bald eagles were observed at the Swinging Bridge, Mongaup Falls, and Rio Reservoir survey areas. Eagles were observed flying in survey areas and on the ice-covered Mongaup Falls and Rio reservoirs.

Bald Eagle Study

Results

<u>Surveys during Swinging Bridge Project Minimum Flow Powerhouse Construction</u>

- There were a total of 14 surveys conducted. A total of 238 bald eagles were observed through the survey period. The maximum number of bald eagles observed was 49 (11 adults and 38 immatures) on March 18, 2019.
- Several bald eagles were observed on the ice within the Swinging Bridge Reservoir during the survey period, and many were perched along the Mongaup River below the Swinging Bridge Powerhouse.
- Eagles were observed using the Mongaup River area below Swinging Bridge Dam for foraging, nesting, and resting activities.

SUMMARY OF BALD EAGLE OBSERVATIONS DURING CONSTRUCTION OF THE NEW MINIMUM FLOW POWERHOUSE AT THE SWINGING BRIDGE DEVELOPMENT

Date	Observation Start Time	Observation End Time	Total Number of Bald Eagles Observed	Number of Mature Bald Eagles Observed	Number of Immature Bald Eagles Observed
2/20/2019	10:08 AM	12:38 PM	11	4	7
2/21/2019	11:20 AM	11:38 AM	2	0	2
2/25/2019	8:50 AM	12:22 PM	35	10	25
2/27/2019	8:38 AM	10:22 AM	9	1	8
3/1/2019	9:52 AM	11:37 AM	6	3	3
3/7/2019	8:59 AM	11:55 AM	27	9	18
3/8/2019~	8:50 AM	11:52 AM	28	7	11
3/11/2019	9:00 AM	12:15 PM	22	3	19
3/13/2019	9:10 AM	12:14 PM	25	1	24
3/15/2019	9:00 AM	11:36 AM	7	3	4
3/18/2019	9:00 AM	11:35 AM	49	11	38
3/20/2019	9:00 AM	11:30 AM	8	0	8
3/25/2019	8:55 AM	9:20 AM	3	1	2
3/27/2019	9:45 AM	11:50 AM	6	2	4

Note:
~ During an observation conducted at 10:30 AM, 10 bald eagles were observed flying/circling near the dam but were too far away for the observers to accurately determine whether the birds were adult or immature.

Aquatic Habitat Assessment Study

Aquatic Habitat Assessment Study

Goals and Objectives

- Identify the aquatic habitat within the normal fluctuation zone (i.e., the area between the reservoir elevation operating ranges) of each of the five reservoirs and identify potential effects that Project operations may have on these habitats.
- The specific objectives of this study are as follows:
  - Conduct a combination of field surveys and desktop analyses to identify and map the aquatic habitats within the Projects' reservoirs fluctuation zones;
  - Identify aquatic invasive plant species within the fluctuation zone;
  - Document unique attributes such as fish spawning beds, mussel beds, or shell materials observed during aquatic habitat mapping;
  - Document observed erosion areas within the fluctuation zones; and
  - Describe the potential influences of the Projects' operations on aquatic habitats within the impoundments.

Aquatic Habitat Assessment Study

Study Area

The Projects' five reservoirs: Toronto, Cliff Lake, Swinging Bridge, Mongaup Falls, and Rio

Full, normal upper/lower target, and low elevations for the Projects' reservoirs

	Toronto	Cliff Lake	Swinging Bridge	Mongaup Falls	Rio
Full Reservoir (Max.)	1,220 (top of flashboards)	1,071.1 (top of flashboards)	1,070 (top of Obermeyer gate/rubber dam)	935 (top of flashboards)	815 (top of flashboards)
Normal Upper Target[1]	1,218	1,068	1,068	935	815
Normal Lower Target[1]	1,200	1,049	1,049	929	808
Low Reservoir (Min.)	1,170	1,048	1,048	910	805
Reservoir Maximum Elevation Operating Range	50 feet	23.1 feet	22 feet	25 feet	10 feet

Study fluctuation zones for the Projects' reservoirs

	Toronto	Cliff Lake	Swinging Bridge	Mongaup Falls	Rio
ZONE 1	1,220 - 1,218	1,071.1 - 1,068	1,070 - 1,068	NA[1]	NA[1]
ZONE 2	1,218 - 1,200	1,068 - 1,049	1,068 - 1,049	935 – 929	815 - 808
ZONE 3	1,200 - 1,170	1,049 - 1,048	1,049 - 1,048	929 - 910	808 – 805

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Aquatic Habitat Assessment Study

Methodology

Reservoir Sonar Survey

- Between June 19 and July 3, 2018, the Projects' reservoirs fluctuation zones were surveyed using a boat equipped with side-scan sonar (SSS) and multi-beam sonar (MBS) equipment.
- Consistent with the approved study plan, the sonar data was being processed to evaluate the shoreline at 2-foot contours within the normal operating range of the reservoirs and at 5-foot contours thereafter.
- Digital elevation model (DEM) data in USGS format was converted to a raster dataset and utilized for elevations above those captured by the sonar surveys.

MULTI-BEAM AND SIDE-SCAN SONAR SURVEY DATES AND ELEVATIONS AT THE PROJECTS' RESERVOIRS

Reservoir	Survey Dates	Reservoir Elevation during Survey (NGVD29)	Reservoir Elevation at Full Pond (NGVD29)
Toronto	June 19 – 23, 2018	1,217.7	1,220
Cliff Lake	June 30 – July 1, 2018	1,068.4	1,071.1
Swinging Bridge	June 24 – 26, 2018	1,068.4	1,070
Mongaup Falls	June 29, 2018	934.5	935
Rio	July 2 – 3, 2018	814.3	815

Aquatic Habitat Assessment Study

Methodology

Field Verification Survey

- To evaluate substrate classification accuracy and to further assess the aquatic habitat in the reservoirs' fluctuation zones, verification of the substrate mapping in the fluctuation zones was performed via boat and/or shoreline.

FIELD VERIFICATION SURVEY DATES AND RESERVOIR ELEVATIONS

Reservoir	Survey Date(s)	Reservoir Elevation
Toronto	September 9-12, 2019	1,214
Cliff Lake	May 15 & 16, 2019	1,061-1,062
Swinging Bridge	May 13-15, 2019	1,058-1,061
Mongaup Falls	September 11, 2019	929
Rio	May 17, 2019	814

- Where appropriate, additional features of habitats or biological characteristics were recorded via GPS and representative photographs.
- The shorelines of the Projects' reservoirs were also inventoried by boat and on foot for active erosion sites concurrently with the aquatic habitat mapping verification surveys.

Aquatic Habitat Assessment Study

Methodology

Sonar and Field Verification Data Assessment

- The approximate locations of substrate and cover type boundaries were manually digitized around areas of uniform sonar signature by visual interpretation of the sonar imagery for each impoundment.

CLASSIFICATION SCHEME AND ASSOCIATED DEFINITIONS DEVELOPED FOR THE PROJECTS' AQUATIC HABITAT MAPS

Substrate Class	Acronym	Definition
Fine	F	Area composed of particles <2.0 millimeter (mm) diameter (sand, silt, clay or fine organic detritus)
Gravel	G	Area composed of particles 2.0 mm – 32 mm (1.26 ")
Gravel, Rubble, Cobble	GRC	An area predominantly composed of a conglomeration of gravel, rubble, and cobble at varying densities from 2.0 mm – 256 mm (10.08"). Cobblestone and platy rock types are included. Any area meeting these criteria, regardless of underlying substrate, is classified GRC
Rocky fine	RF	An area predominantly composed of small and medium boulders 256 mm (10.08") – 1,024 mm (40.31") in diameter across the widest side. Any area meeting these criteria, regardless of underlying substrate, is classified RF
Rocky boulder	RB	An area predominantly composed of boulders 1,024 mm (40.31") or larger in diameter across the widest side. Any area meeting these criteria, regardless of underlying substrate, is classified RB
Bedrock	BR	An area predominated by mostly solid bedrock
Sandy/Silt-loam-soil complex	SLS	Any area of land located within the maximum reservoir elevation predominantly composed of terrestrial habitat (e.g., upland)
Riprap/artificial shore	RRAS	A reservoir shore, or stream/river shore area, that is covered/protected with concrete, coarse stones, cobbles, concrete slabs, gabions, etc., placed primarily for erosion control

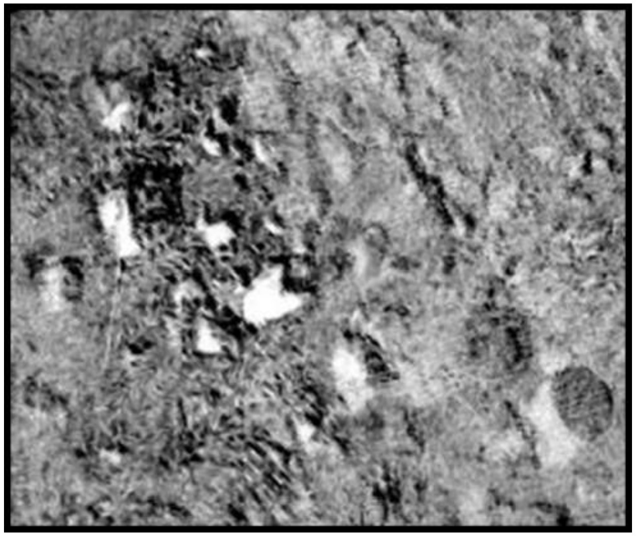
Aquatic Habitat Assessment Study

Methodology

<u>Sonar and Field Verification Data Assessment</u>

- Substrate classes were defined on the basis of material composition and particle size. Sonar data was interpreted using texture, tone, shape, pattern, and association to distinguish and classify substrate and cover type polygons.
- Habitat units were also differentiated based on general slope characteristics within each reservoir. In each reservoir, habitat units were generally identified as segments of the shorelines/fluctuation zones with relatively uniform habitat characteristics.

Sonar image of rocky boulder/rocky fine in Toronto Reservoir



Sonar image of large woody debris in Toronto Reservoir

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Aquatic Habitat Assessment Study

Methodology

Sonar and Field Verification Data Assessment

- Dominant cover types were based on the categories of: Centrarchid nesting area (CNA), submerged aquatic vegetation (SAV), aquatic invasive plant species (IS), and large woody debris (LWD).

Cover types by category and description

Category	Acronym	Definition
Centrarchid Nesting Area	CNA	Includes observed Centrarchid nests; saucer-shaped nests observed along the shorelines of the reservoirs. These nests usually consist of a circular depression in silt, sand, or gravel that is lighter in color than the surrounding substrate because an adult male has consistently scraped silt, algae, or other organic material from accumulating within the nest area.
Submerged Aquatic Vegetation	SAV	Includes submerged vegetation and includes the dominant genus' of *Vallsineria, Elodea*, *Hydrilla*, *Najas, Potamogetan,* and *Ceratophyllum.*
Large Woody Debris	LWD	Includes stumps, logs, branches, fallen trees, beaver lodges, and any other woody-type materials.
Invasive Aquatic Plant Species	IS	Includes common invasive species such as purple loosestrife (*Lythrum salicaria*) and Phragmites (*Phragmites australis*).

Aquatic Habitat Assessment Study

Results

<u>Shoreline Slope</u>

Zone (reservoir elevation)	Slope Category (acres)					Total Area (acres)
	Gradual	Moderate	Steep	Very Steep	Vertical	
	0-15°	16-30°	31-50°	51-75°	76-90°	
Toronto Reservoir						
Zone 1 (1,220 - 1,218)	15.20	5.79	0.43	--	0.02	21.44
Zone 2 (1,218 - 1,200)	176.10	44.18	9.83	--	0.03	230.14
Zone 3 (1,200 - 1,170)	428.38	17.76	0.98	--	--	447.12
Total Area (acres)	**619.68**	**67.73**	**11.24**	**--**	**0.05**	**698.70**
Cliff Lake Reservoir						
Zone 1 (1,071.1 - 1,068)	15.44	3.49	--	--	--	18.93
Zone 2 (1,068 - 1,049)	83.76	20.26	--	--	--	104.02
Zone 3 (1,049 - 1,048)	2.98	0.33	--	--	--	3.31
Total Area (acres)	**102.18**	**24.08**	**--**	**--**	**--**	**126.26**
Swinging Bridge Reservoir						
Zone 1 (1,070 - 1,068)	19.41	10.58	1.84	--	--	31.83
Zone 2 (1,068 - 1,049)	190.31	108.36	21.78	--	--	320.45
Zone 3 (1,049 - 1,048)	7.84	5.23	1.17	--	--	14.24
Total Area (acres)	**217.56**	**124.17**	**24.79**	**--**	**--**	**366.52**
Mongaup Falls Reservoir						
Zone 2 (935 - 929)	16.80	13.75	0.49	1.23	0.51	32.78
Zone 3 (929 - 910)	59.67	24.19	0.33	--	0.02	84.21
Total Area (acres)	**76.47**	**37.94**	**0.82**	**1.23**	**0.53**	**116.99**
Rio Reservoir						
Zone 2 (815 - 808)	23.41	10.85	6.46	--	0.05	40.77
Zone 3 (808 - 805)	11.74	7.38	3.68	--	0.05	22.85
Total Area (acres)	**35.15**	**18.23**	**10.14**	**--**	**0.10**	**63.62**

Aquatic Habitat Assessment Study

Results

Substrate

Zone (reservoir elevation)	Substrate Category Area (acres)								
	Fine	Gravel	Gravel, Rubble, Cobble	Rocky Fine	Rocky Boulder	Bedrock	Sandy/Silt-Loam-Soil Complex	Riprap/ Artificial Shore	Total Area (acres)
Toronto Reservoir									
Zone 1 (1,220 - 1,218)	4.00	0.83	5.03	10.37	0.36	0.64	--	0.21	21.44
Zone 2 (1,218 - 1,200)	75.81	3.89	36.79	105.28	2.51	3.41	0.06	2.39	230.14
Zone 3 (1,200 - 1,170)	406.00	--	1.02	35.22	4.87	--	--	--	447.11
Total Area (acres)	**485.81**	**4.72**	**42.84**	**150.87**	**7.74**	**4.05**	**0.06**	**2.60**	**698.69**
Cliff Lake Reservoir									
Zone 1 (1,071.1 - 1,068)	12.11	--	2.72	0.40	0.70	--	2.94	0.08	18.95
Zone 2 (1,068 - 1,049)	78.34	--	18.18	4.60	2.02	--	0.58	0.28	104.00
Zone 3 (1,049 - 1,048)	2.98	--	0.33	--	--	--	--	--	3.31
Total Area (acres)	**93.43**	**--**	**21.23**	**5.00**	**2.72**	**--**	**3.52**	**0.36**	**126.26**
Swinging Bridge Reservoir									
Zone 1 (1,070 - 1,068)	8.04	0.21	3.14	11.88	1.82	0.22	6.34	0.18	31.83
Zone 2 (1,068 - 1,049)	147.86	1.69	32.15	117.87	14.30	2.04	2.78	1.77	320.46
Zone 3 (1,049 - 1,048)	6.60	0.01	1.75	5.02	0.69	0.06	--	0.08	14.21
Total Area (acres)	**162.50**	**1.91**	**37.04**	**134.77**	**16.81**	**2.32**	**9.12**	**2.03**	**366.50**
Mongaup Falls Reservoir									
Zone 2 (935 - 929)	13.18	6.73	7.24	2.72	--	--	2.18	0.10	32.15
Zone 3 (929 - 910)	54.60	2.07	19.61	7.92	--	--	0.02	--	84.22
Total Area (acres)	**67.78**	**8.80**	**26.85**	**10.64**	**--**	**--**	**2.20**	**0.10**	**116.37**
Rio Reservoir									
Zone 2 (815 - 808)	15.11	--	13.66	10.46	0.54	--	0.58	0.42	40.77
Zone 3 (808 - 805)	9.29	--	6.04	6.89	0.38	--	--	0.25	22.85
Total Area (acres)	**24.40**	**--**	**19.70**	**17.35**	**0.92**	**--**	**0.58**	**0.67**	**63.62**

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Aquatic Habitat Assessment Study

Results

Cover Type

Zone (reservoir elevation)	Cover Type Category				Total Area (acres)
	Large Woody Debris	Invasive Aquatic Plant Species	Submerged Aquatic Vegetation	Centrarchid Nesting Areas[1]	
Toronto Reservoir					
Zone 1 (1,220 - 1,218)	0.70	--	0.82	0.08	1.60
Zone 2 (1,218 - 1,200)	1.41	--	117.49	3.04	121.94
Zone 3 (1,200 - 1,170)	--	--	0.45	--	0.45
Total Area (acres)[1]	**2.11**	**--**	**118.76**	**3.12**	**124.00**
Cliff Lake Reservoir					
Zone 1 (1,071.1 - 1,068)	0.22	--	--	--	0.22
Zone 2 (1,068 - 1,049)	0.80	--	--	0.10	0.90
Zone 3 (1,049 - 1,048)	0.01	--	--	--	0.01
Total Area (acres)[1]	**1.03**	**--**	**--**	**0.10**	**1.13**
Swinging Bridge Reservoir					
Zone 1 (1,070 - 1,068)	0.24	--	--	--	0.24
Zone 2 (1,068 - 1,049)	1.44	--	2.35	1.11	4.90
Zone 3 (1,049 - 1,048)	--	--	--	--	--
Total Area (acres)[1]	**1.68**	**--**	**2.35**	**1.11**	**5.14**
Mongaup Falls Reservoir					
Zone 2 (935 - 929)	0.93	--	0.04	0.75	0.97
Zone 3 (929 - 910)	2.35	--	--	--	3.13
Total Area (acres)[1]	**3.28**	**--**	**0.04**	**0.75**	**4.10**
Rio Reservoir					
Zone 2 (815 - 808)	0.59	0.15	--	2.06	2.80
Zone 3 (808 - 805)	0.27	0.01	--	--	0.28
Total Area (acres)[1]	**0.86**	**0.16**	**--**	**2.06**	**3.08**

Aquatic Habitat Assessment Study

Results

Cover Type

- Centrarchid nests
  - The majority of the observed Centrarchid nests occur in Zone 2 (Toronto, Cliff Lake, Swinging Bridge, Mongaup Falls and Rio reservoirs), with nests also occurring in Zone 1 in Toronto Reservoir.
- Submerged aquatic vegetation
  - The presence of SAV was generally sparse in the study area, with the exception of Zone 2 in Toronto Reservoir.
  - Generally, the majority of mapped SAV beds were co-located with unconsolidated substrates in the upper portions of the reservoirs.
  - SAV beds were generally dominated by various *Potamogeton* species, wild celery (*Vallisneria americana*), coontail (*Ceratophyllum demersum*), waterweed species (*Elodea spp*.), and *Callitriche* species.

Aquatic Habitat Assessment Study

Results

Erosion

- Erosion types in the area:
  - Undercut bank
  - Shallow transitional slides
  - Slumping
  - Rills/gullies
  - Trampling

PERCENTAGE OF SHORELINE EROSION OBSERVED AT THE PROJECTS' RESERVOIRS

Reservoir	Total Length of Shoreline (miles)	Total Estimated Erosion (% of Total Shoreline)
Toronto	11.37	3.00
Cliff Lake	5.93	11.79
Swinging Bridge	19.87	3.74
Mongaup Falls	5.08	17.00
Rio	9.15	4.20

UNDERCUT BANK ON SWINGING BRIDGE RESERVOIR

TRAMPLING ON RIO RESERVOIR

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Aquatic Habitat Assessment Study

Results

<u>Additional Observations</u>

- No live mussels and very few mussel shells were observed during the study. A few mussel shells were observed along the shoreline of Swinging Bridge Reservoir in Zone 2 on exposed sand and are believed to be Eastern elliptio (*Elliptio complanata*)
- During the field verification surveys, two small, localized areas of fish stranding were observed in Zone 2 at Swinging Bridge Reservoir and Mongaup Falls Reservoir.

Aquatic Habitat Assessment Study

Potential Effects on Aquatic Habitat at the Projects

Natural Processes

- Precipitation and Flows
  - Due to the size of the drainage area (approximately 210 square miles), rainfall can have varying effects on reservoir elevations based on how widespread the rain event is, as well as the magnitude of the rainfall.
  - Eagle Creek tracks and monitors inflows to Swinging Bridge Reservoir on a routine basis.
- Wind and Waves
  - Wind or boats generally cause waves.
  - Primary wind directions are from the west-northwest, southwest, and north-northeast with wind speeds averaging approximately 4 through 13 miles-per-hour (mph).
  - Given the generally broad, open expanse of Toronto Reservoir (length: 2.1 miles, width: 0.2 to 0.7 miles), it is occasionally subject to strong winds during storm events that may result in wind-generated wave action along shorelines of the reservoir and tributaries. If the intensity of these events is sustained over sufficiently long periods, the potential for shoreline erosion increases.
  - The potential exists for effects to occur on the littoral habitat from human-induced activities such as boating on the Swinging Bridge and Toronto reservoirs, particularly during the summer when recreational activities are most prevalent.

Aquatic Habitat Assessment Study

Potential Effects on Aquatic Habitat at the Projects

<u>Project Operations</u>

- The Projects operate in a peaking mode while maintaining minimum flow requirements and seasonal target reservoir elevations.
- Although not requirements of the current licenses, Eagle Creek utilizes the normal upper and lower target reservoir elevations to balance hydrologic conditions and the demands of the power grid with environmental and recreational considerations. Water levels in the Projects' reservoirs at any location at any time is, therefore, a complex function of both natural and human factors.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Aquatic Habitat Assessment Study

Summary and Discussion

Toronto Reservoir

- Maximum fluctuation zone of 50 feet (between elevations 1,220 and 1,170 feet), represented by Zones 1, 2, and 3, and a normal/typical fluctuation zone of 18 feet (between elevations 1,218 and 1,200 feet), represented by Zone 2.
- Dominated by gradual slopes with fine and rocky fine substrate.
- Dominant cover type is SAV, primarily found in Zone 2, with smaller areas of large woody debris and Centrarchid nesting observed in Zones 1 and 2.
- Erosion was observed along approximately 3 percent of the total shoreline.

Aquatic Habitat Assessment Study

Summary and Discussion

Cliff Lake Reservoir

- Maximum fluctuation zone of 23.1 feet (between elevations 1,071.1 and 1,048 feet) represented by Zones 1, 2, and 3, and a normal/typical fluctuation zone of 19 feet (between elevations 1,068 and 1,049 feet), represented by Zone 2.
- Dominated by gradual slopes, and fine and gravel/rubble/cobble substrates.
- Small areas of large woody debris were observed in Zones 1, 2, and 3 as well as a small area of Centrarchid nesting in Zone 2.
- Erosion was observed along approximately 12 percent of the total.

EAGLE CREEK
RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Aquatic Habitat Assessment Study

Summary and Discussion

Swinging Bridge Reservoir

- Maximum fluctuation zone of 22 feet (between elevations 1,070 and 1,048 feet), represented by Zones 1, 2, and 3, and a normal/typical fluctuation zone of 19 feet (between elevations 1,068 and 1,049 feet), represented by Zone 2.
- Dominated by gradual slopes and (lesser amounts of) moderate slopes and primarily consists of fine and rocky fine substrates.
- Small areas of large woody debris were observed in Zones 1 and 2 along with small areas of SAV and Centrarchid nesting in Zone 2.
- Erosion was observed along approximately 4 percent of the total shoreline.
- A few mussel shells were observed in Zone 2.
- Additionally, a live minnow-sized *Lepomis spp.* (sunfish) and tadpoles were observed stranded in two small water-filled depressions along the eastern edge in the northern portion of the reservoir.

Aquatic Habitat Assessment Study

Summary and Discussion

Mongaup Falls Reservoir

- Maximum fluctuation zone of 25 feet (between elevations 935 and 910 feet), represented by Zones 2 and 3, and a normal/typical fluctuation zone of 6 feet (between elevations 935 and 929 feet), represented by Zone 2.
- Dominated by gradual and (lesser amounts of) moderate slopes and primarily consists of fine and gravel/rubble/cobble substrates.
- Small areas of large woody debris were observed in Zones 2 and 3 along with small areas of SAV in Zone 2 and Centrarchid nesting in Zone 3.
- Erosion was observed along approximately 17 percent of the total shoreline.
- Additionally, several live (unidentified) minnows and newts were observed stranded in two water-filled depressions north of the Forestburgh Road (Rt 43) crossing.

Aquatic Habitat Assessment Study

Summary and Discussion

Rio Reservoir

- Maximum fluctuation zone of 10 feet (between elevations 815 and 805 feet), represented by Zones 2 and 3, and a normal/typical fluctuation zone of 7 feet (between elevations 815 and 808 feet), represented by Zone 2.
- Dominated by gradual and (lesser amounts of) moderate and steep slopes with primarily fine, gravel/rubble/cobble, and rocky fine substrates.
- Small areas of large woody debris and aquatic invasive species were observed in Zones 2 and 3 along with approximately 2 acres of Centrarchid nesting observed in Zone 2.
- Erosion was observed along approximately 4 percent of the total shoreline.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Water Quality Study Update

Water Quality Study Update

Goals and Objectives

- Supplement the existing water quality dataset to evaluate water quality within the Projects’ reservoirs and downstream river reaches relative to Project operations and applicable state water quality standards.

Study Area

- For WQ Monitoring: Projects’ reservoirs, the Mongaup River from Swinging Bridge Dam to the Rio Main Powerhouse tailrace, Black Lake Creek from Toronto Dam to the confluence with the Mongaup River, and Black Brook in the vicinity of (upstream and downstream) Black Brook Dam.

EAGLE CREEK
RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Water Quality Study Update

Methodology

2016 & 2017 WQ Data

- Pursuant to the Commission's June 10, 2019 Study Plan Determination, Eagle Creek evaluated water quality data collected in 2016 (a dry water year) and 2017 (a normal water year) from locations downstream of the Swinging Bridge, Mongaup Falls, and Rio powerhouses pursuant to the current license requirements.

EAGLE CREEK
RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

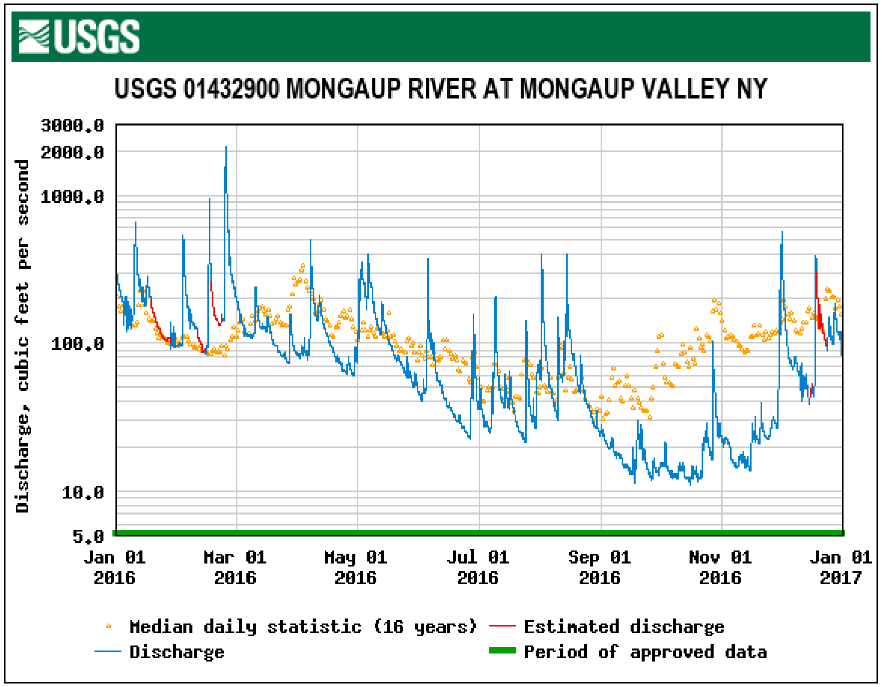
Water Quality Study Update

Results

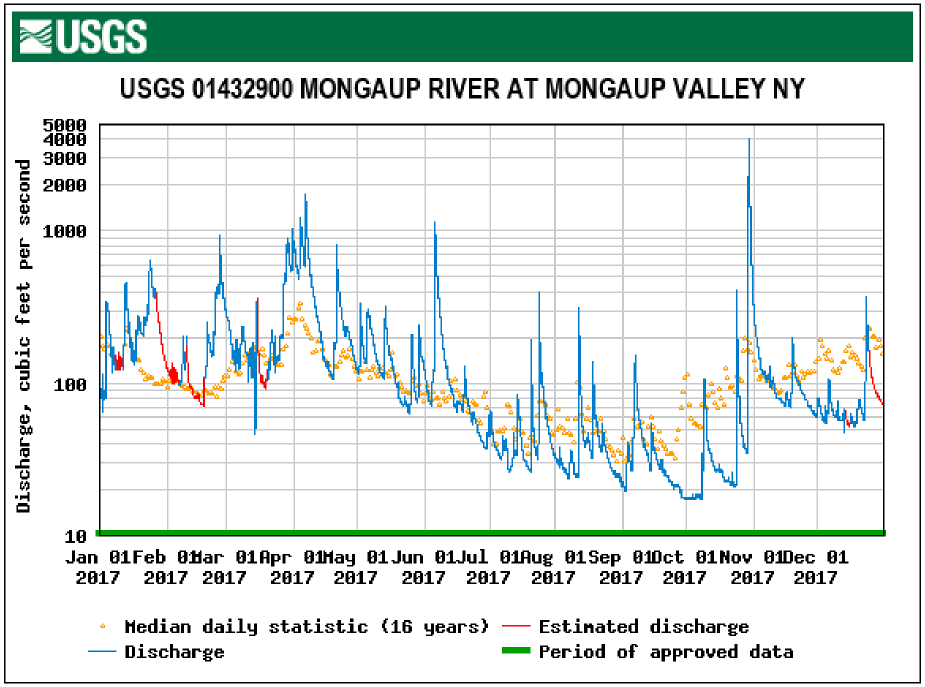
Mongaup River Streamflow Data

Upstream of the Swinging Bridge Reservoir

2016 (dry year)



2017 (normal year)



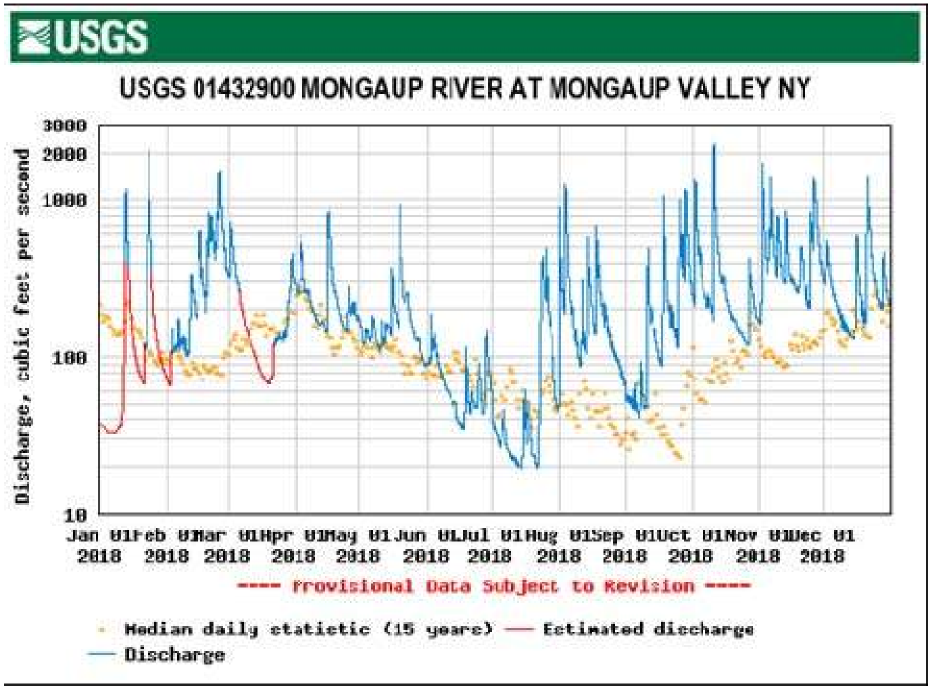
Water Quality Study Update

Results

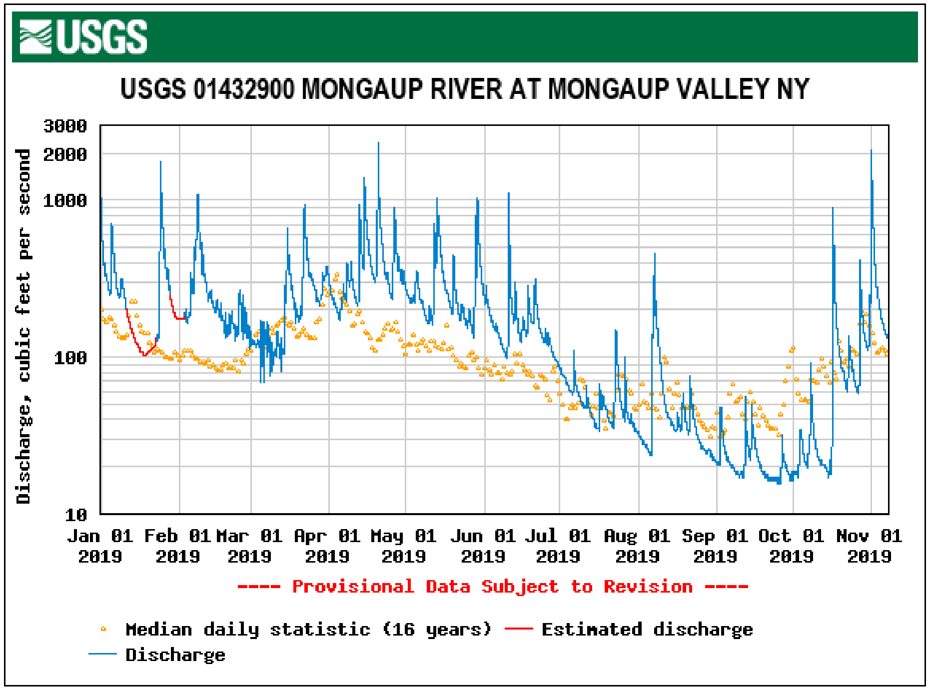
<u>Mongaup River Streamflow Data</u>

Upstream of the Swinging Bridge Reservoir

2018 (wet year)



2019 (normal year)



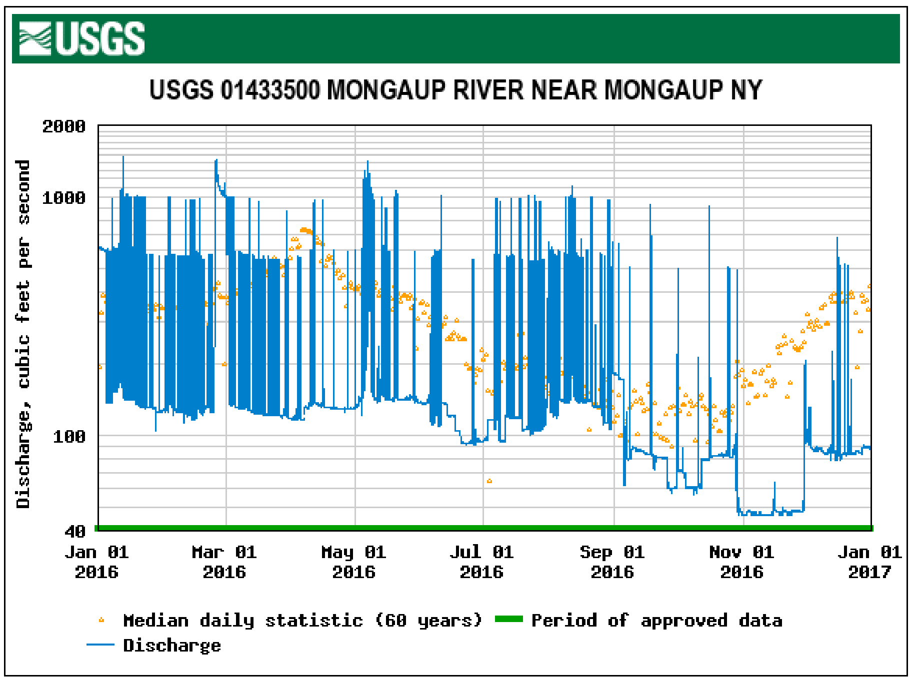
Water Quality Study Update

Results

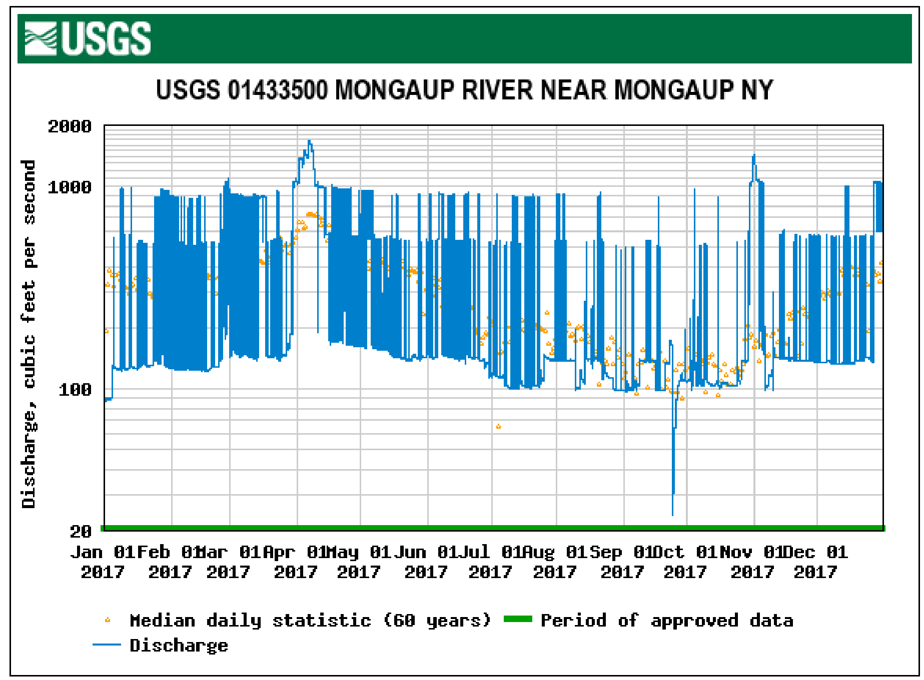
Mongaup River Streamflow Data

Downstream of the Rio Main Powerhouse

2016 (dry year)



2017 (normal year)



EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

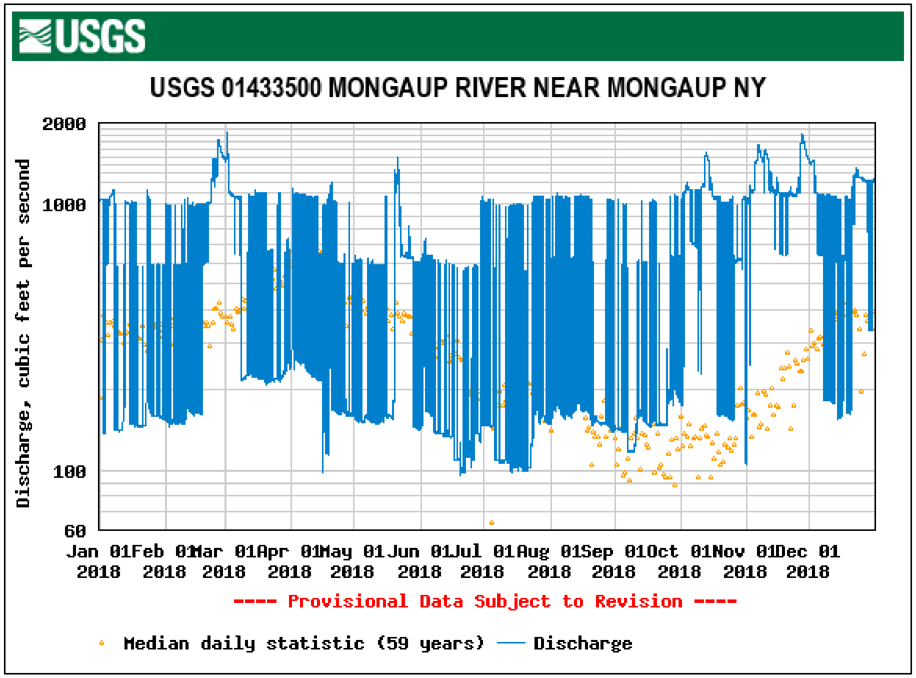
Water Quality Study Update

Results

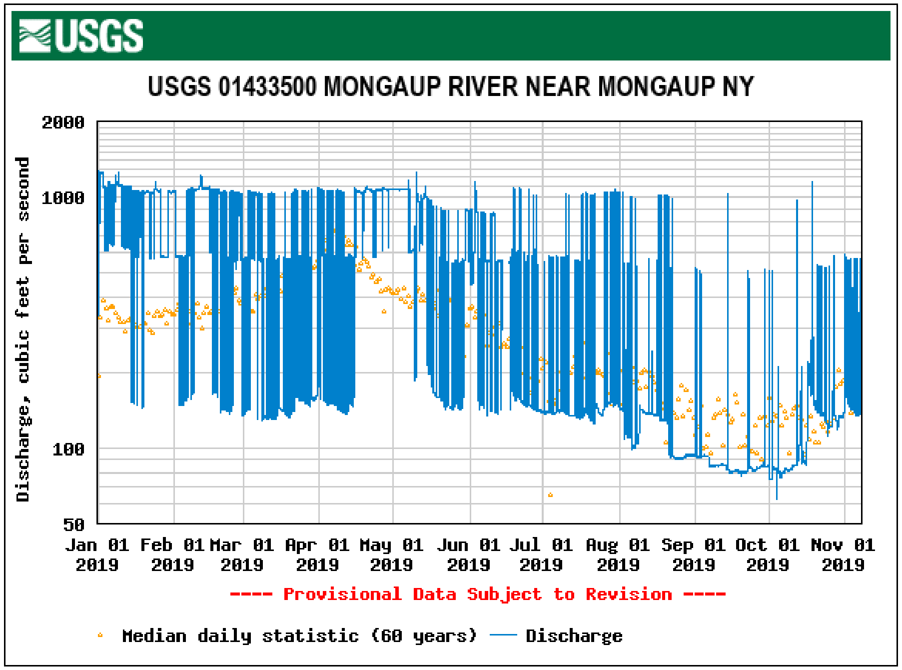
Mongaup River Streamflow Data

Downstream of the Rio Main Powerhouse

2018 (wet year)



2019 (normal year)



Water Quality Study Update

Results

2016 Water Quality and Streamflow Data

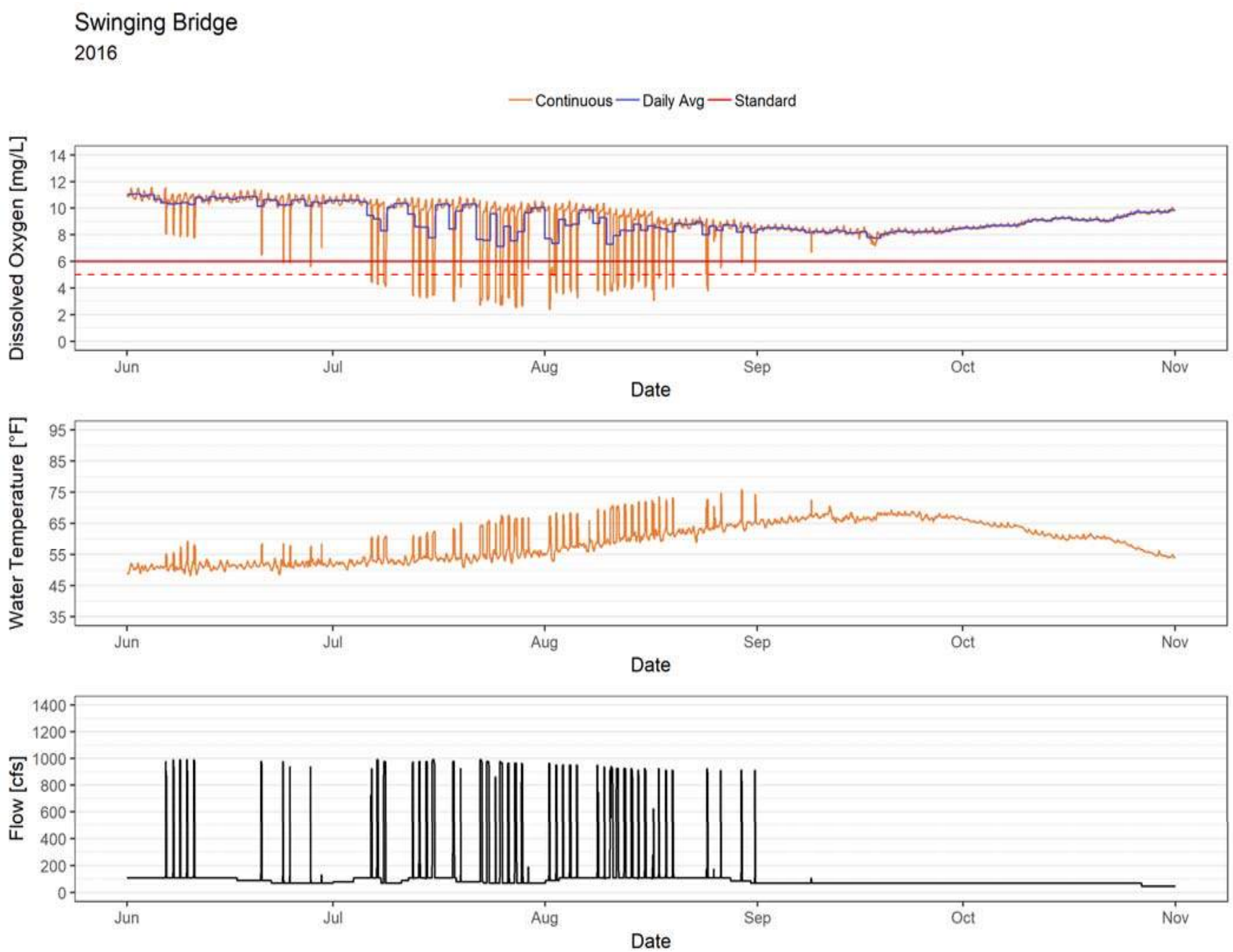
Mongaup River downstream of Swinging Bridge Powerhouse - 2016

DO Concentrations:

- Ranged from 2.38 to 11.56 mg/L
- In compliance June 1 through July 5 and from August 25 through October 31
- From July 6 through August 24, DO concentrations periodically fell below the instantaneous DO standard during periods of generation
- In compliance with the daily average DO standard during entire monitoring period

Temperature:

- Ranged from 48.33 to 75.79 °F



Water Quality Study Update

Results

<u>2017 Water Quality and Streamflow Data</u>

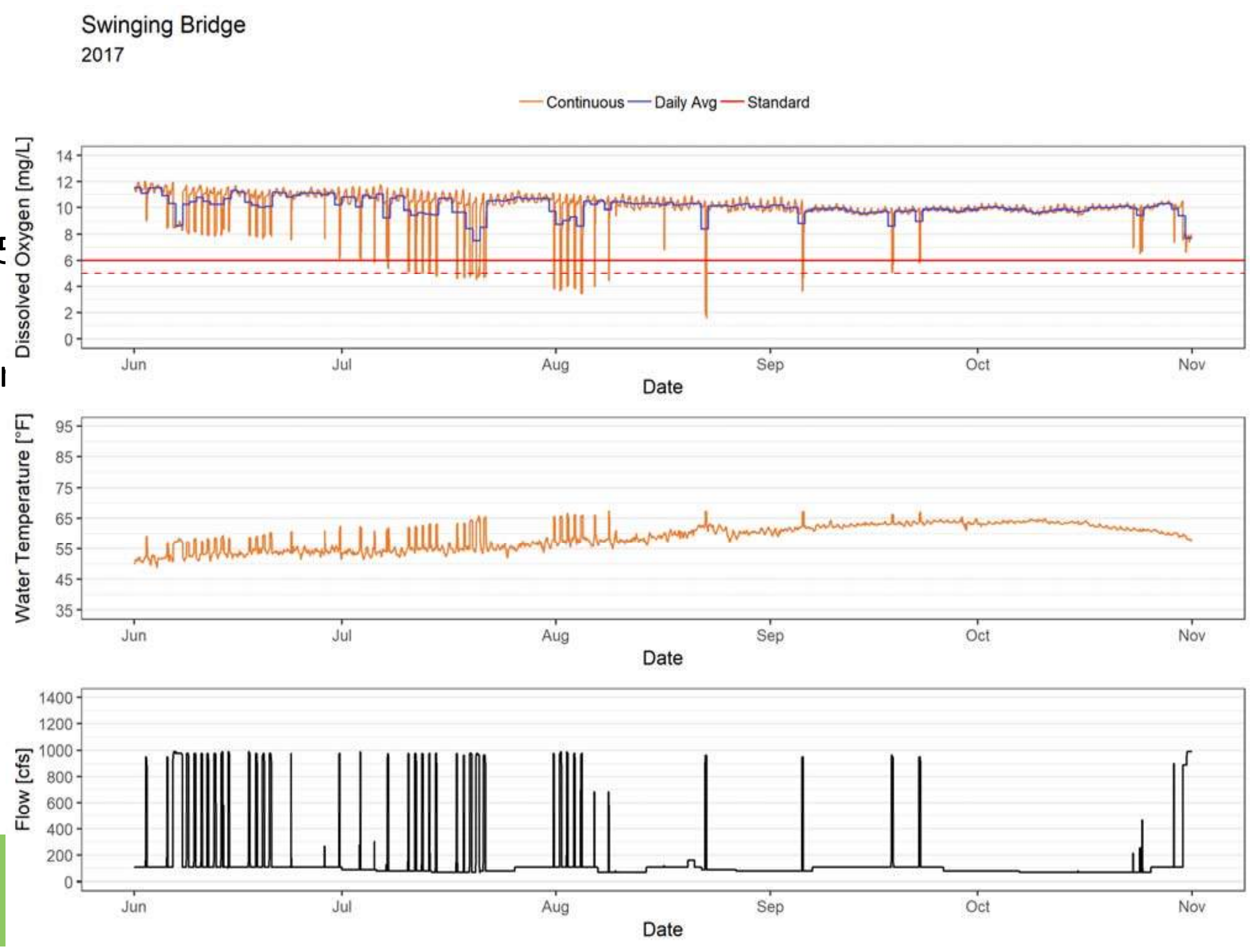
Mongaup River downstream of Swinging Bridge Powerhouse - 2017

DO Concentrations:

- Ranged from 1.61 to 12.01 mg/L
- In compliance June 1 through July 13 and from September 6 through October 31
- From July 14 through September 5 DO concentrations periodically fell below the instantaneous DO standard during periods of generation
- In compliance with the daily average DO standard during entire monitoring period

Temperature:

- Ranged from 49.01 to 67.45 °F



Water Quality Study Update

Results

<u>2016 Water Quality and Streamflow Data</u>

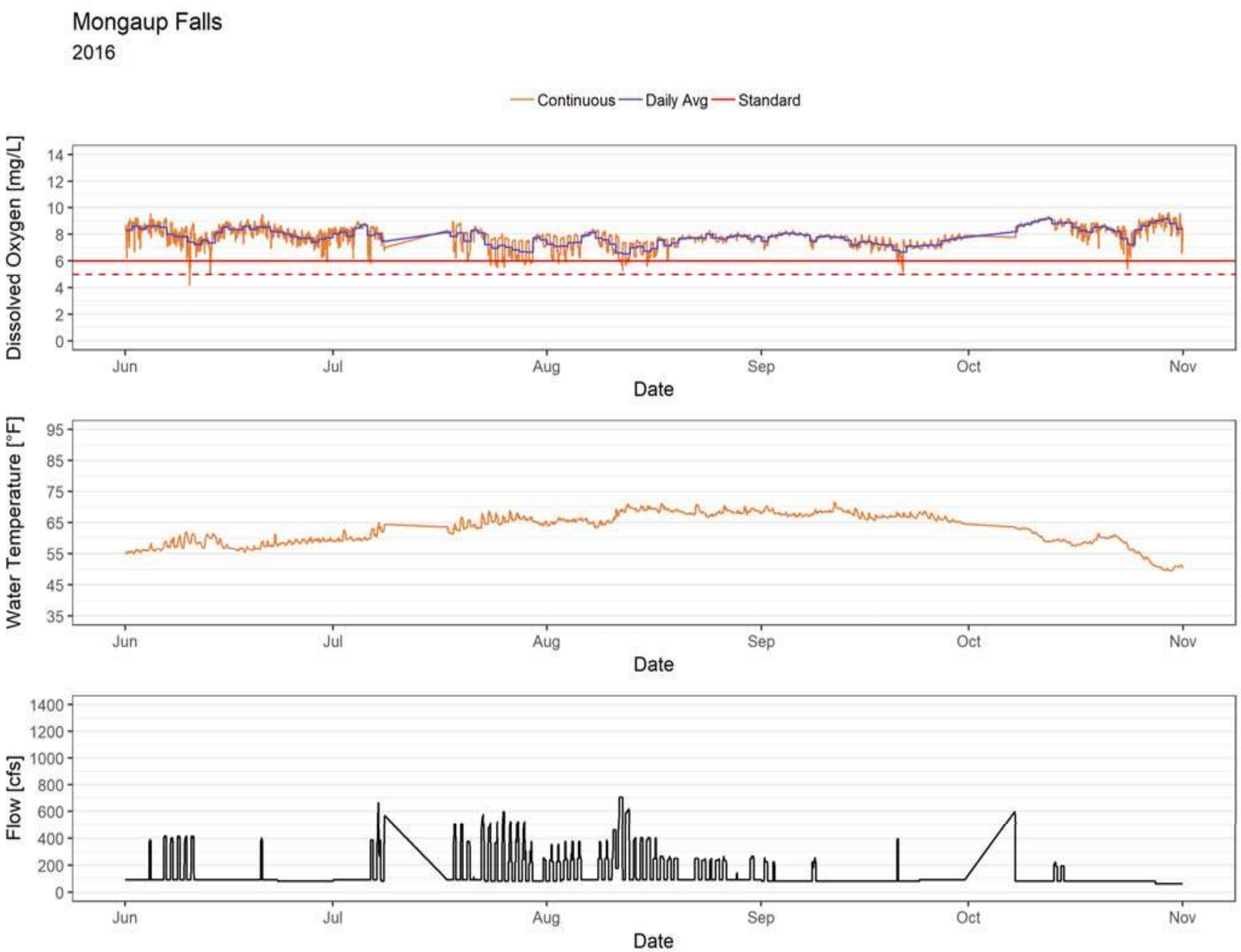
Mongaup River downstream of Mongaup Falls Powerhouse - 2016

DO Concentrations:

- Ranged from 4.19 to 9.66 mg/L
- In compliance except for one hour on June 10
- In compliance with the daily average DO standard during entire monitoring period

Temperature:

- Ranged from 49.48 to 71.69 °F



Water Quality Study Update

Results

2017 Water Quality and Streamflow Data

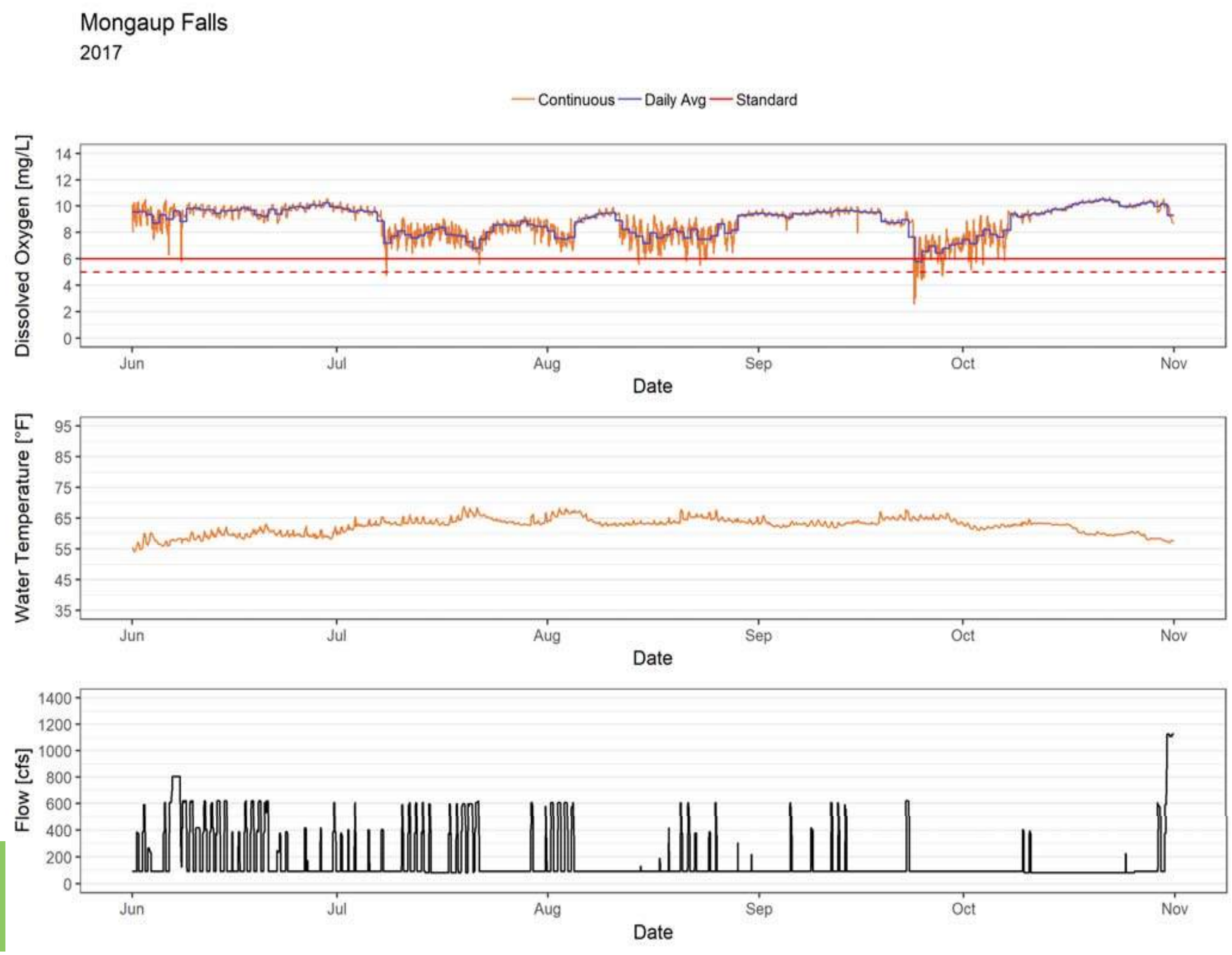
Mongaup River downstream of Mongaup Falls Powerhouse - 2017

DO Concentrations:

- Ranged from 2.58 to 10.68 mg/L
- In compliance June 1 through October 31 with the exception of six days
- In compliance with the daily average DO standard during entire monitoring period

Temperature:

- Ranged from 54.16 to 68.76 °F

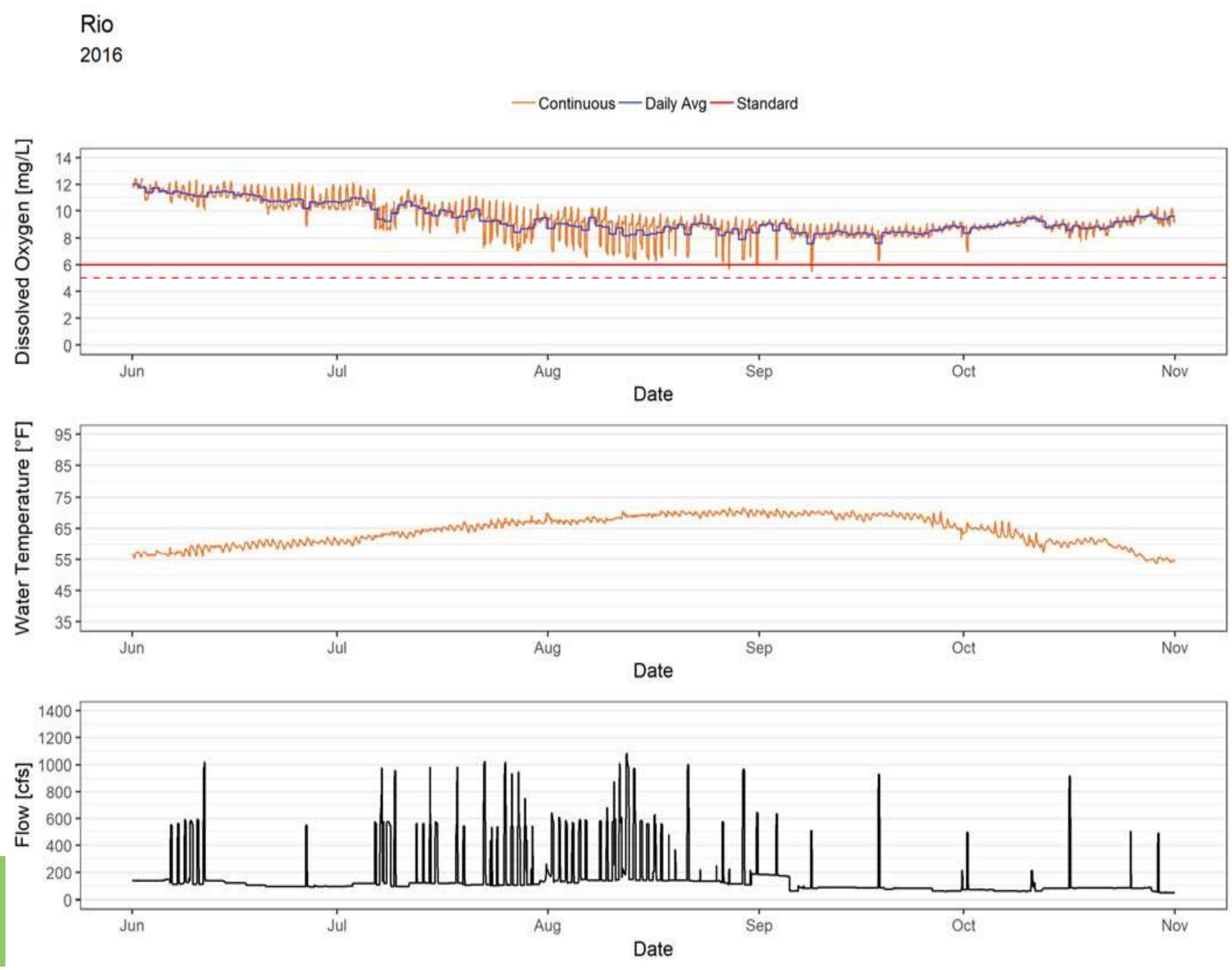


Water Quality Study Update

Results

2016 Water Quality and Streamflow Data

Mongaup River downstream of Rio Main Powerhouse - 2016



DO Concentrations:

- Ranged from 5.50 to 12.40 mg/L
- In compliance with the all applicable state DO standards during entire monitoring period

Temperature:

- Ranged from 53.96 to 71.60 °F

Water Quality Study Update

Results

2017 Water Quality and Streamflow Data

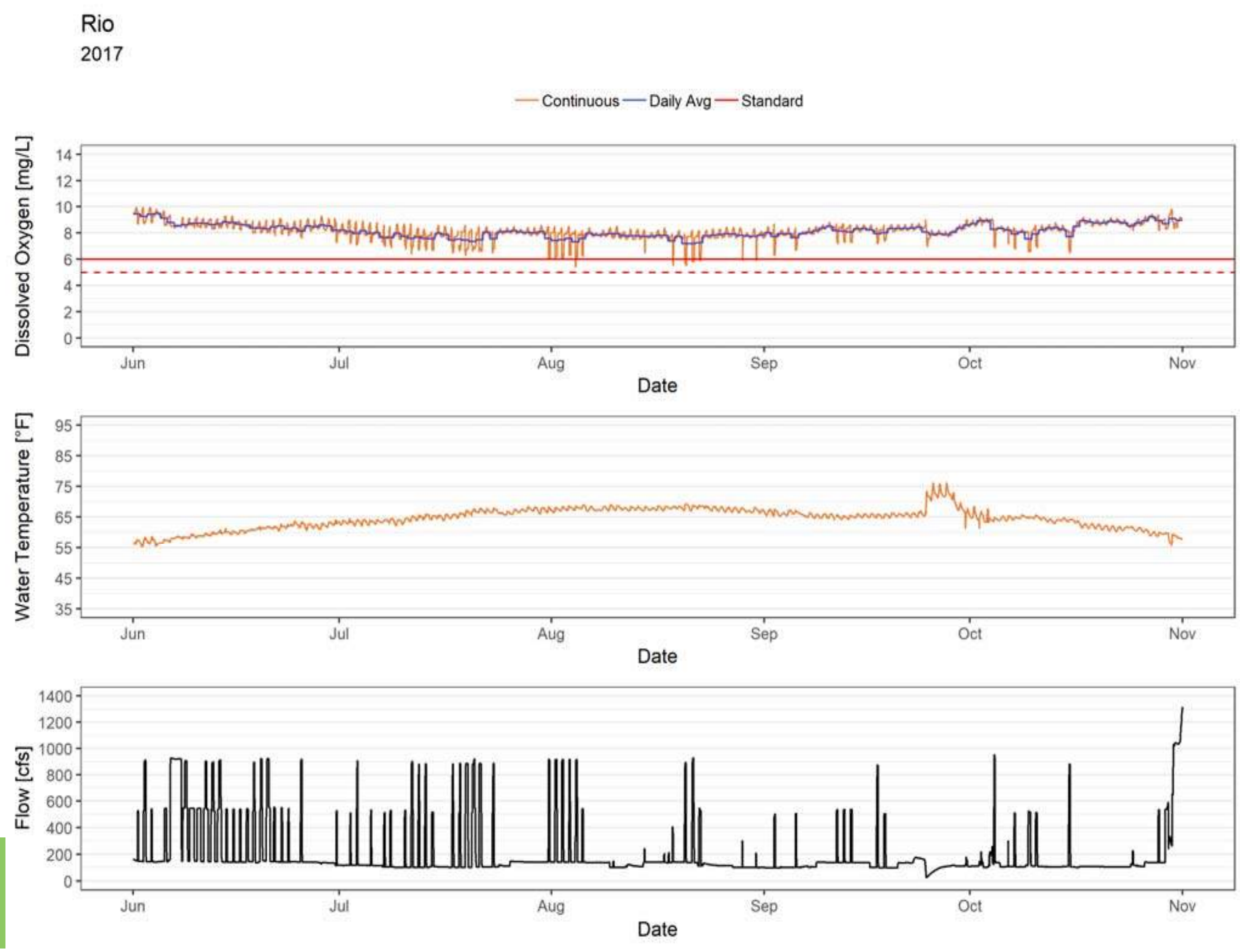
DO Concentrations:

- Ranged from 5.40 to 9.90 mg/L
- In compliance with the all applicable state DO standards during entire monitoring period

Temperature:

- Ranged from 55.40 to 76.10 °F

Mongaup River downstream of Rio Main Powerhouse - 2017



Water Quality Study Update:

Summary

- Mongaup River Hydroelectric Projects:
  - Similar to the 2018 water quality data, water quality excursions occurred in 2016 and 2017 at the monitoring stations located in the Mongaup River downstream of the Swinging Bridge Powerhouse during periods of generation occurring from mid-July through late September.
  - Water quality was largely in compliance with applicable water quality standards in the Mongaup River downstream of the Mongaup Falls Powerhouse in 2016 and 2017.
  - Water quality was in compliance with applicable water quality standards in the Mongaup River downstream of the Rio Main Powerhouse in 2016 and 2017.

Water Quality Study Update:
Delaware River Water Temperature Monitoring

Goals and Objectives

- Evaluate potential effects from Rio Project operations on Delaware River water temperatures.

Study Area

- For evaluating water temperature in Delaware River: The Delaware River from immediately upstream to approximately 3 miles downstream of the Mongaup River confluence.

Water Quality Study Update:
Delaware River Water Temperature Monitoring

Methodology

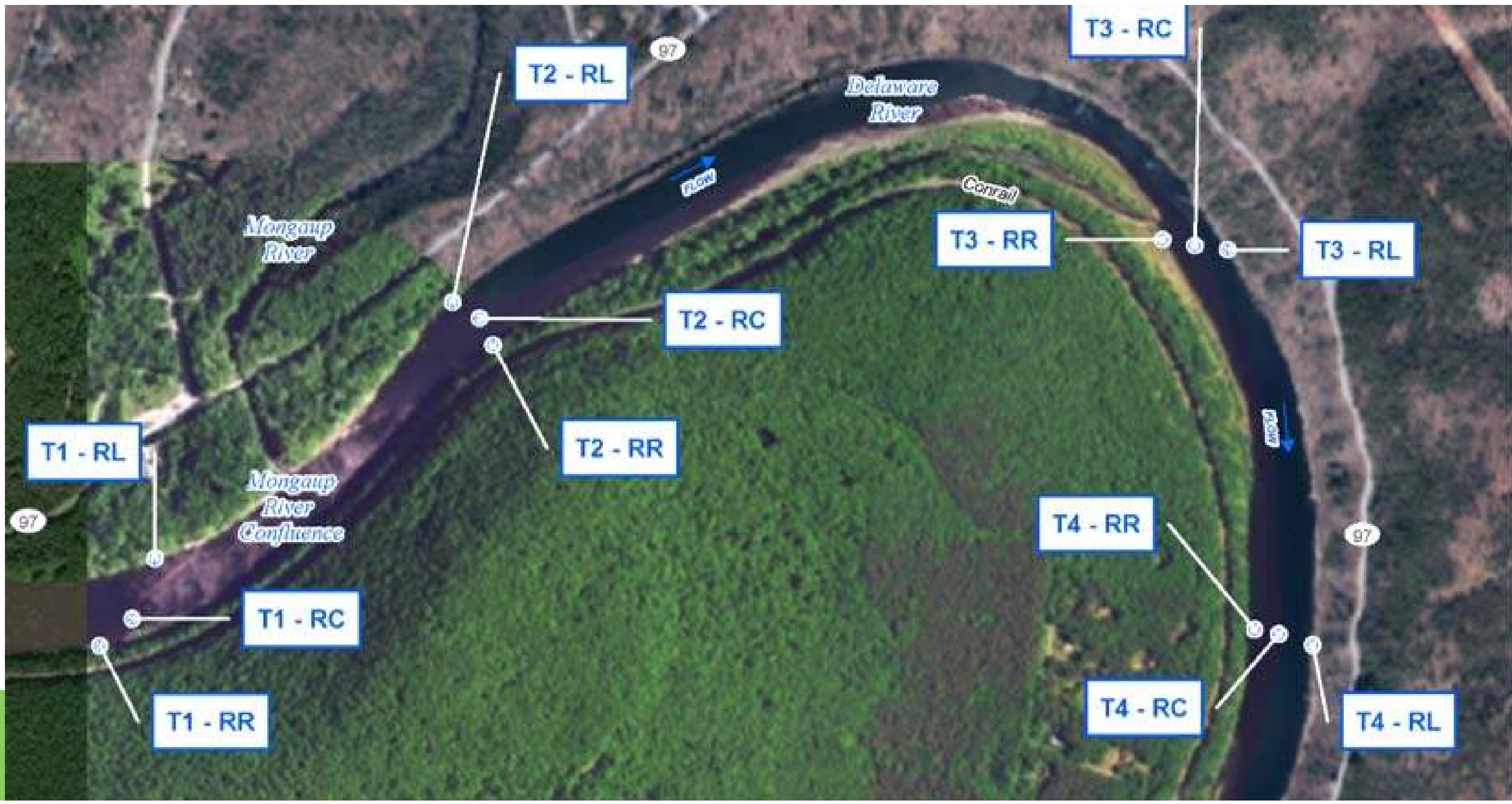
Delaware River Water Temperature Monitoring

- 2018: Eagle Creek deployed a total of 12 water temperature monitors in the Delaware River across 4 transects (representing river left, center, and right). One of the four transects was located immediately upstream of the confluence with the Mongaup River, and the remaining three transects were located downstream of the confluence.
- 2019: Eagle Creek deployed a total of four water temperature monitors in the thalweg located in the Delaware River. One of the monitors was located immediately upstream of the confluence with the Mongaup River, and the remaining three monitors were located downstream of the confluence.
- All monitoring devices consisted of an Onset HOBO Tidbit v2 or equivalent, were deployed using an anchoring mechanism, and were programmed to record data at 15-minute intervals.

Water Quality Study Update:
Delaware River Water Temperature Monitoring
Results

<u>Delaware River Water Temperature Evaluation - 2018</u>

- A total of 12 monitoring devices were deployed in 2018: 3 devices (@ river right, river center, and river left) were deployed at each of the 4 transects (1 located upstream of Mongaup River confluence and 3 located downstream of Mongaup River confluence).

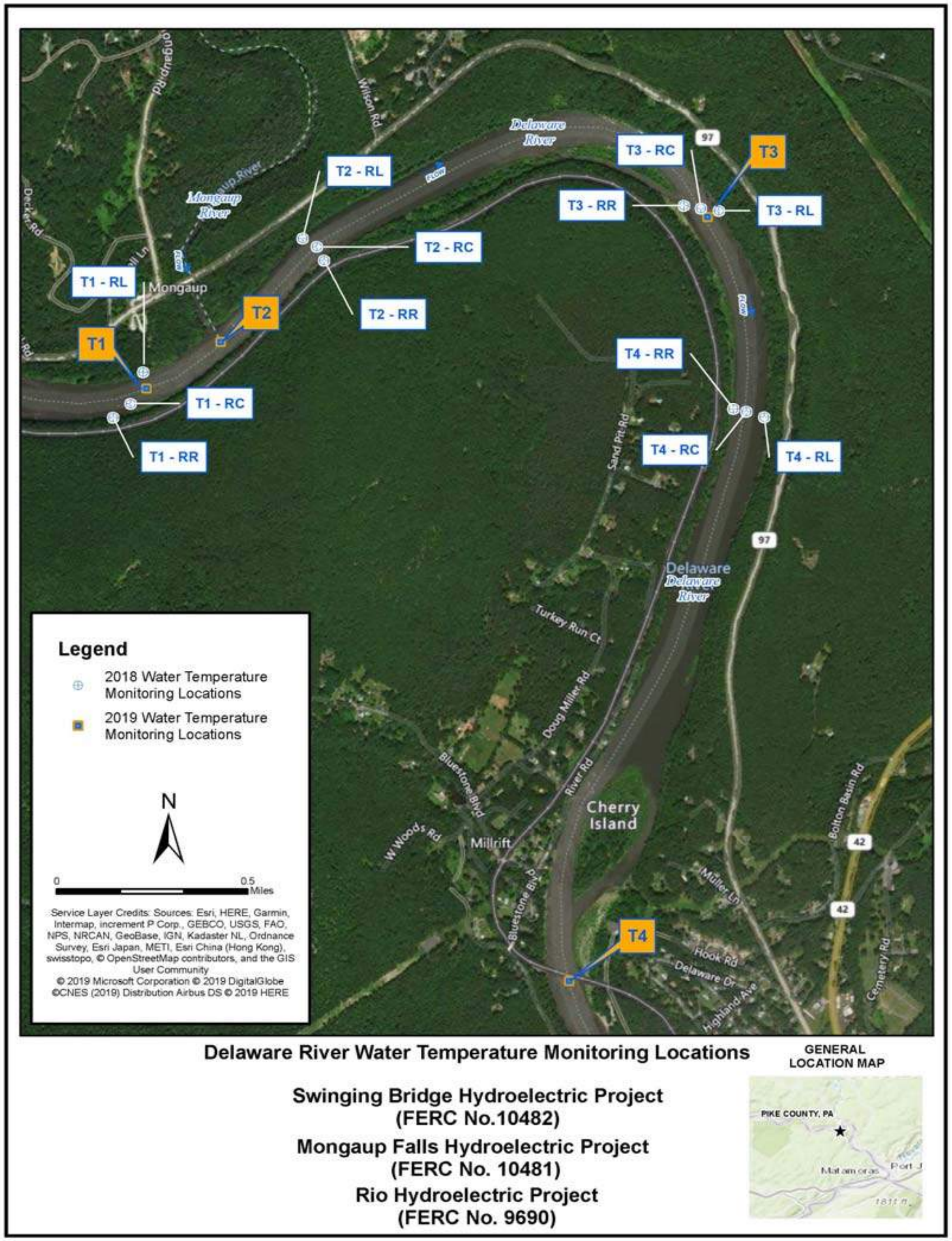


Water Quality Study

Results

Delaware River Water Temperature Evaluation - 2019

- A total of 4 monitoring devices were deployed in 2019:
- One device was located upstream of the confluence with the Mongaup River (T1),
- One device was located in the Delaware River at the mouth of the Mongaup River (T2),
- And two devices were located downstream of the Mongaup River confluence (T3 and T4) with the furthermost transect located approximately 2.8 river miles downstream of the confluence.

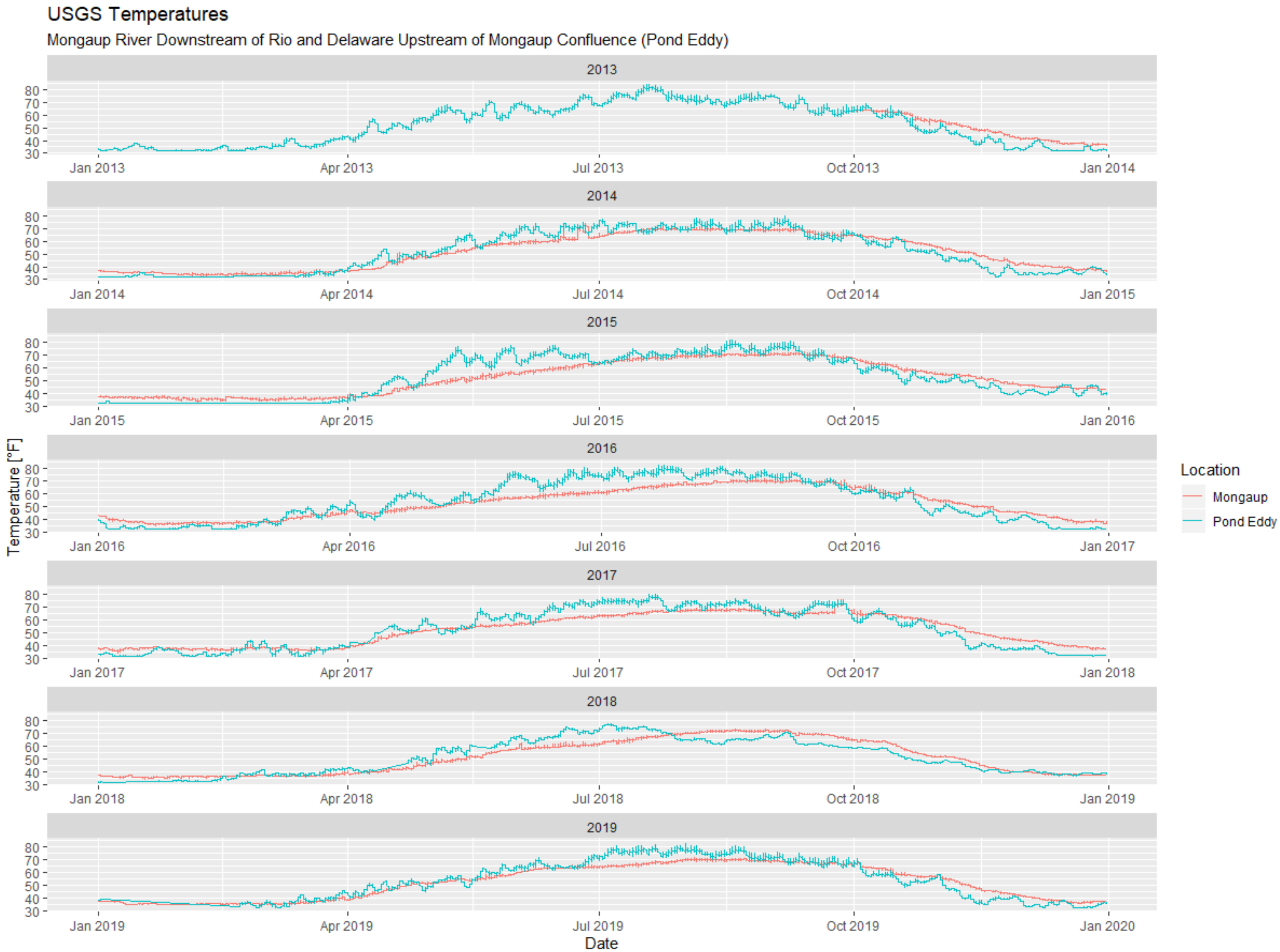


Water Quality Study Update:
Delaware River Water Temperature Monitoring

Results

- Water temperature data collected at (T1) in 2018 and 2019 were compared to water temperature data recorded at the USGS gage at Pond Eddy, NY (USGS Gage 01432805), in the Delaware River approximately 4.5 miles upstream of the Mongaup River confluence.
  - Data at T1-RR in 2018 exhibited large daily swings in water temperature potentially influenced by air temperatures and/or solar radiation and was inconsistent with the water temperature data recorded at the USGS gage located at Pond Eddy.
  - Data at T1 from June through August 2019 was consistent with the water temperature data recorded at the USGS gage located at Pond Eddy.
  - Therefore, the water temperature data collected in the Delaware River downstream of the Mongaup River confluence in 2018 was compared to the water temperature data collected at the upstream USGS gage at Pond Eddy.
- Water temperature data collected at USGS gages located in the Mongaup River (USGS Gage 01433500) and in the Delaware River (USGS Gage 01432805) between 2014 and 2019 were compared to understand trends in water temperature.

Water Quality Study Update:
Delaware River Water Temperature Monitoring



Water Quality Study Update:
Delaware River Water Temperature Monitoring

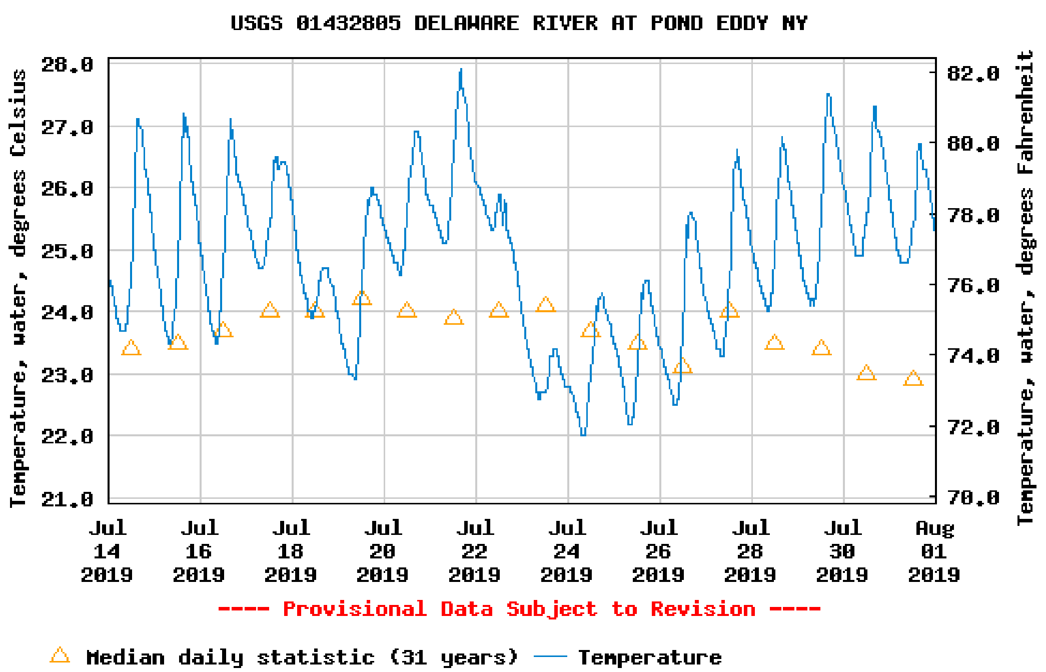
Results

- A comparison of the water temperature data in the Mongaup River and in the Delaware River upstream of the Mongaup River confluence from 2014 through 2019 indicates the following:
  - From January through March, water temperatures in the Delaware River were slightly colder or similar to those in the lower Mongaup River.
  - During April and May, water temperatures in the Delaware River were trending slightly warmer or similar to those in the lower Mongaup River.
  - During the majority of June, July, and August, water temperatures in the Delaware River were generally warmer than water temperatures in the lower Mongaup River. However, in 2018 (wet water year), water temperatures in the Delaware River were colder than those in the lower Mongaup River beginning in late July.
  - During September and October, water temperatures in the Delaware River were similar and at times colder than water temperatures in the lower Mongaup River.
  - Between approximately November and January, water temperatures in the Delaware River were typically colder than water temperatures in the lower Mongaup River.

Water Quality Study Update:
Delaware River Water Temperature Monitoring

Results

When looking at water temperature data recorded in the Delaware River upstream of the Mongaup River confluence at USGS Gage 01432805 during specific periods, it appears that water temperatures routinely fluctuate on a daily basis by 2 to 7 ^{o}F (i.e., with no influence from the Mongaup River Projects).

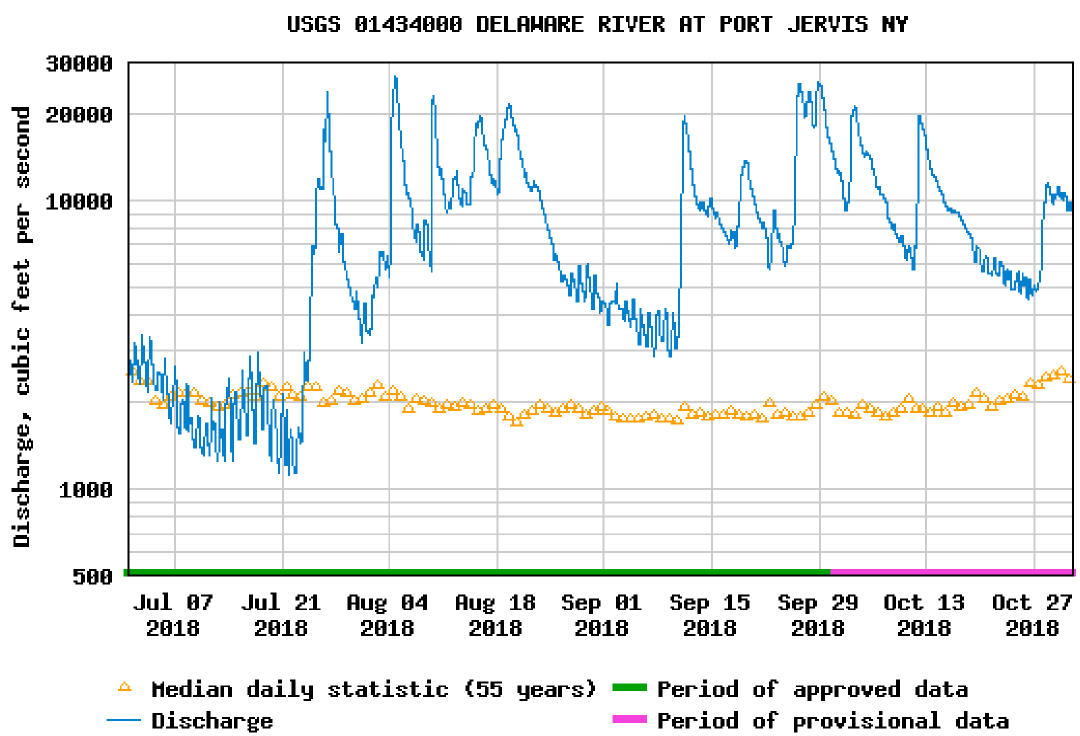


EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

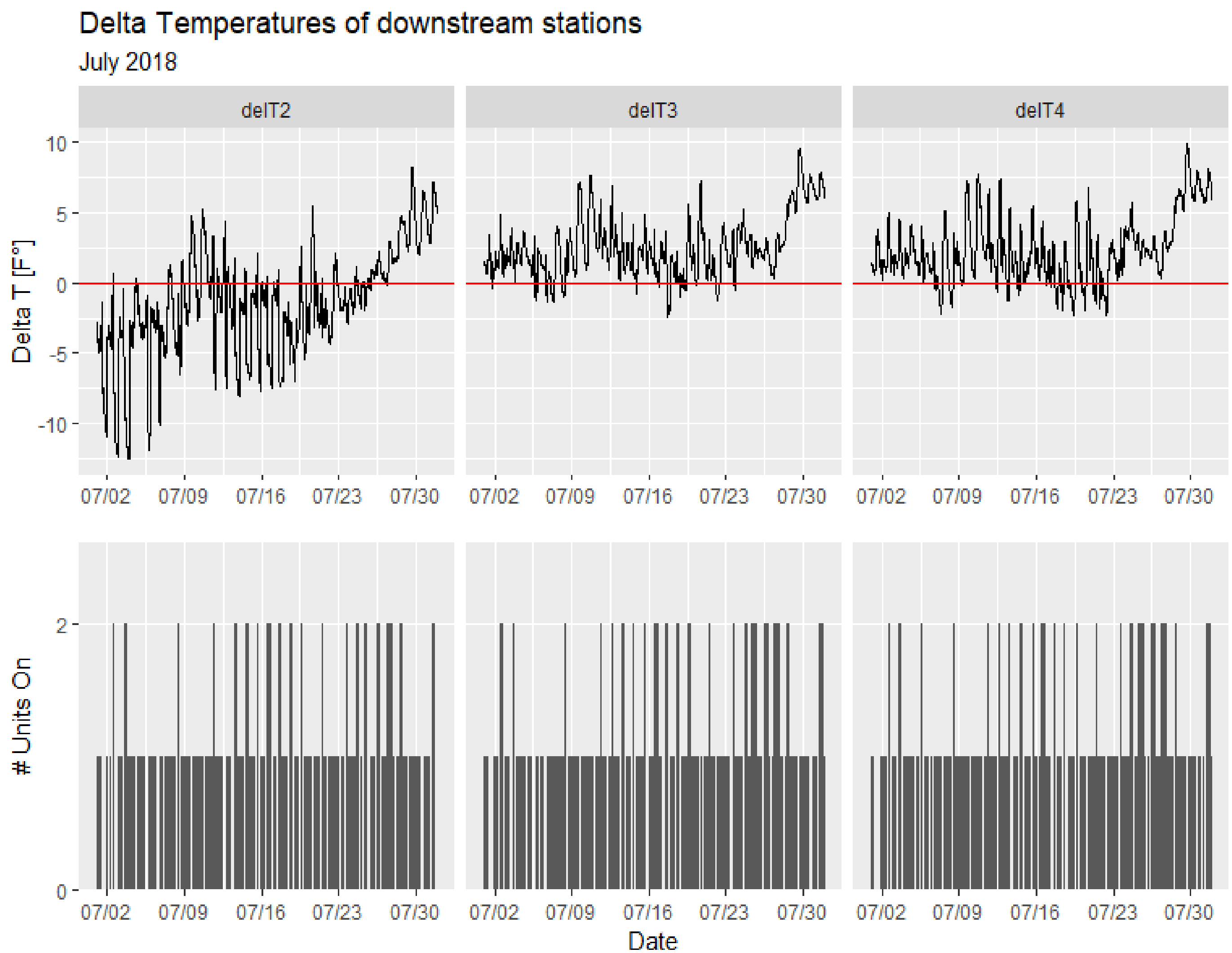
Water Quality Study Update:
Delaware River Water Temperature Monitoring

Results – 2018

Flows measured in the Delaware River at USGS Gage 01434000 (downstream of the Mongaup River confluence) ranged from approximately 1,100 cfs to 24,000 cfs in July, 3,400 cfs to 27,000 cfs in August, 3,000 cfs to 26,000 cfs in September, and 4,600 cfs to 21,000 cfs in October 2018.

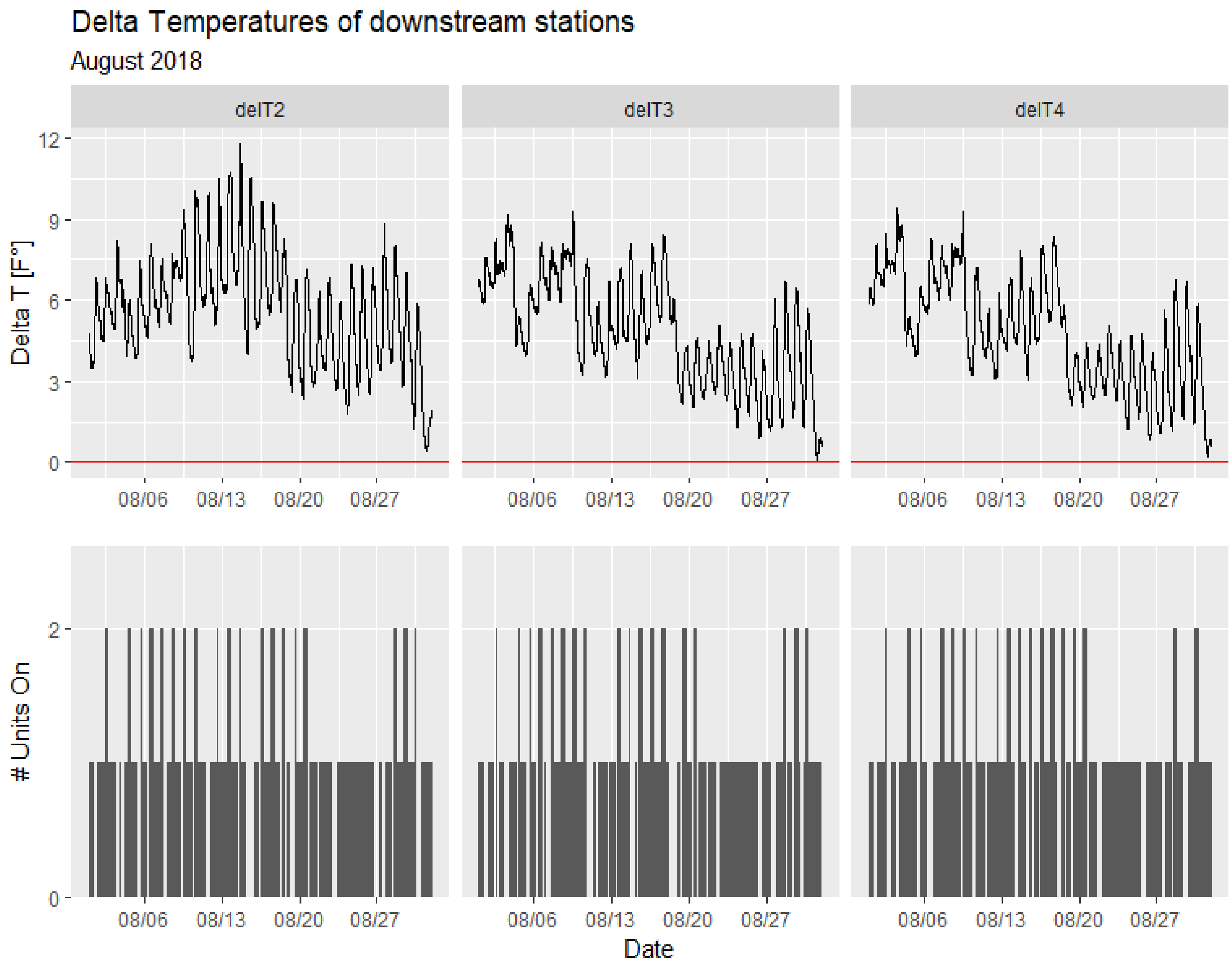


Water Quality Study Update:
Delaware River Water Temperature Monitoring
Results – 2018



Water Quality Study Update:
Delaware River Water Temperature Monitoring

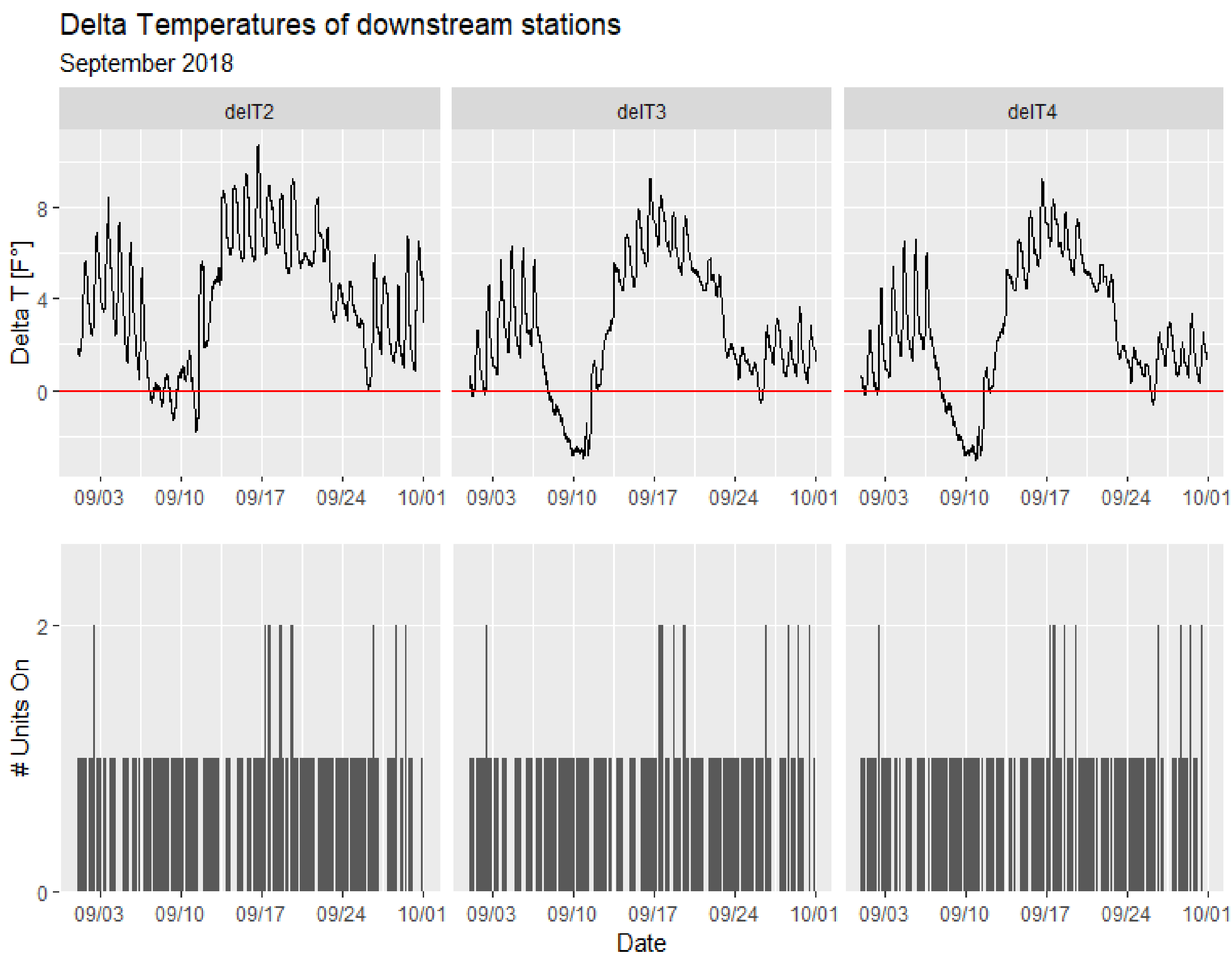
Results – 2018



EAGLE CREEK RENEWABLE ENERGY – EXCELLENCE IN HYDRO –

Water Quality Study Update:
Delaware River Water Temperature Monitoring

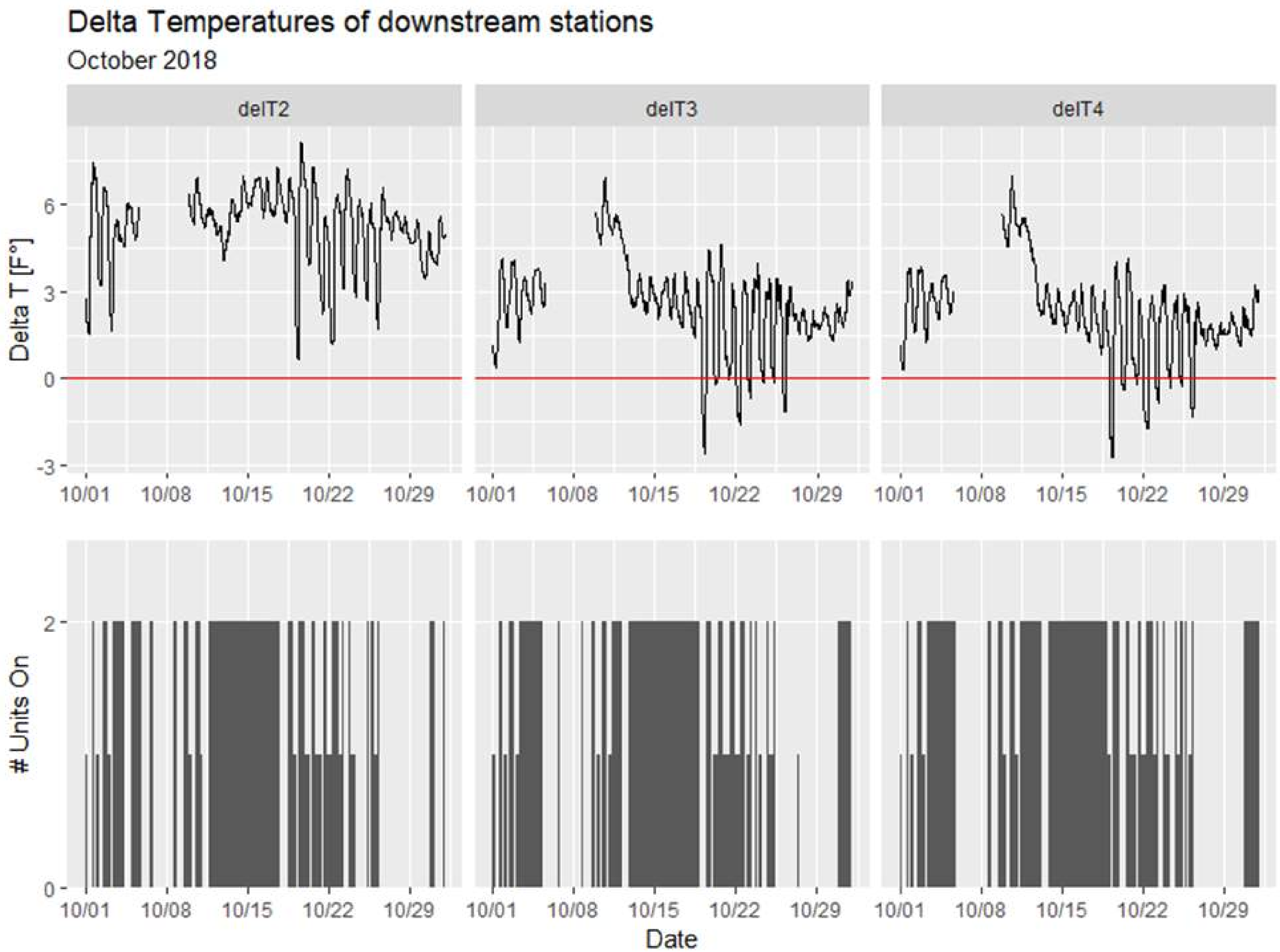
Results – 2018



EAGLE CREEK RENEWABLE ENERGY – EXCELLENCE IN HYDRO –

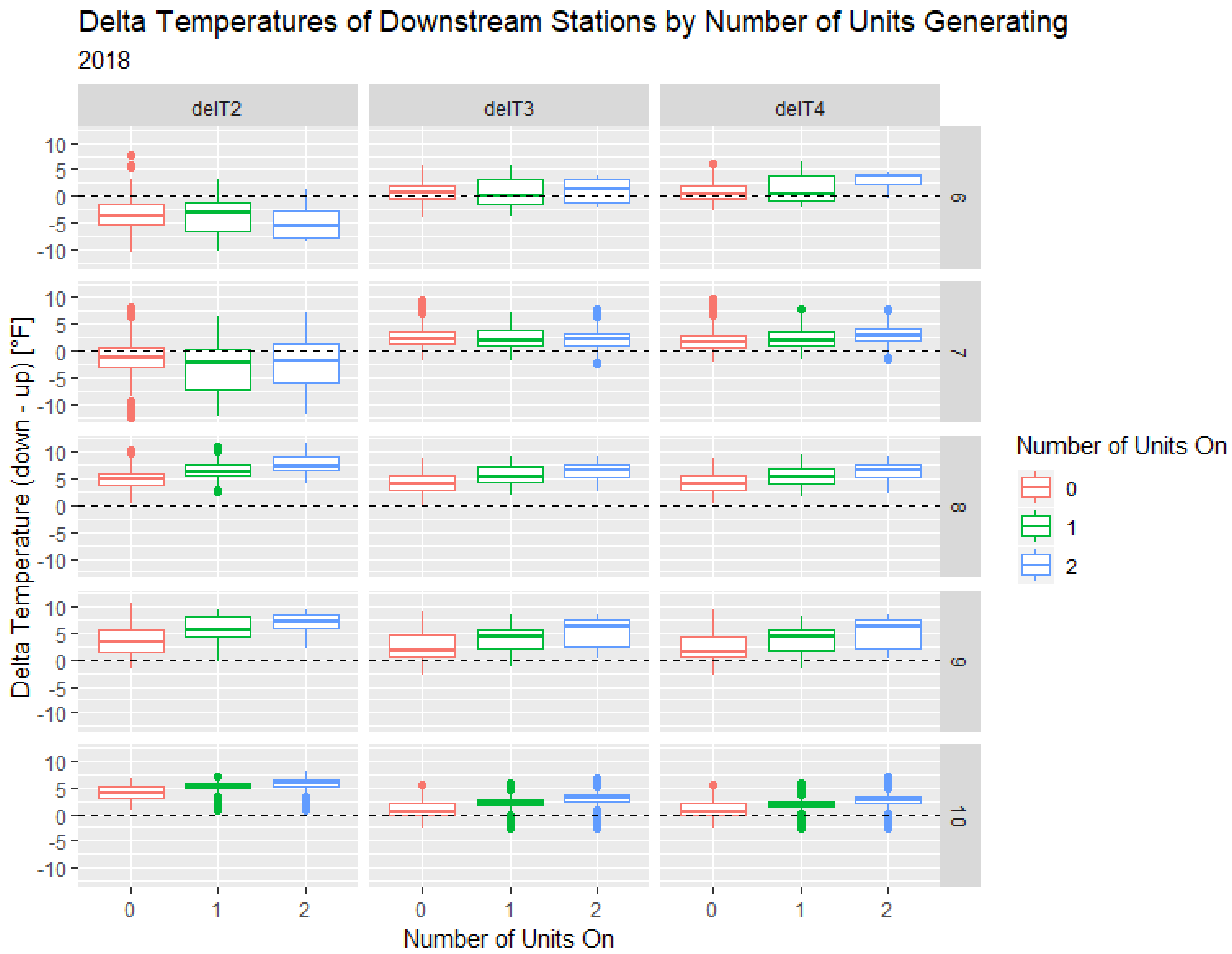
Water Quality Study Update:
Delaware River Water Temperature Monitoring

Results – 2018



Water Quality Study Update:
Delaware River Water Temperature Monitoring

Results – 2018



EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Water Quality Study Update:
Delaware River Water Temperature Monitoring

Results – 2018

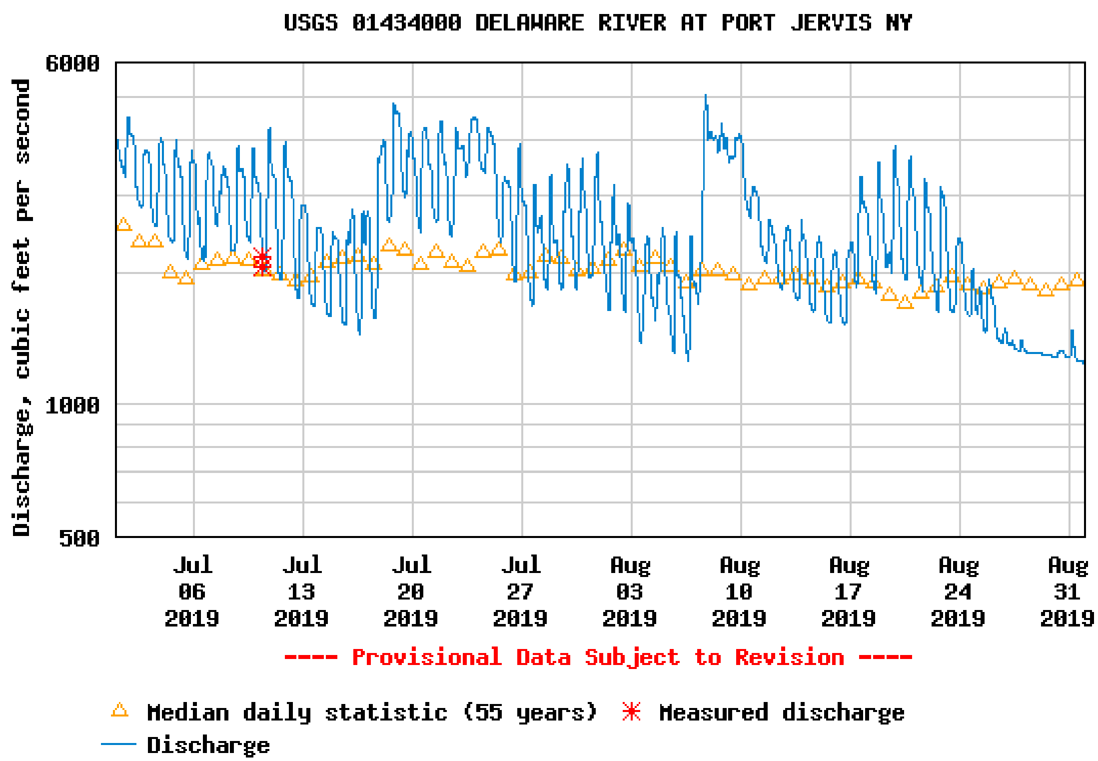
- From June through late July 2018, water temperatures in the Delaware River upstream of the Mongaup River confluence were warmer than water temperatures in the lower Mongaup River, resulting in a decrease in water temperature at T2 (with the 50th percentile delta ranging from approximately 1 to 6 ^{o}F) and no change to a slight increase in water temperature at T3 and T4 (with the 50th percentile delta ranging from approximately 1 to 4 ^{o}F).
- From late July through October 2018, water temperatures in the Delaware River upstream of the Mongaup River confluence were colder than water temperatures in the lower Mongaup River resulting in an increase in water temperatures at T2, T3, and T4 (with the 50th percentile delta ranging from 1 to 7 ^{o}F).

EAGLE CREEK RENEWABLE ENERGY
– EXCELLENCE IN HYDRO –

Water Quality Study Update:
Delaware River Water Temperature Monitoring

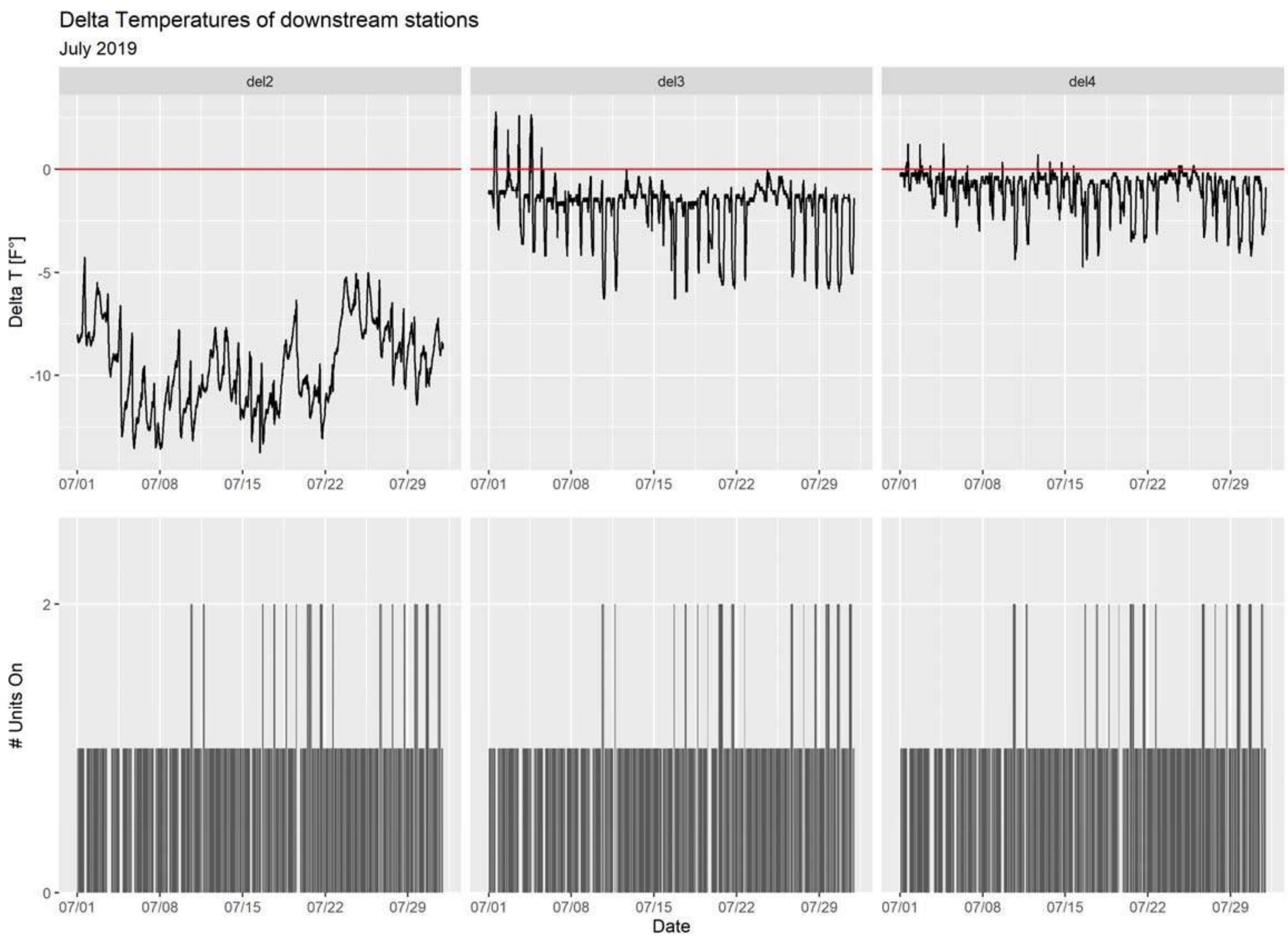
Results – 2019

- Flows measured in the Delaware River at USGS Gage 01434000 (downstream of the Mongaup River confluence) ranged from approximately 1,200 cfs to 4,800 cfs in July and August, 2019 (Figure 5.4-10).



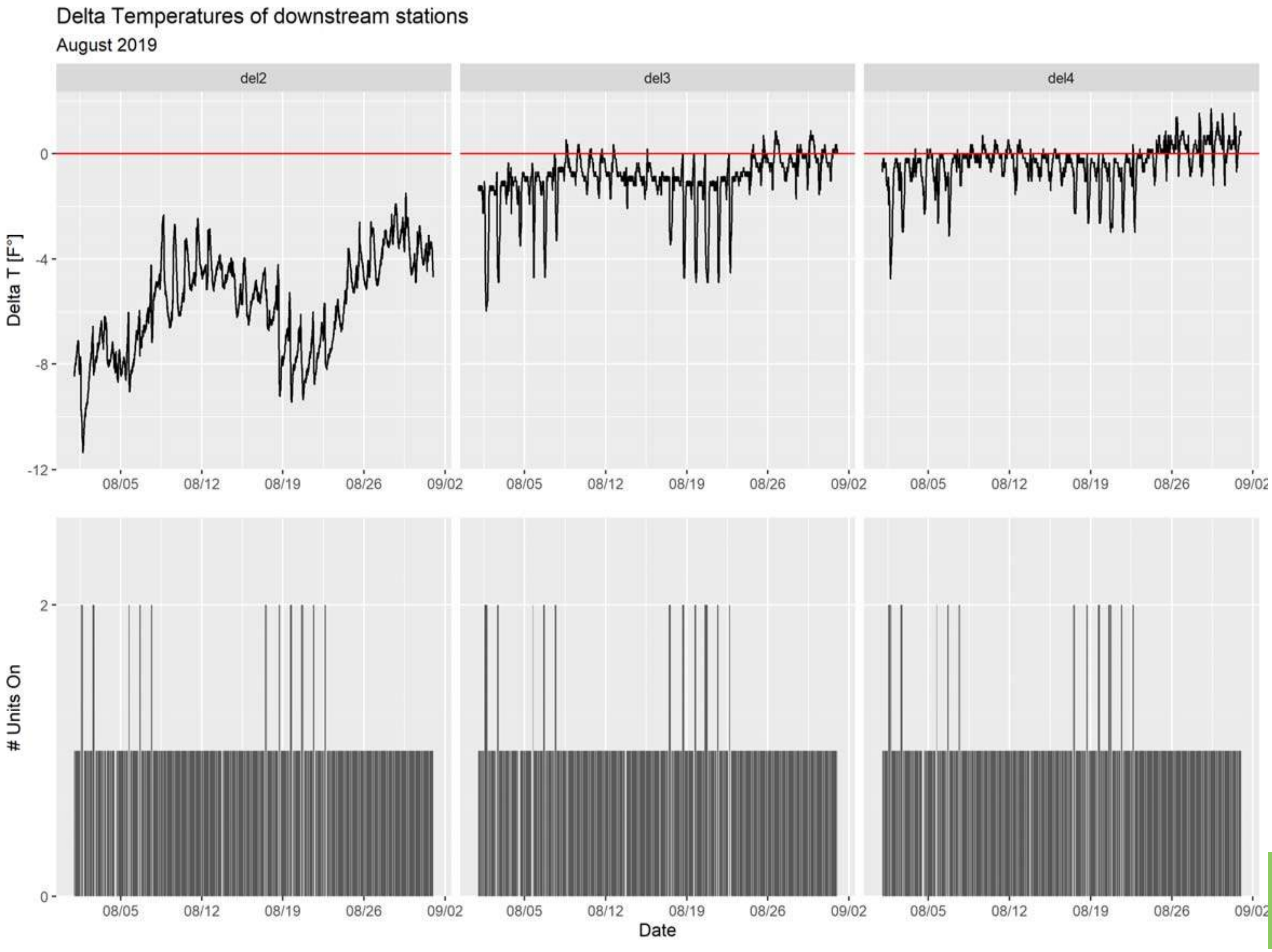
Water Quality Study Update:
Delaware River Water Temperature Monitoring

Results – 2019



Water Quality Study Update:
Delaware River Water Temperature Monitoring

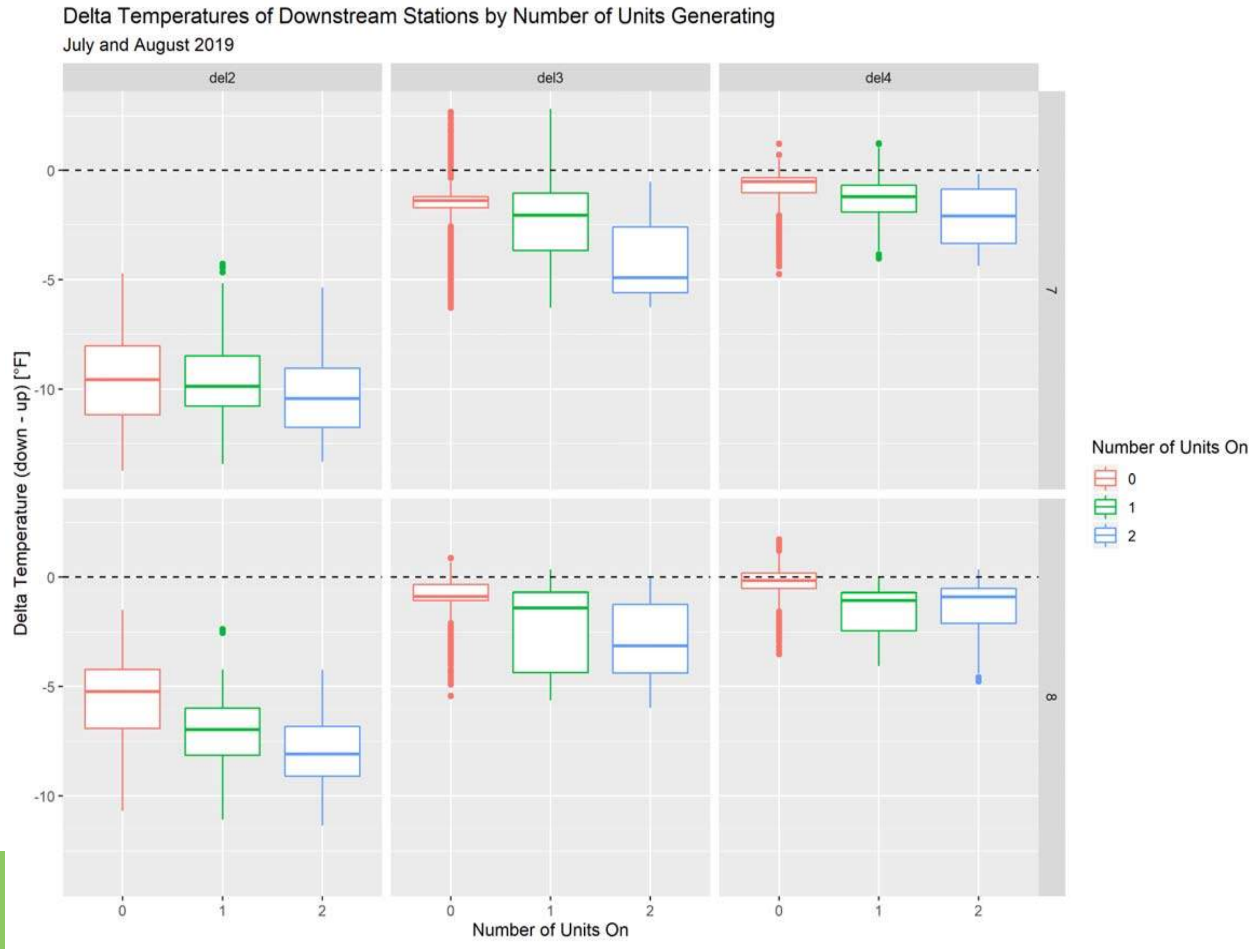
Results – 2019



EAGLE CREEK RENEWABLE ENERGY
– EXCELLENCE IN HYDRO –

Water Quality Study Update:
Delaware River Water Temperature Monitoring

Results – 2019



EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Water Quality Study Update:
Delaware River Water Temperature Monitoring

Results – 2019

- In July 2019, water temperatures at T2 were approximately 9 to 11 ^{o}F colder than T1, temperatures at T3 were approximately 1.5 to 5 ^{o}F colder than T1, and temperatures at T4 were approximately 1 to 2 ^{o}F colder than T1.
- In August 2019, water temperatures at T2 were approximately 5.5 to 8 ^{o}F colder than T1, temperatures at T3 were approximately 1 to 3 ^{o}F colder than T1, and temperatures at T4 were approximately 0 to 1 ^{o}F colder than at T1.

Water Quality Study Update:
Delaware River Water Temperature Monitoring

Summary

- Between 2014 and 2019, water temperatures in the Delaware River were generally warmer than water temperatures in the lower Mongaup River during June, July, and August, with the exception of 2018 (wet water year) when water temperatures in the Delaware River were colder than those in the lower Mongaup River beginning in late July.
- During these months, flows from the Mongaup River may affect water temperatures in the Delaware River immediately downstream of the Mongaup River confluence by approximately 0 to 11 ^{o}F and to a lesser degree as thermal mixing occurs. However, a review of water temperatures in the Delaware River upstream of the Mongaup River confluence (i.e., no affect from the Mongaup River) show a daily fluctuation of approximately 2 to 7 ^{o}F occurs routinely.
- The Delaware River is a large and dynamic river fed by 216 tributaries. The lower Mongaup River is a class B(T) stream reach with water quality standards, including temperatures below 70 ^{o}F, in support of trout populations. Releases from the Rio Project into the bypassed reach and below the Rio Main Powerhouse provide water with typically cooler temperatures to meet the Mongaup River water temperatures standards for the benefit of the trout population.

Delaware River Flow Study

Delaware River Flow Study

Goals and Objectives

- Evaluate the general effect of flow releases from the Rio Project on the Delaware River downstream of its confluence with the Mongaup River.
- Evaluate the sub-hourly effects of Rio Project operation on flows in the Delaware River downstream of its confluence with the Mongaup River during low, normal, and high flows in the Delaware River.

Study Area

- The study area to be evaluated for the effect of flow releases from the Rio Project on the Delaware River includes the Mongaup River from the Rio Main Powerhouse downstream to its confluence with the Delaware River and the Delaware River downstream of the confluence to the USGS gage located at Riegelsville, PA.

Delaware River Flow Study

Methodology

Delaware River Flow Evaluation

- Graphed flows measured in 2016 through 2019 at five USGS gages.
- 2016 represents a dry year, 2017 and 2019 represent normal years, and 2018 represents a wet year.
- Evaluated the sub-hourly effects of Rio Project operations on flows in the Delaware River during representative periods of low (less than the 90 percent annual exceedance flow), normal (approximately 50 percent annual exceedance flow), and high (greater than the 10 percent annual exceedance flow) flows in the Delaware River.
- Representative periods of low, normal, and high flows in the Delaware River were evaluated in relation to Rio Project operation during normal operations (i.e., bypassed reach minimum flow release (~100 cfs), one-unit release (535 cfs), and two-unit release (~970 cfs)).

Delaware River Flow Study

USGS Gage No.	USGS Gage Name	Location	Comments	Drainage Area (square miles)	Percentage of Area Contributed by Rio Gage[1]
01433500	Mongaup River near Mongaup, NY	Downstream of Rio Main Powerhouse tailrace	--	200	100
01434000	Delaware River at Port Jervis, NY	6.5 miles downstream of Mongaup River confluence	1.2 miles upstream of Neversink River confluence	3,070	6.5
01438500	Delaware River at Montague, NJ	Approx. 8.36 miles downstream of USGS Gage No. 01434000	Downstream of Neversink River confluence	3,480	5.7
01446500	Delaware River at Belvidere, NJ	Approx. 48.94 miles downstream of USGS Gage No. 01438500	Downstream of Brodhead Creek confluence	4,535	4.4
01457500	Delaware River at Riegelsville, NJ[2]	Approx. 22.78 miles downstream of USGS Gage No. 01446500	Downstream of Bushkill Creek and Lehigh River confluences[3]	6,328	3.2

Eagle Creek Renewable Energy — Excellence in Hydro —

Delaware River Flow Study

Results

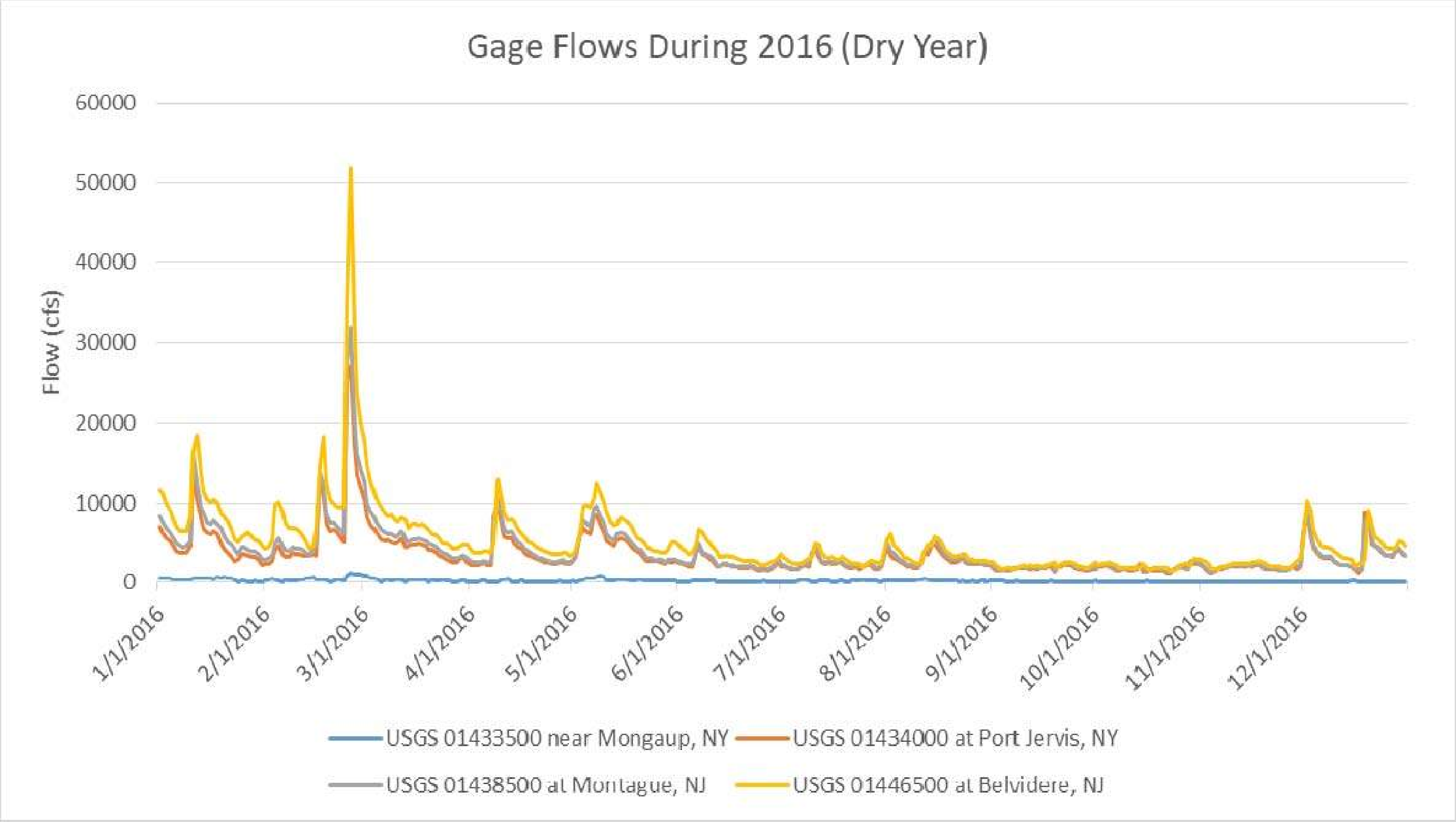
Year	Flow in the Delaware River[1]	Dates	Minimum Flow (cfs)	Maximum Flow (cfs)	Mean Flow (cfs)
2016 (dry)	Low	9/8/2016 – 9/20/2016[2]	1,300	2,570	1,882
	Normal	8/13/2016 – 8/19/2016	2,440	5,460	3,844
	High	5/13/2016 – 5/19/2016	3,790	6,260	4,991
2017 (normal)	Low	10/4/2017 – 10/10/2017	1,330	2,570	1,726
	Normal	8/18/2017 – 8/24/2017	1,960	4,100	3,165
	High	5/3/2017 – 5/9/2017	9,940	21,300	13,896
2018 (wet)	Low	6/27/2018 – 7/3/2018	1,640	4,890	2,683
	Normal	9/1/2018 – 9/7/2018	2,890	5,120	3,931
	High	9/27/2017 – 10/3/2018	9,190	25,800	17,544
2019 (normal)	Low	9/13/2019 – 9/27/2019[2]	1,130	2,400	1,459
	Normal	7/8/2019 – 7/14/2019	1,660	3,940	2,582
	High	4/15/2019 – 4/21/2019	9,470	43,800	23,315

1These representative flow periods are flows measured at USGS gage 01434000 at Port Jervis, NY.
2There was no one-week period during which both one and two unit releases occurred at the Rio Main Powerhouse; therefore, the period was extended to approximately two weeks.

Delaware River Flow Study

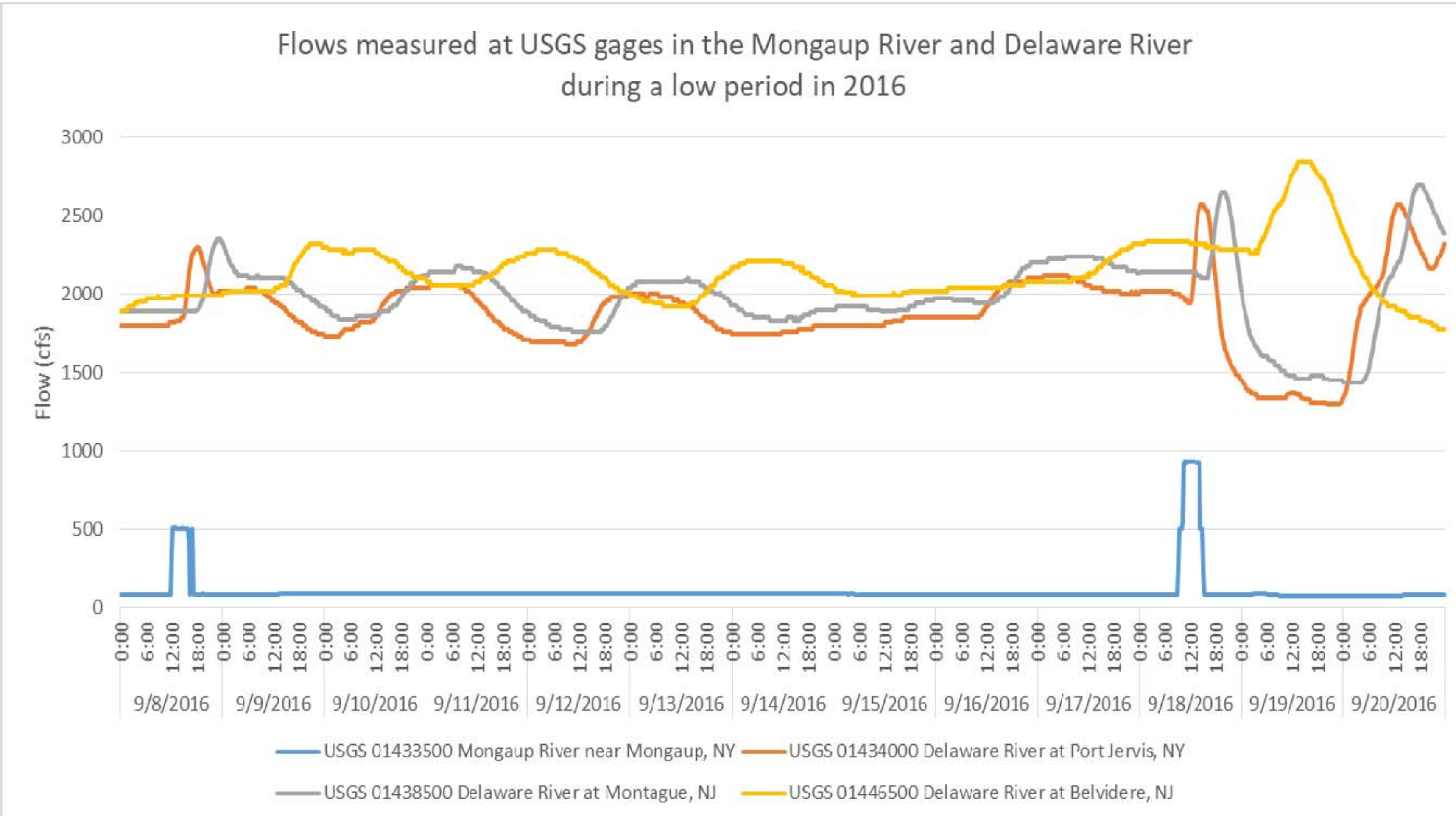
Results – 2016 (Dry Year)

- Flows largely remained below 10,000 cfs throughout the year with consistently lower flows generally below 5,000 cfs in the second half of 2016



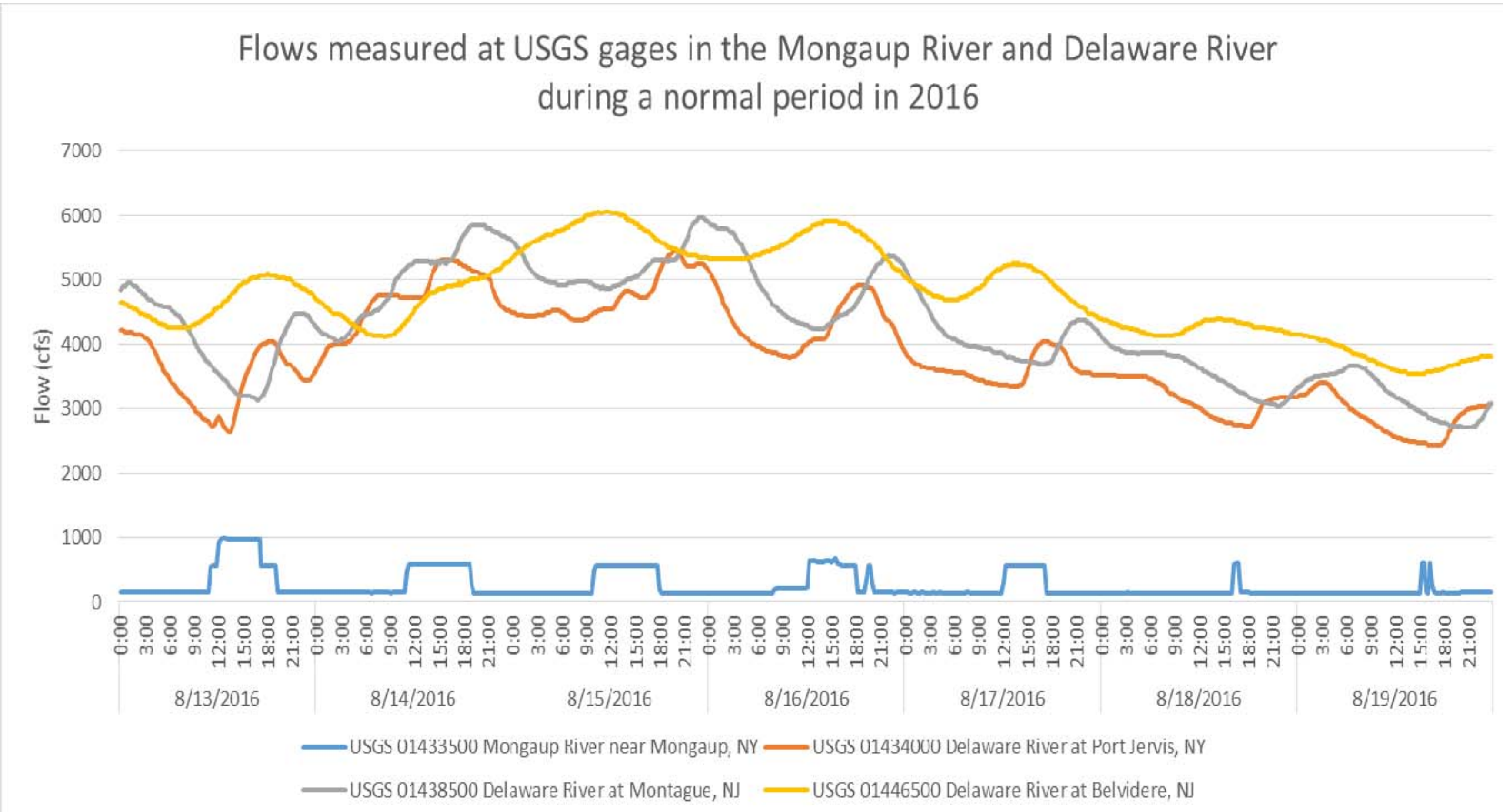
Delaware River Flow Study

Results – 2016 (Dry Year)



Delaware River Flow Study

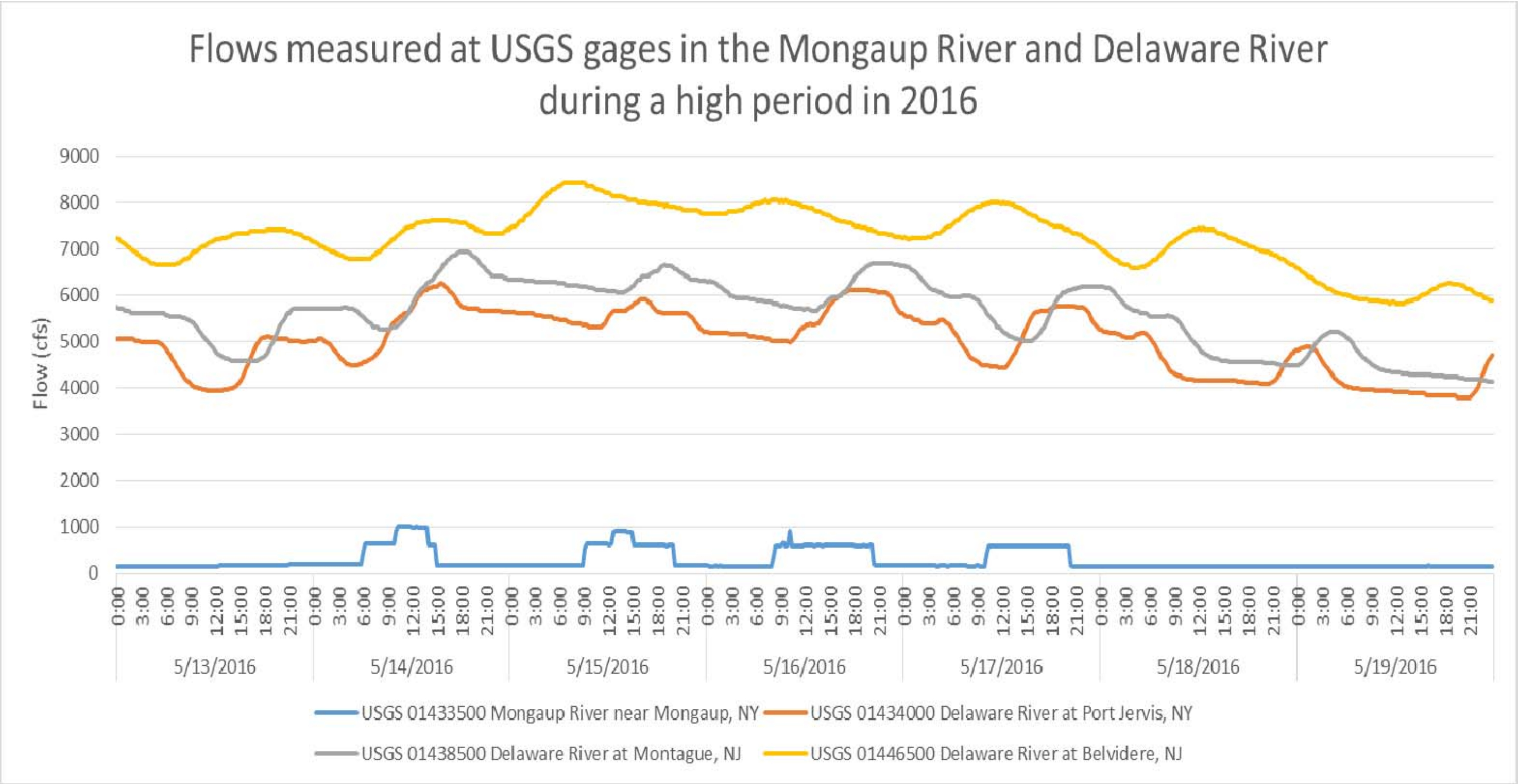
Results – 2016 (Dry Year)



EAGLE CREEK RENEWABLE ENERGY
– EXCELLENCE IN HYDRO –

Delaware River Flow Study

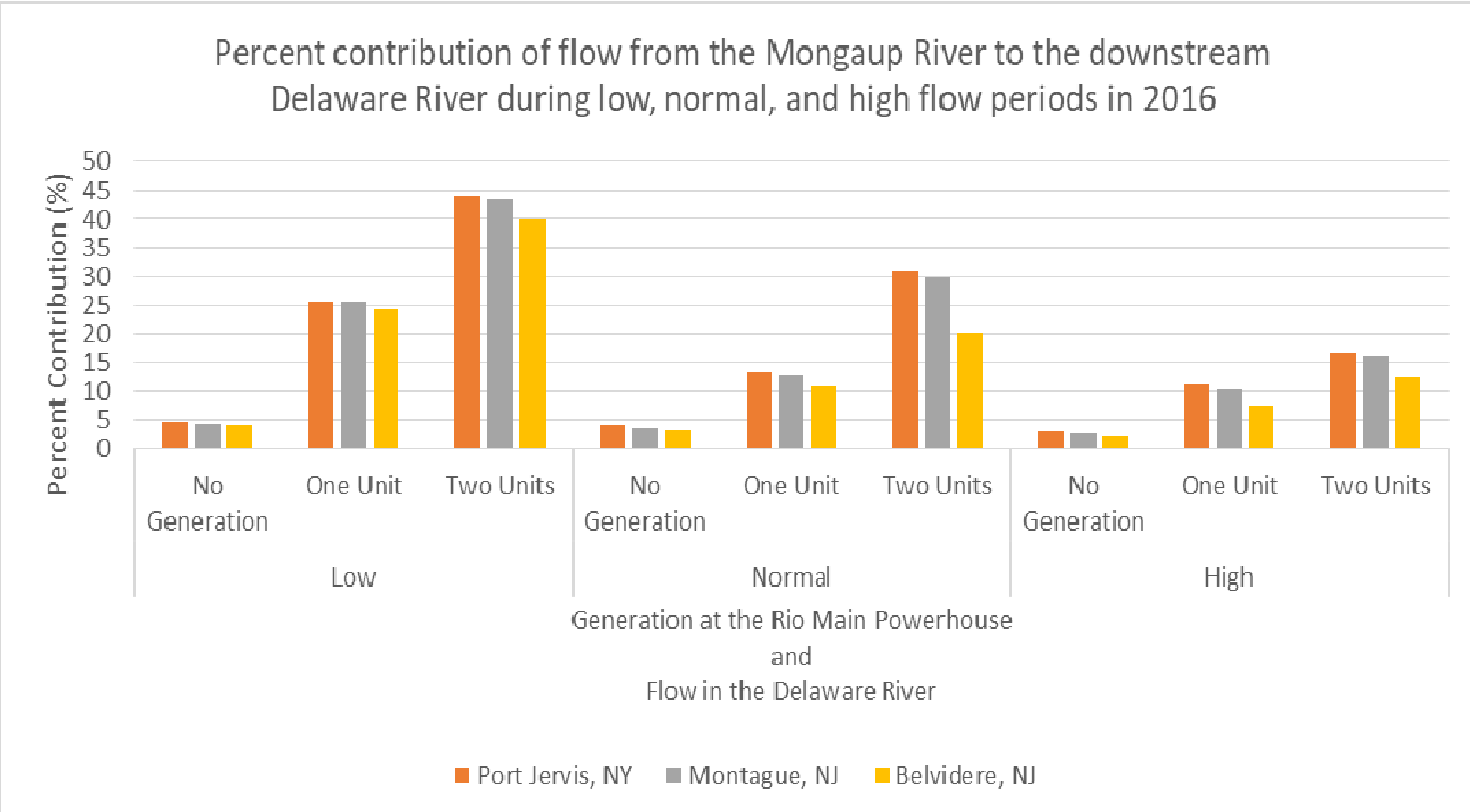
Results – 2016 (Dry Year)



EAGLE CREEK RENEWABLE ENERGY
– EXCELLENCE IN HYDRO –

Delaware River Flow Study

Results – 2016 (Dry Year)

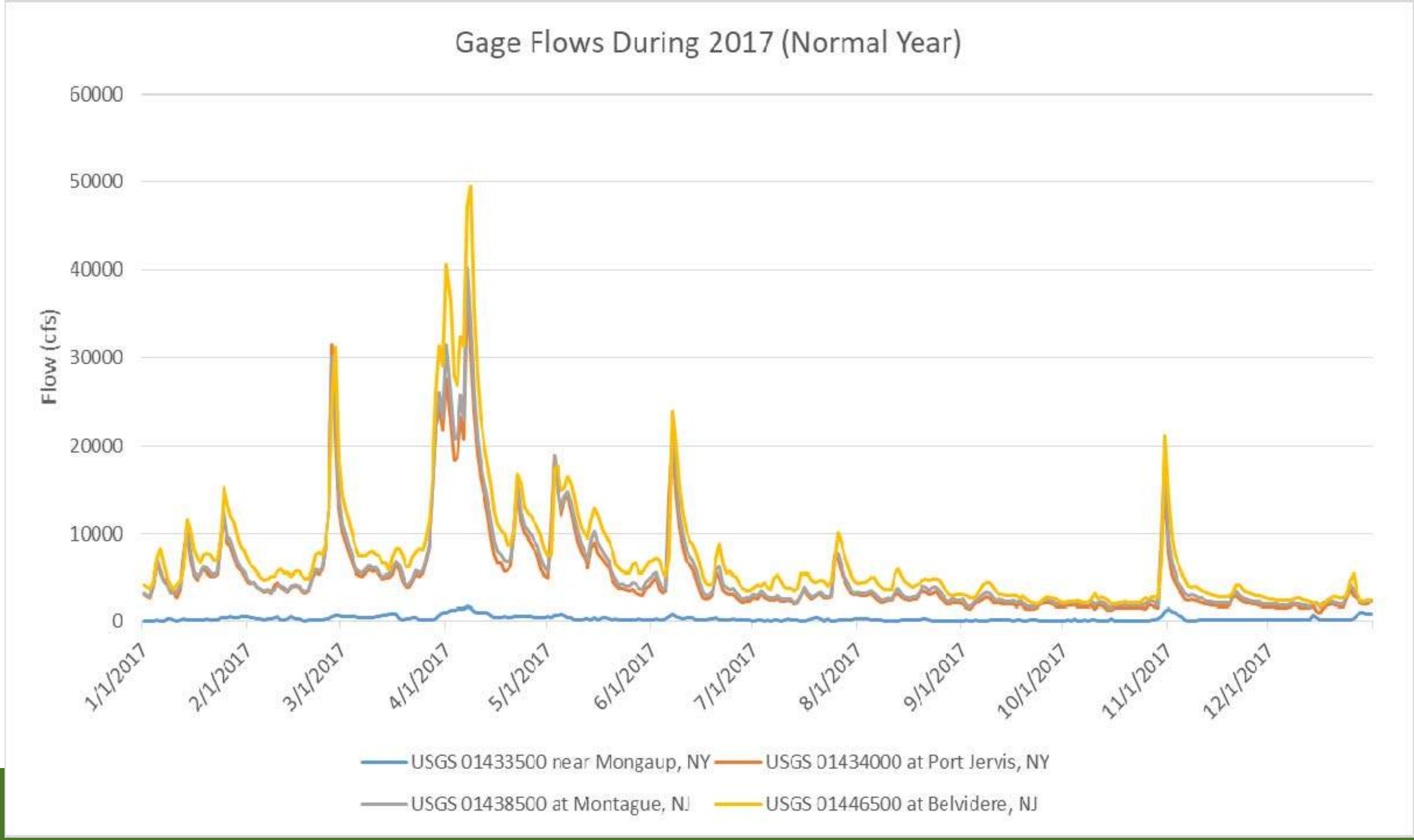


EAGLE CREEK RENEWABLE ENERGY – EXCELLENCE IN HYDRO –

Delaware River Flow Study

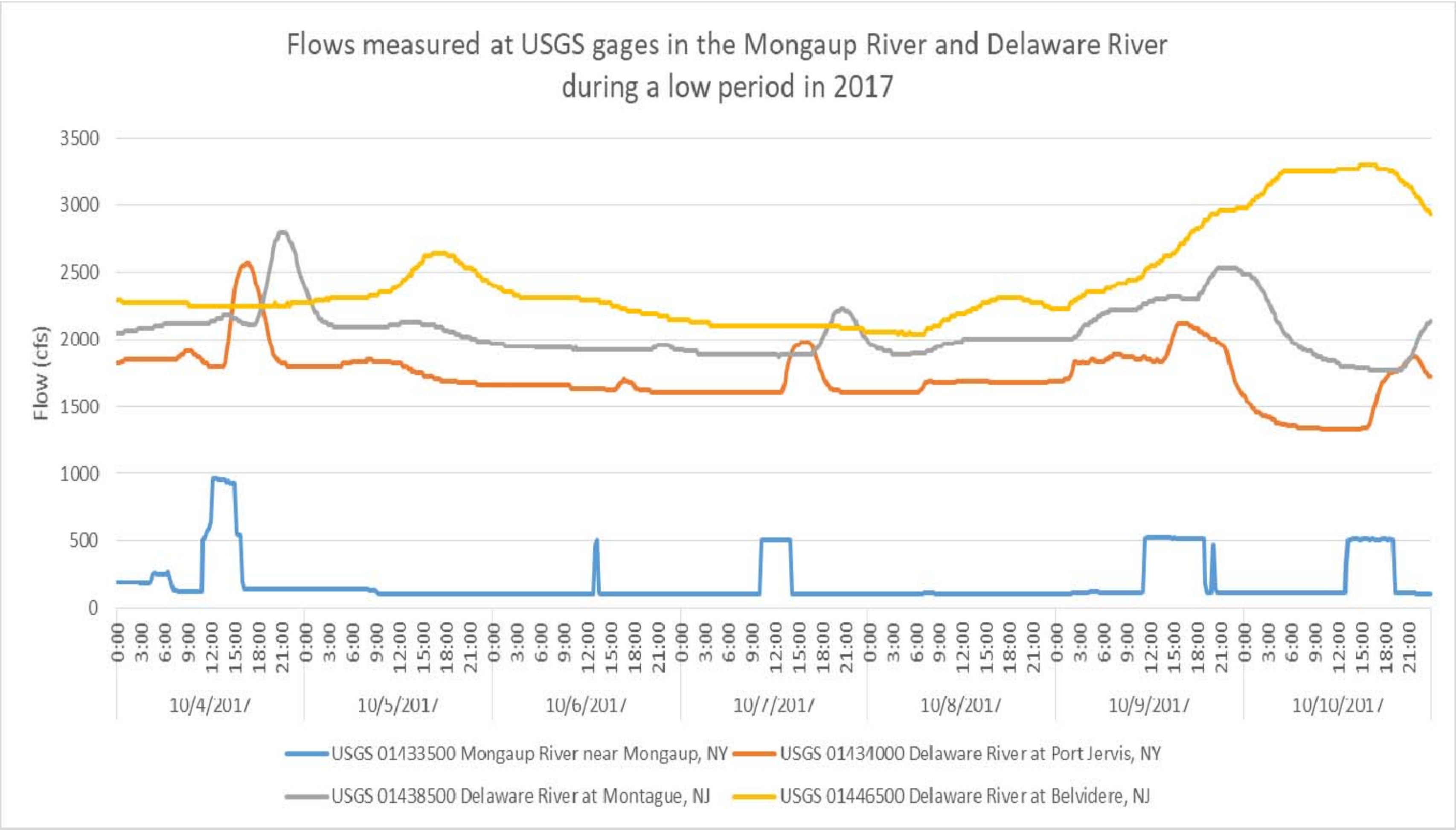
Results – 2017 (Normal Year)

During the first half of 2017, the Delaware River experienced flows primarily ranging from approximately 10,000 cfs to 50,000 cfs with flows decreasing in the second half of 2017 generally remaining below 10,000 cfs.



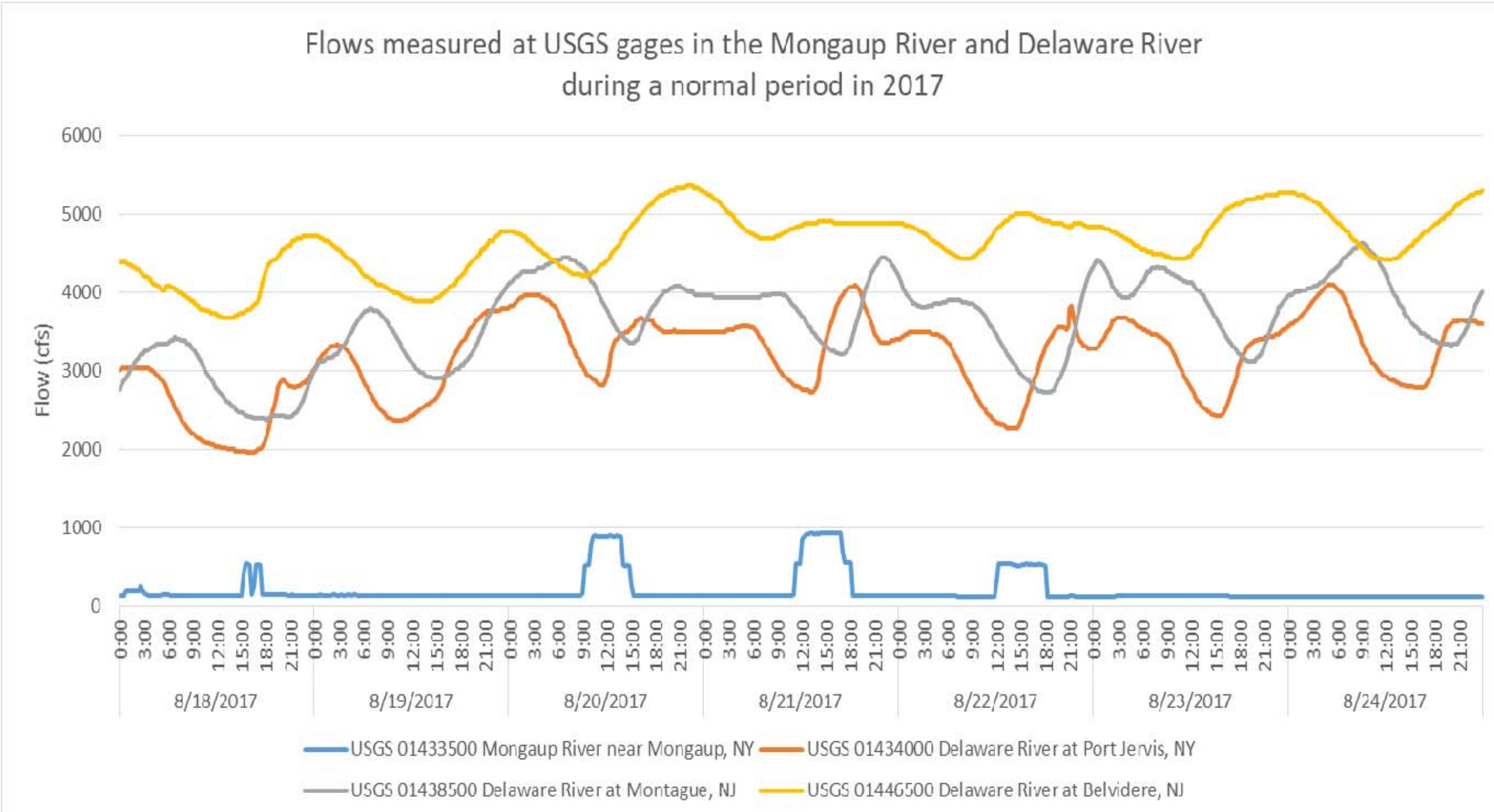
Delaware River Flow Study

Results – 2017 (Normal Year)



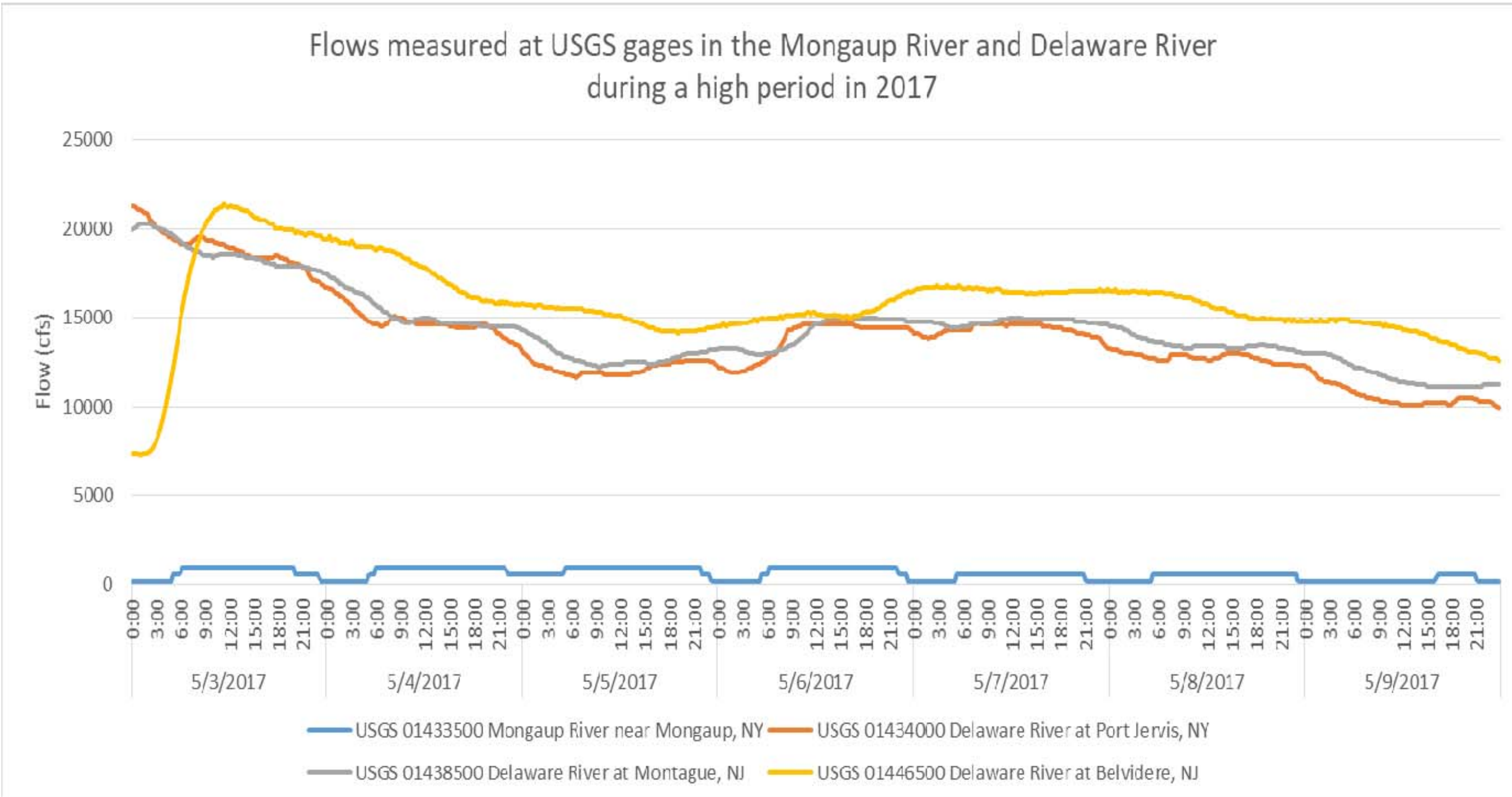
Delaware River Flow Study

Results – 2017 (Normal Year)



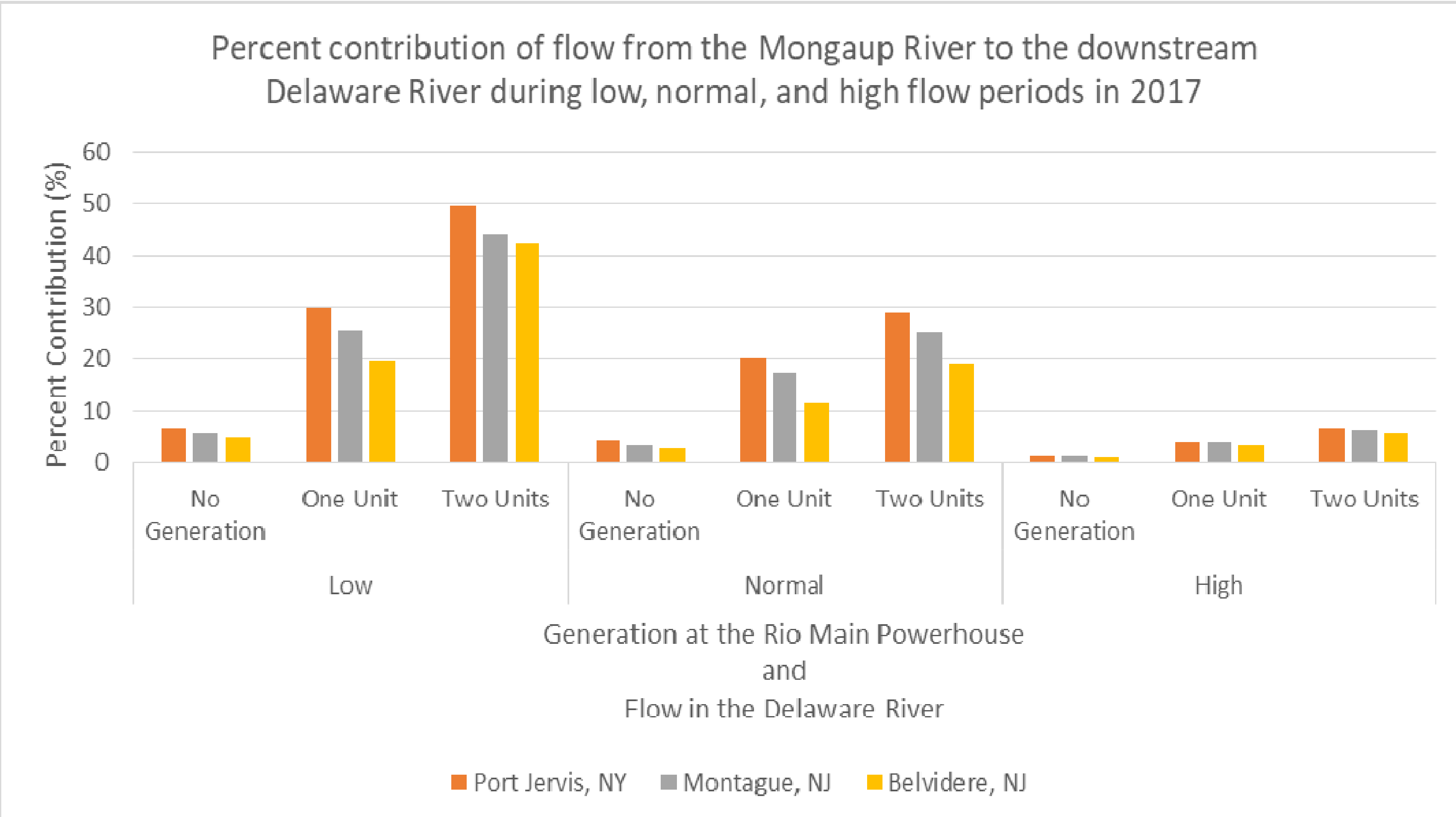
Delaware River Flow Study

Results – 2017 (Normal Year)



Delaware River Flow Study

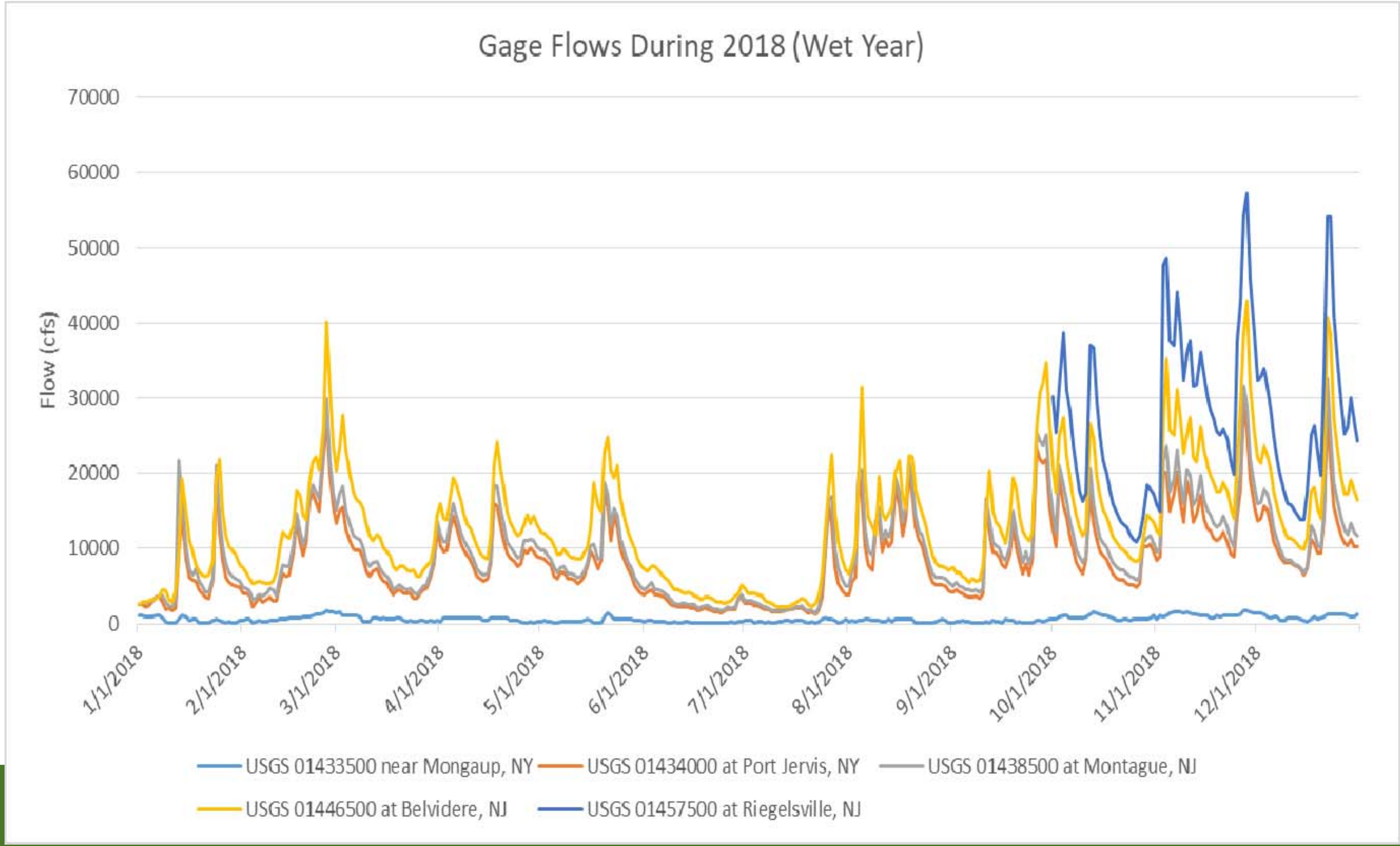
Results – 2017 (Normal Year)



Delaware River Flow Study

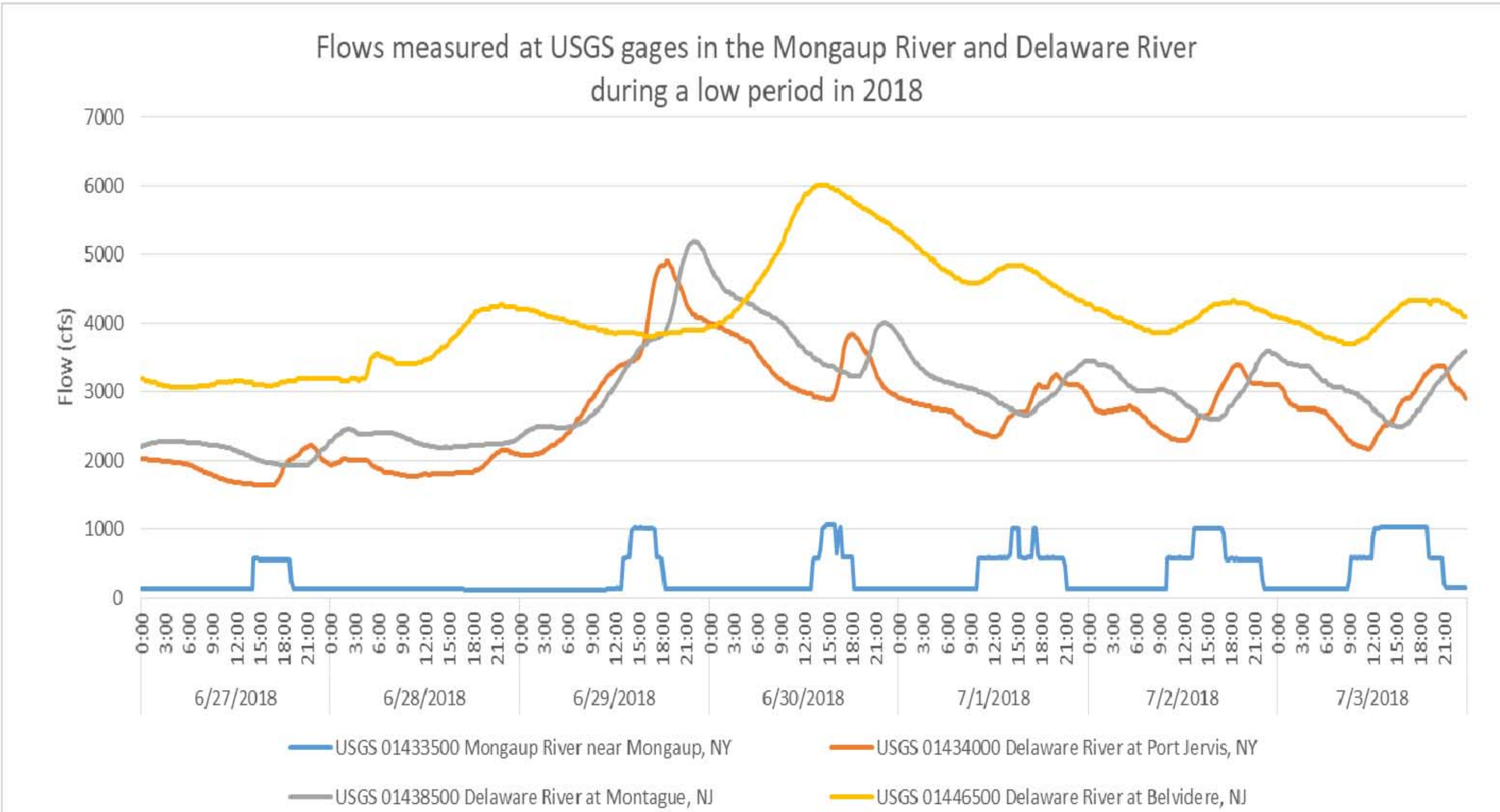
Results – 2018 (Wet Year)

During 2018, there were significant fluctuations in flow, especially in spring, fall, and winter. Besides the months of June and July, flows typically remained over 10,000 cfs in the Delaware River, peaking to approximately 30,000 cfs at Port Jervis.



Delaware River Flow Study

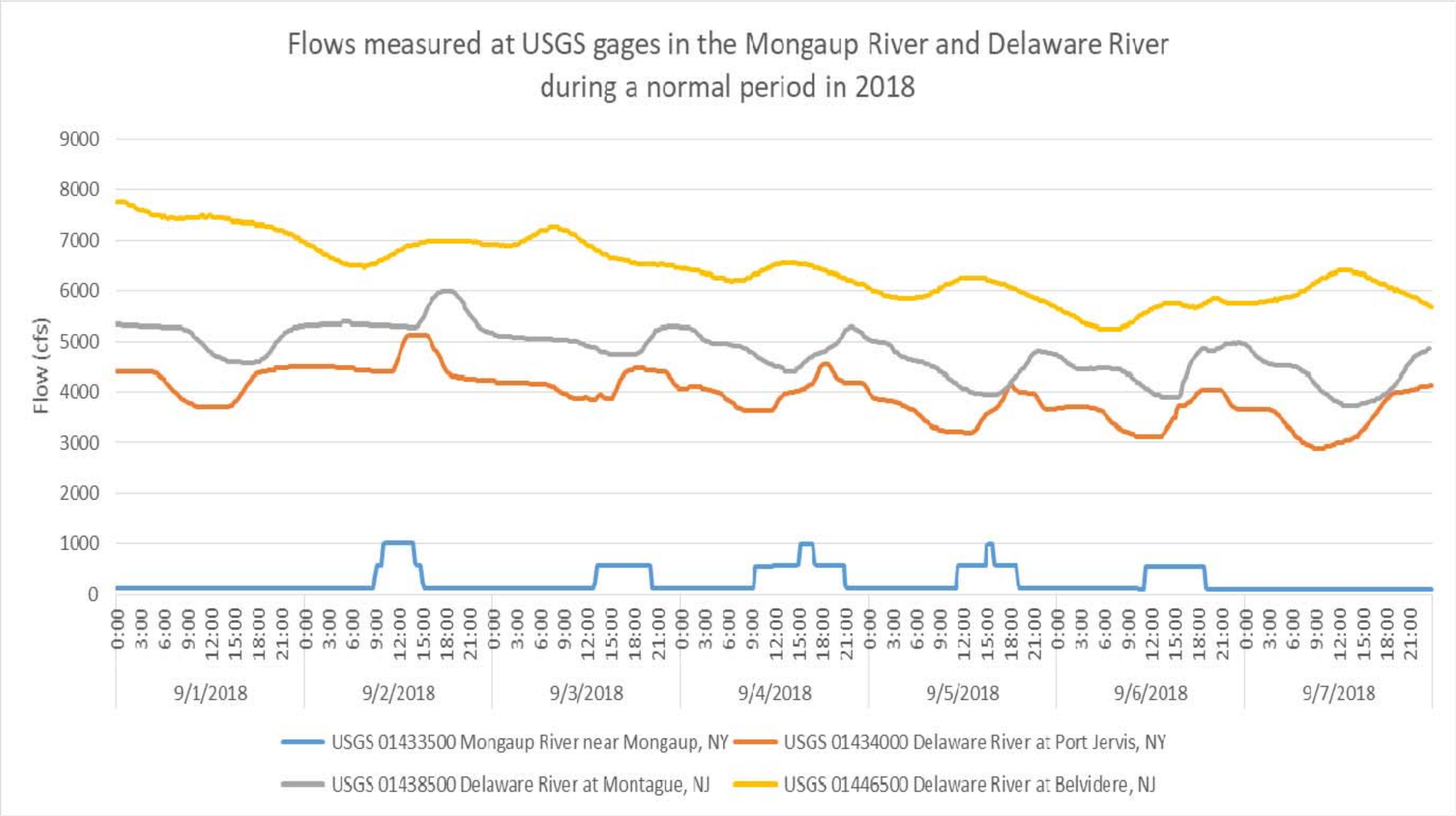
Results – 2018 (Wet Year)



EAGLE CREEK RENEWABLE ENERGY
– EXCELLENCE IN HYDRO –

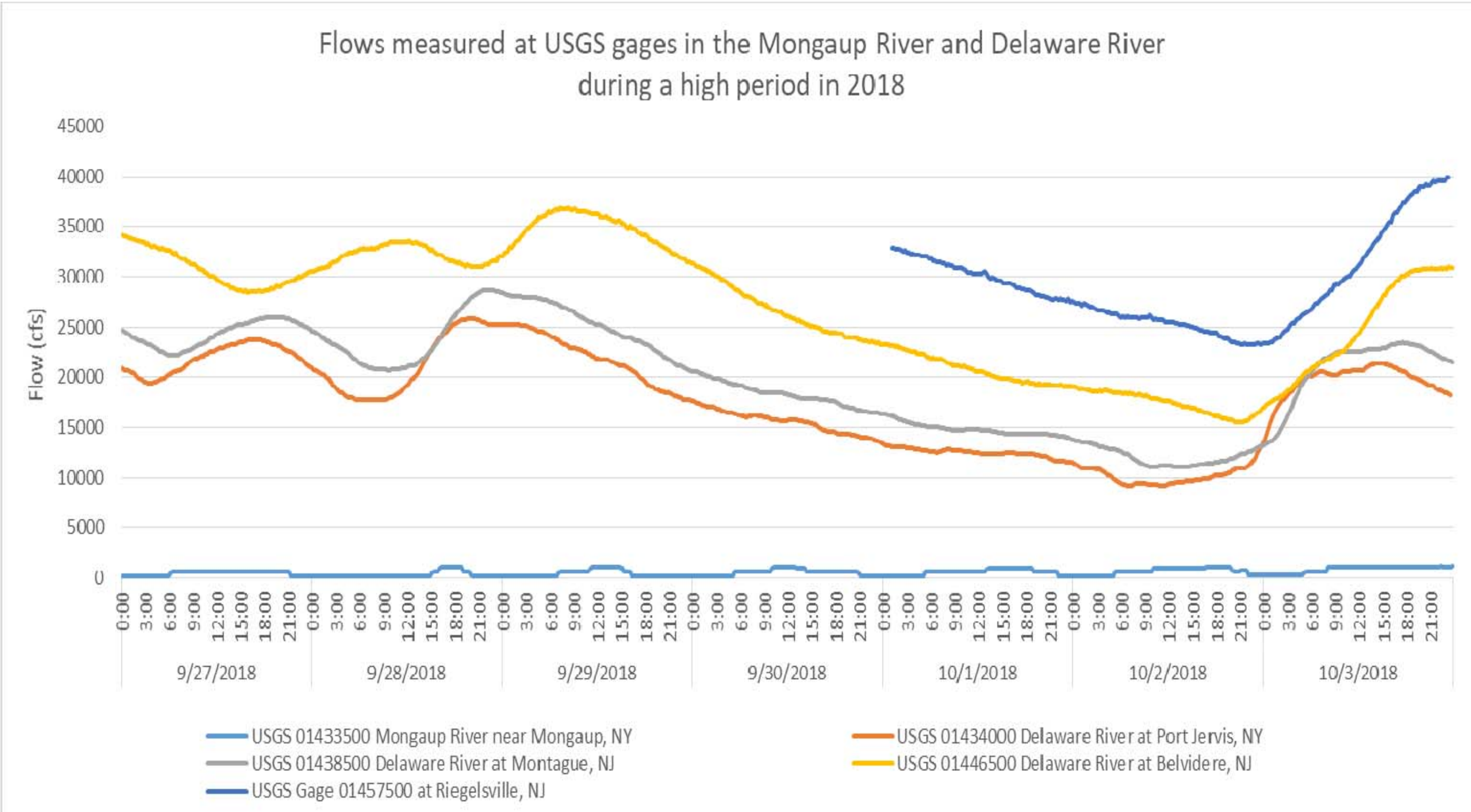
Delaware River Flow Study

Results – 2018 (Wet Year)



Delaware River Flow Study

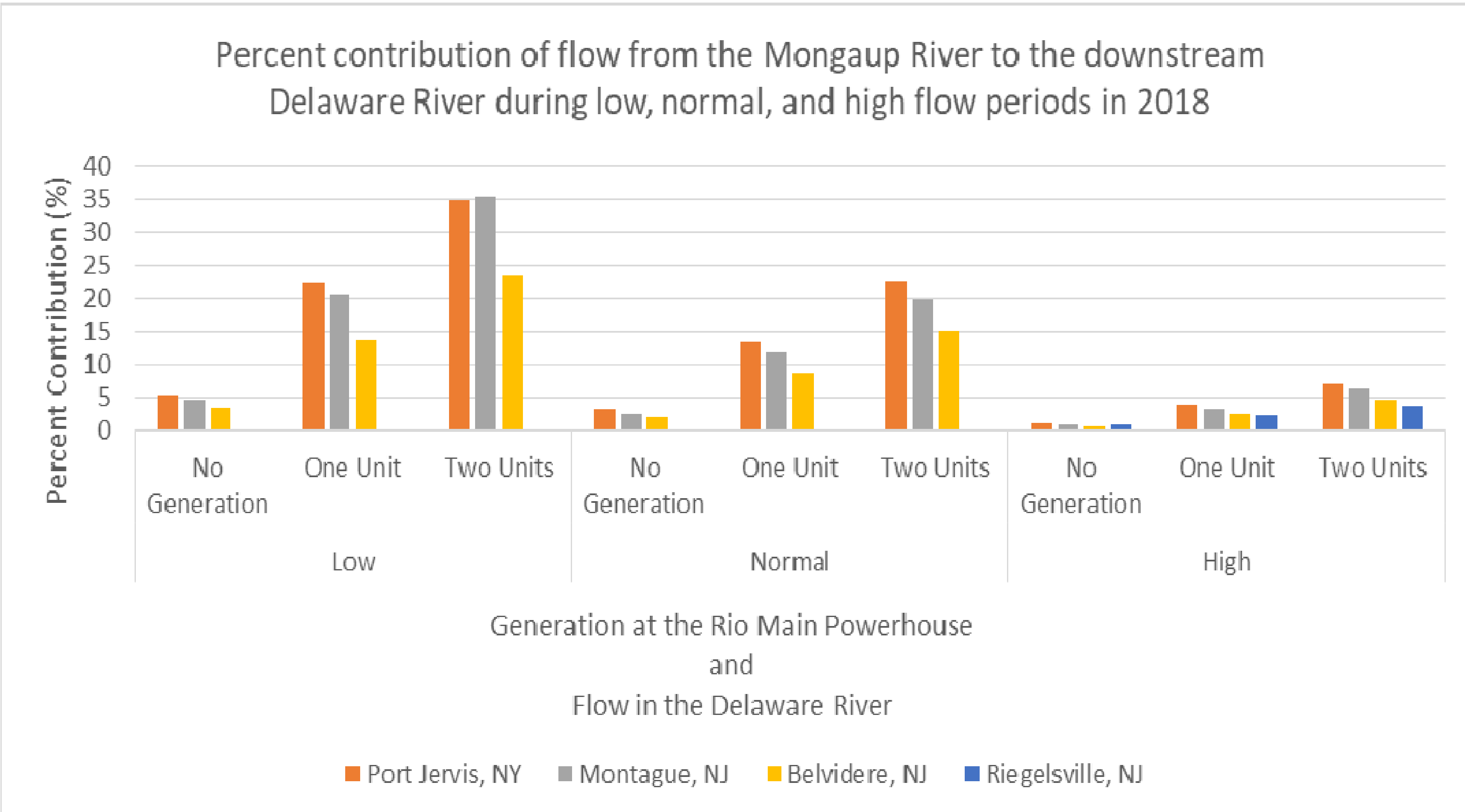
Results – 2018 (Wet Year)



EAGLE CREEK RENEWABLE ENERGY – EXCELLENCE IN HYDRO –

Delaware River Flow Study

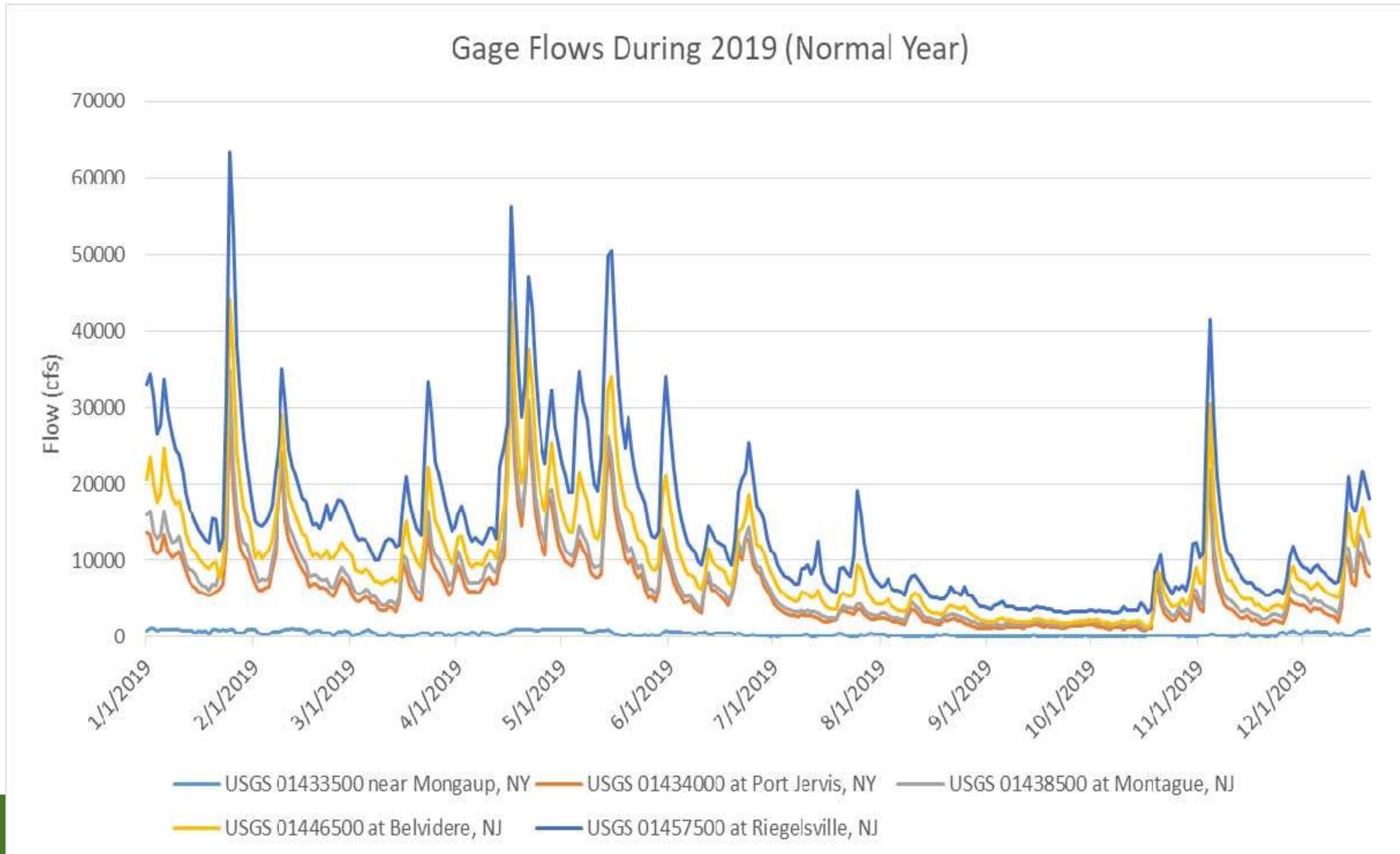
Results – 2018 (Wet Year)



Delaware River Flow Study

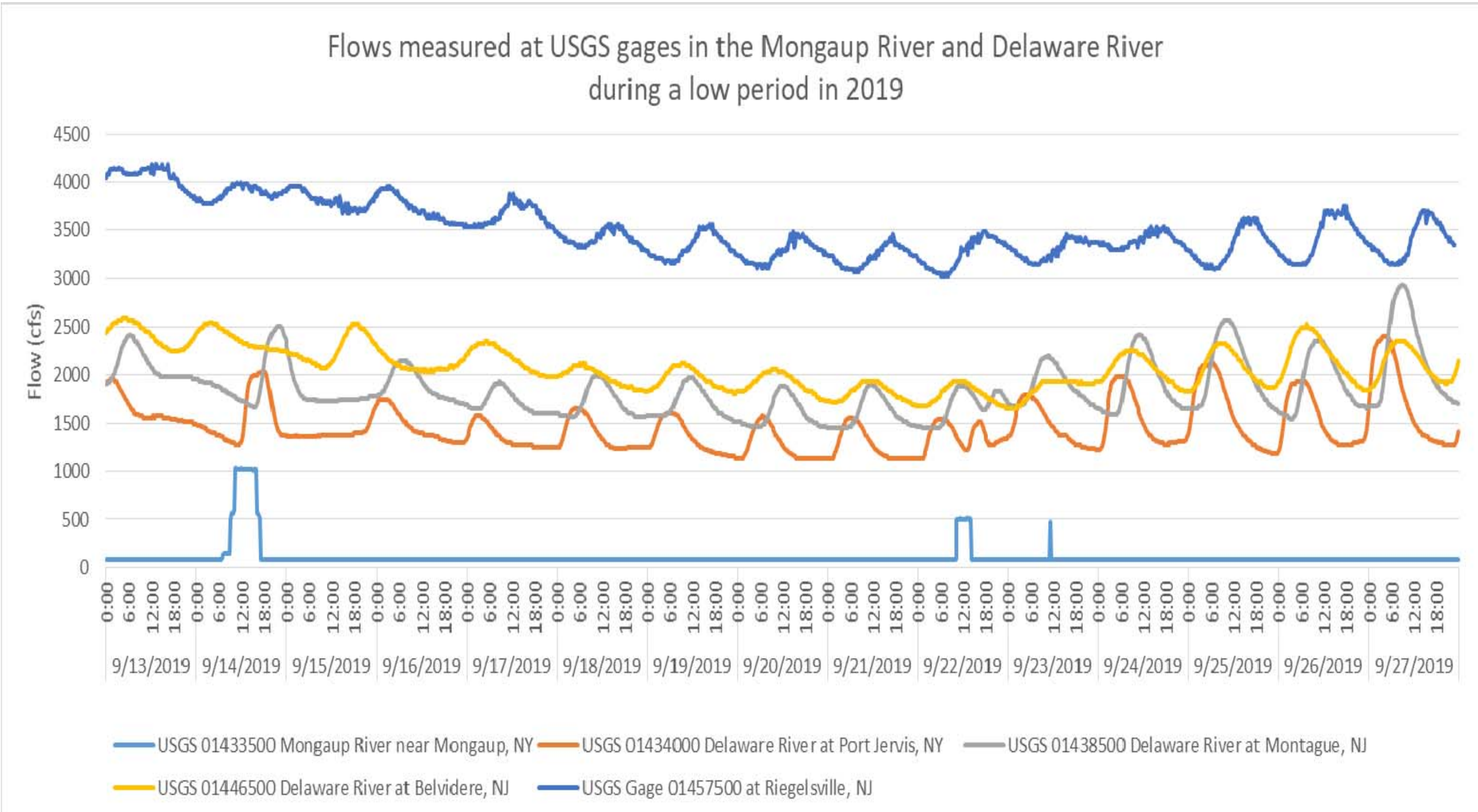
Results – 2019 (Normal Year)

During 2019, there were significant fluctuations in flow, except for the months of September and October.



Delaware River Flow Study

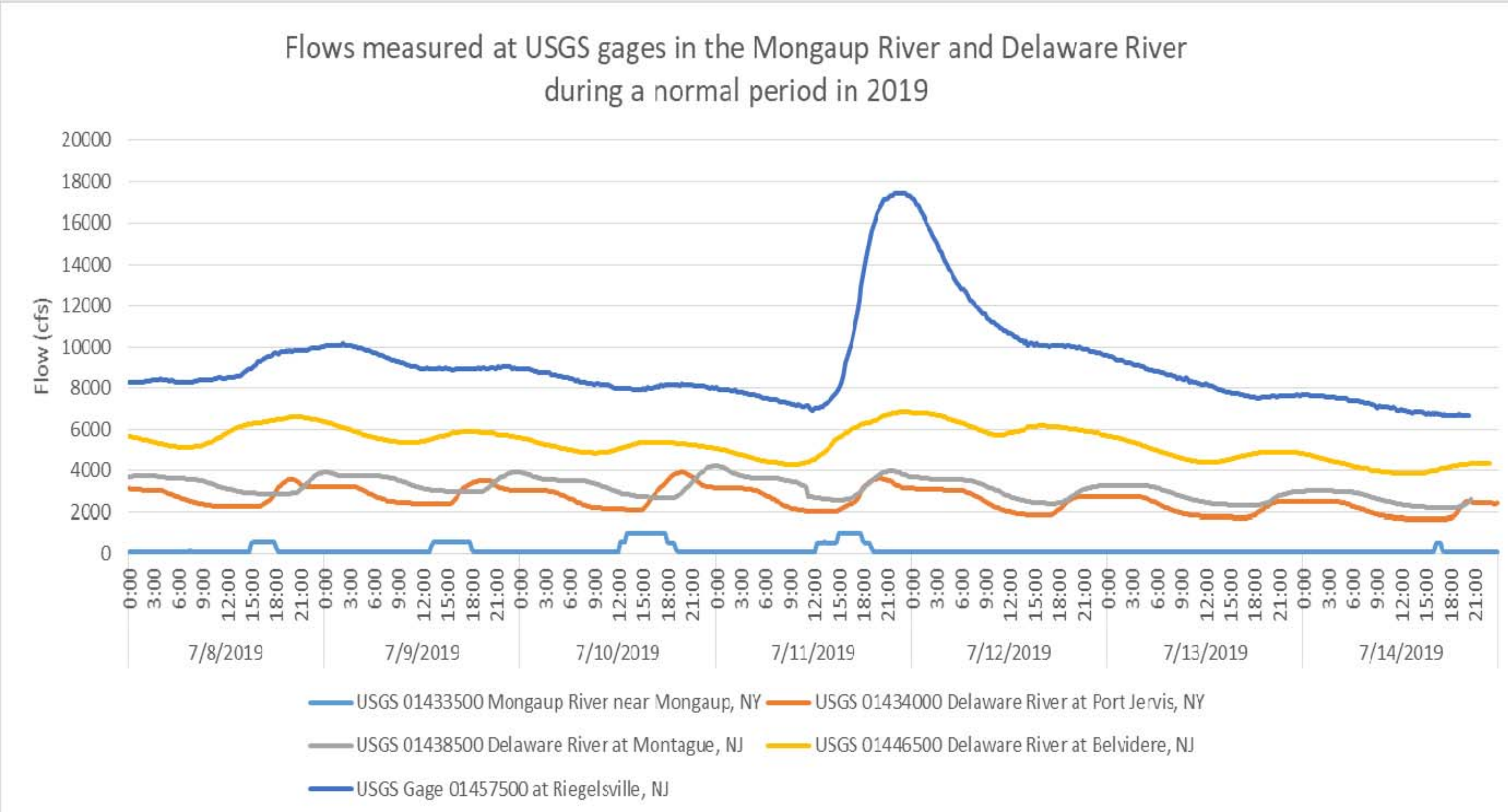
Results – 2019 (Normal Year)



EAGLE CREEK RENEWABLE ENERGY
– EXCELLENCE IN HYDRO –

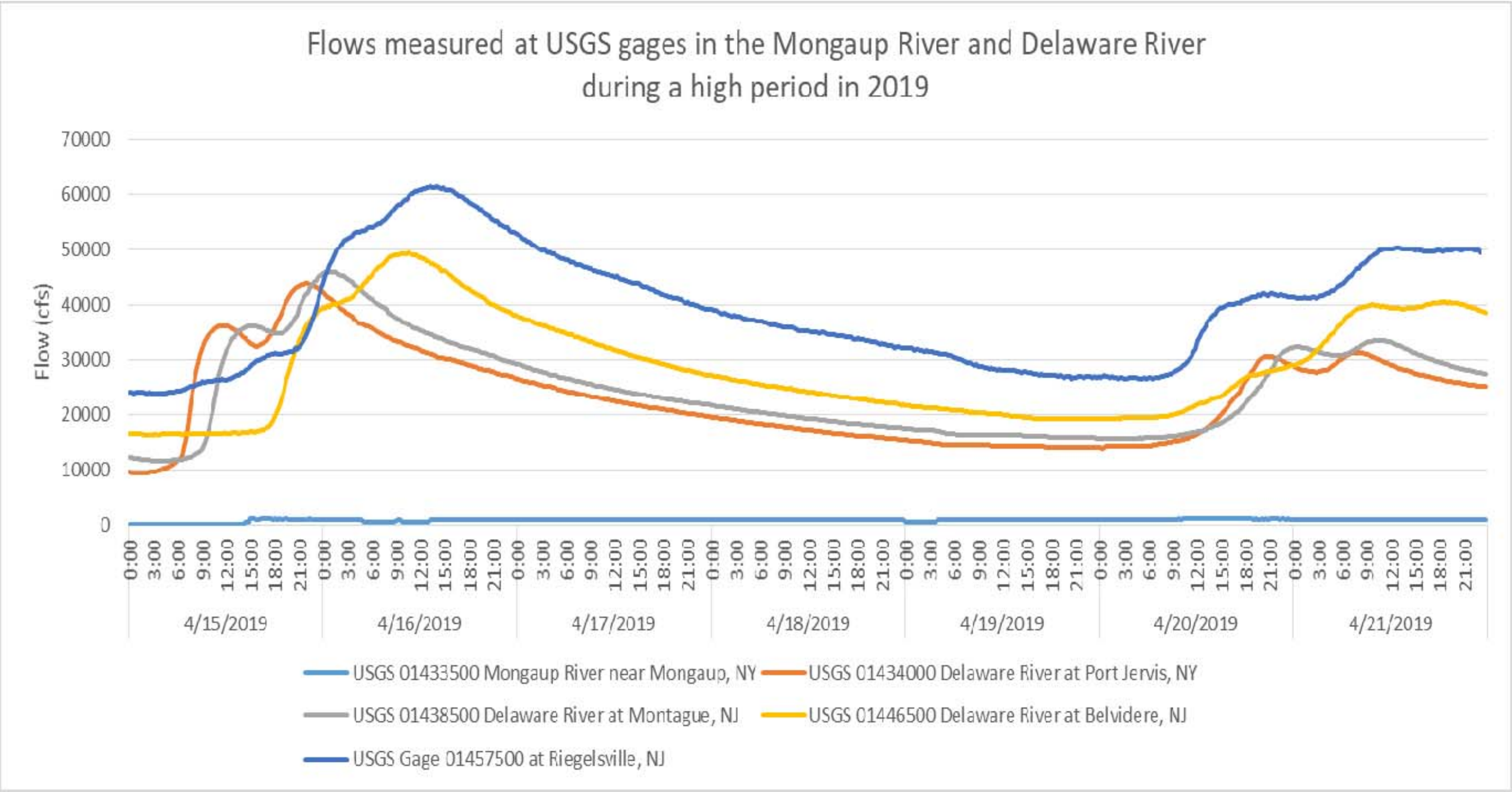
Delaware River Flow Study

Results – 2019 (Normal Year)



Delaware River Flow Study

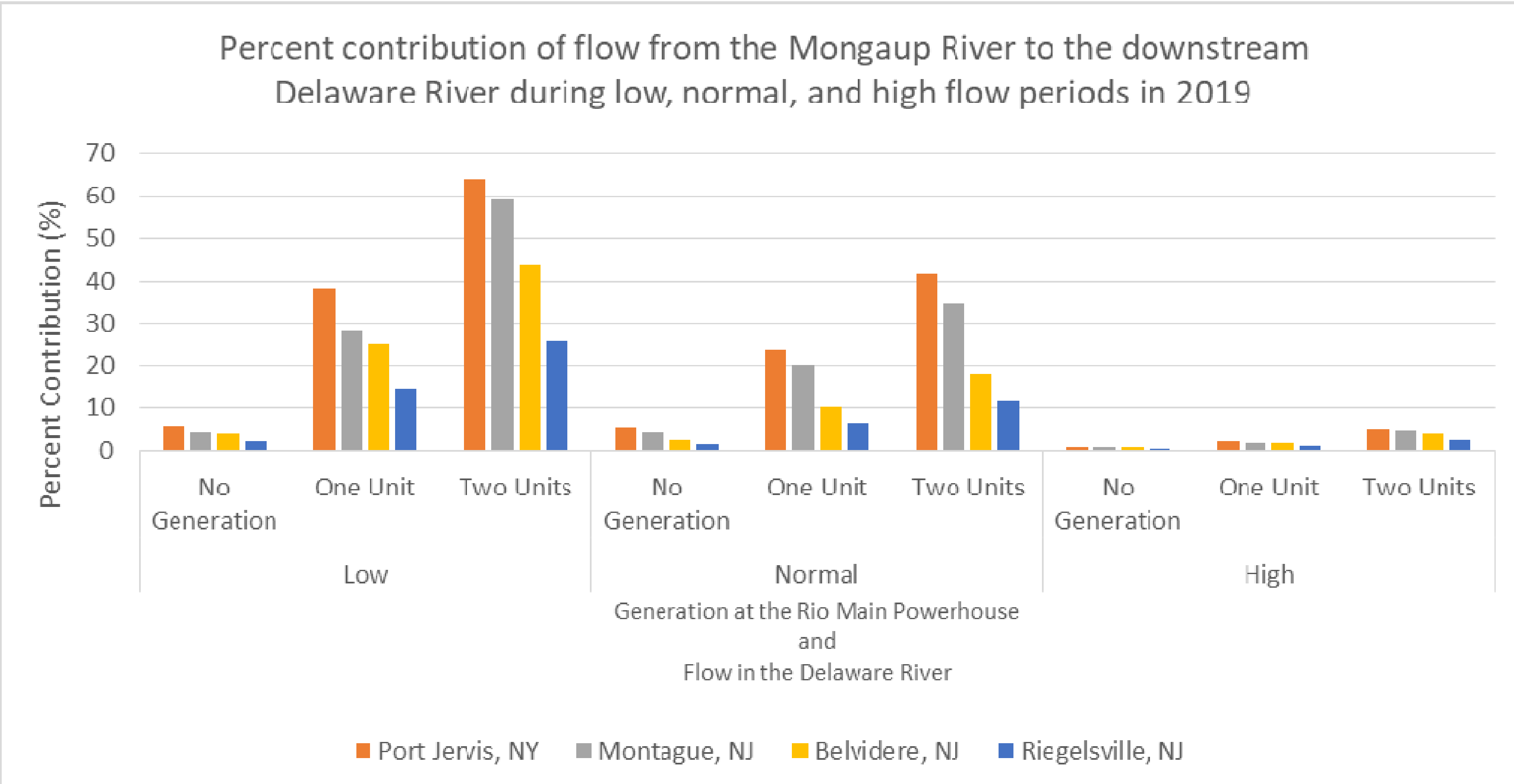
Results – 2019 (Normal Year)



EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Delaware River Flow Study

Results – 2019 (Normal Year)



Delaware River Flow Study

Results

<u>2016-2019 Summary</u>

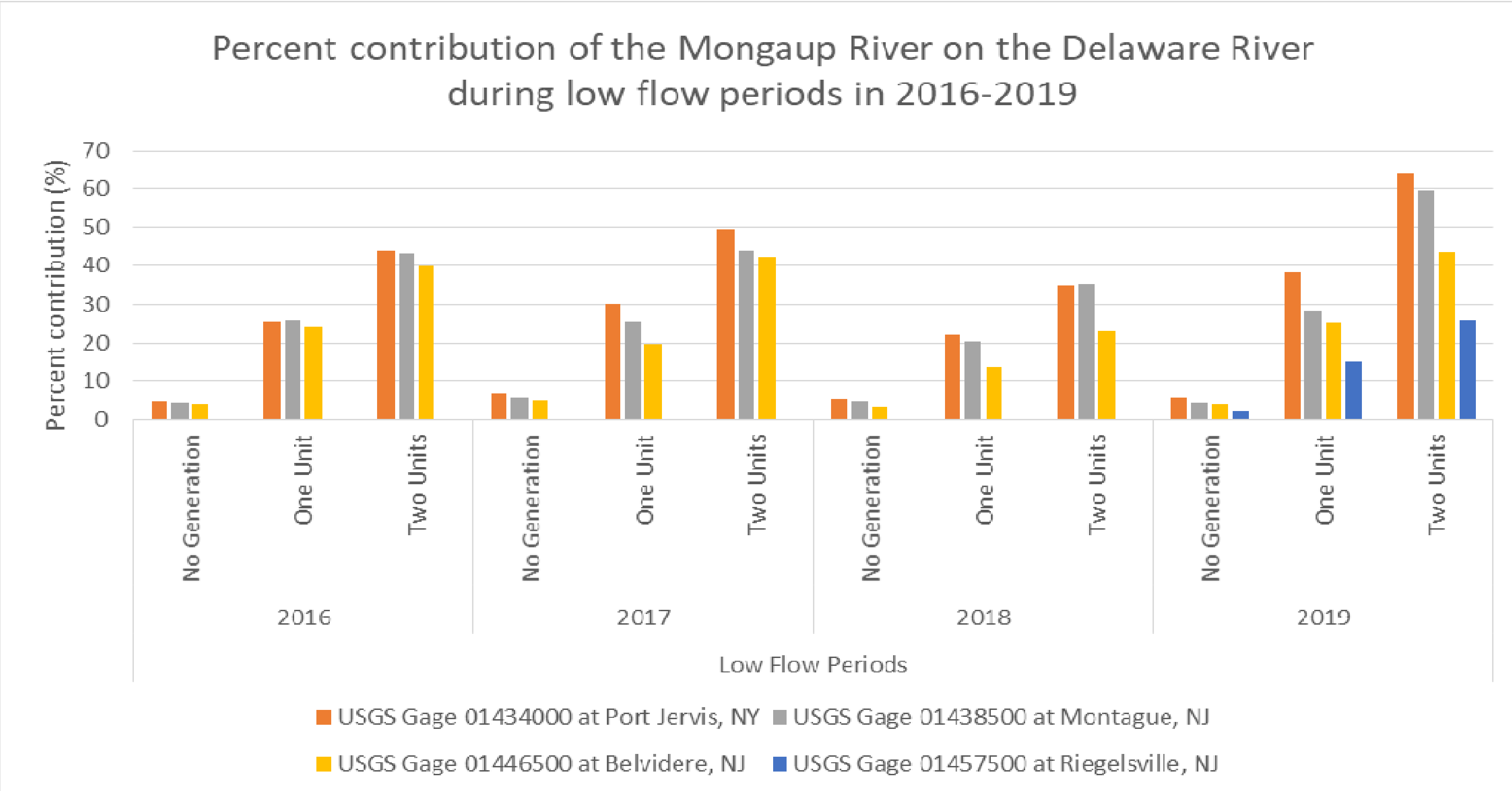
- During periods of no generation at the Rio Main Powerhouse, the Mongaup River contributed approximately 1 to 7 percent of flow to the Delaware River.
- During periods of one unit of generation at the Rio Main Powerhouse, the Mongaup River contributed approximately 1 to 38 percent of flow to the Delaware River.
- During periods of two units of generation at the Rio Main Powerhouse, the Mongaup River contributed approximately 3 to 64 percent of flow to the Delaware River.
- The greatest percent contribution of flow of the Mongaup River to the Delaware was seen during a low flow period in 2019, when a two-unit release contributed approximately 64 percent of the flow to the Delaware River as recorded at the USGS gage at Port Jervis, NY. However, percent contribution of flow did not exceed 50 percent in any other year.
- Flow contribution decreased further downstream of Port Jervis, NY in the Delaware River when the Rio Main Powerhouse was generating.

Delaware River Flow Study

Results

<u>2016-2019 Summary</u>

Low flow periods: The Mongaup River contributed less than 40 percent of flow to the Delaware River when one unit was generating at the Rio Main Powerhouse. When two units were generating at the Rio Main Powerhouse, the Mongaup River contributed less than 65 percent of flow to the Delaware River.



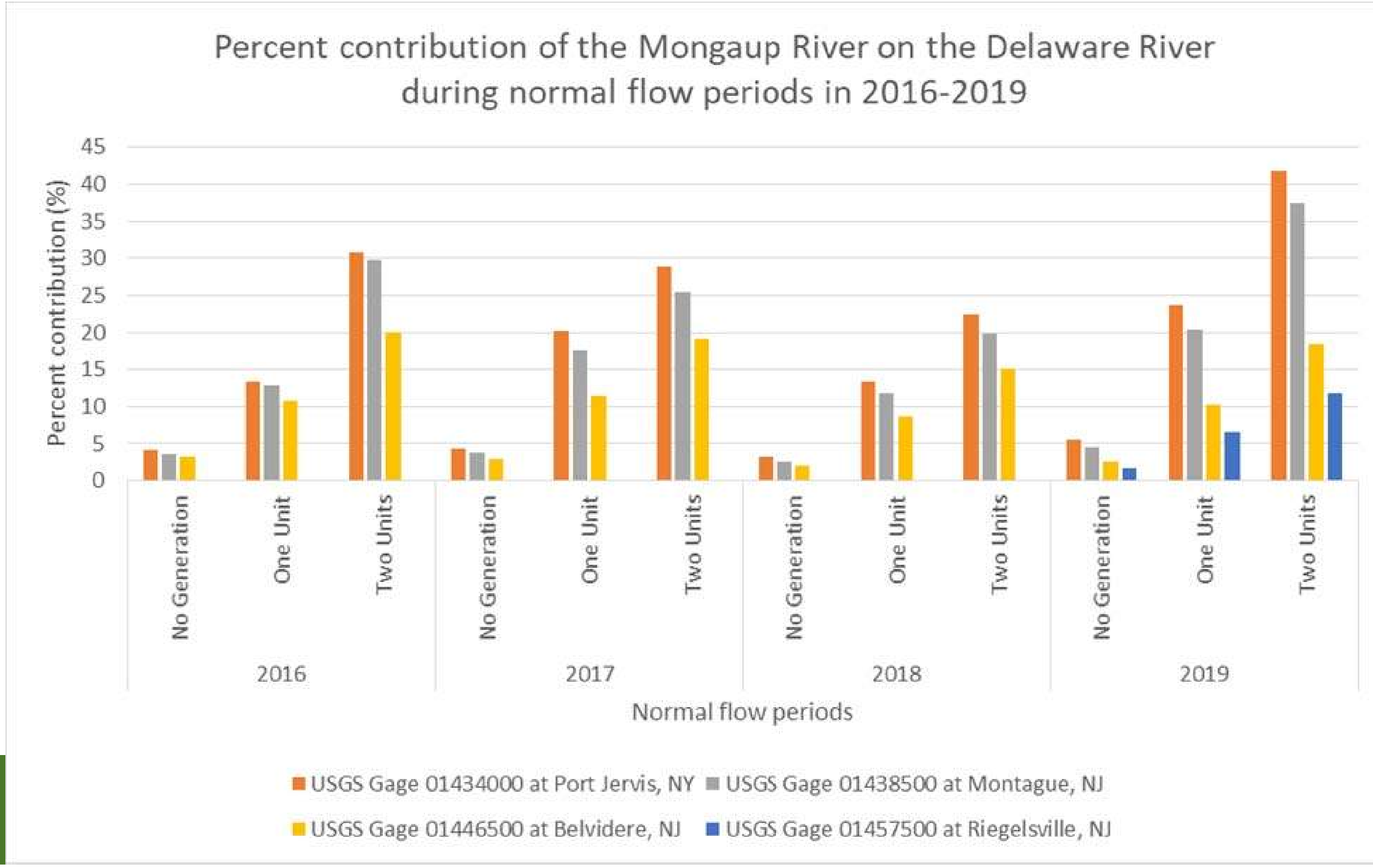
EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Delaware River Flow Study

Results

<u>2016-2019 Summary</u>

Normal flow periods: When one unit is generating at the Rio Main Powerhouse, the Mongaup River contributed less than approximately 25 percent or less of flow to the Delaware River. When two units are generating at the Rio Main Powerhouse, the Mongaup River contributed less than 32 percent of flow to the Delaware River from 2016 to 2017 and less than 43 percent of flow in 2019.



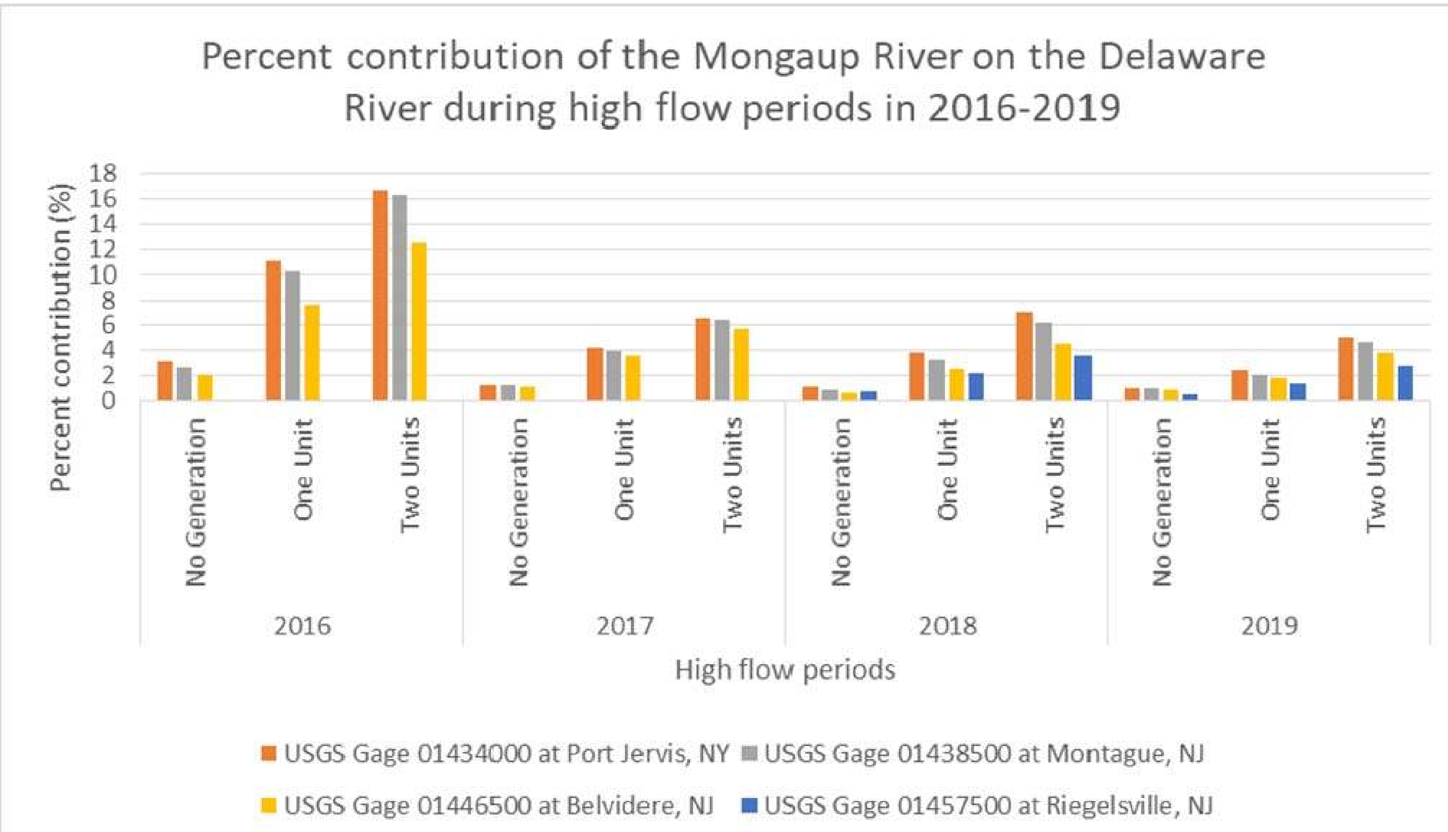
EAGLE CREEK RENEWABLE ENERGY – EXCELLENCE IN HYDRO –

Delaware River Flow Study

Results

<u>2016-2019 Summary</u>

High flow periods: Years 2017 through 2019 show very similar percent contributions and trends of Mongaup River flow on the Delaware River. However, as 2016 was a dry year, even during its high flow period, mean flow was significantly less than mean flow in 2017 through 2019, which causes higher percent contributions of the Mongaup River on flow in the Delaware River to be seen in 2016.



Delaware River Flow Study

Summary

- Overall, the lowest percent contributions of the Mongaup River on flow in the downstream Delaware River occurred when the Rio Project was not generating (less than 5 percent contribution).
- The highest percent contributions of the Mongaup River on flow in the downstream Delaware River occurred when two units were generating at the Rio Project during low flow periods.
- Further downstream gages on the Delaware River experience approximately 1 to 10 percent less contribution of flow from the Mongaup River.
- There are many periods when the flow in the Delaware River significantly increases and decreases within the span of a single day irrespective of operation of the Rio Project. Factors contributing to variation in flows in the Delaware River irrespective of Rio Project operations include natural precipitation events as well as releases from other storage and/or hydroelectric projects located on the East and West Branches of the Delaware River as well as tributaries to the Delaware River both upstream and downstream of the Mongaup River confluence.

Fish Entrainment and Turbine Survival Study Update

Fish Entrainment and Turbine Survival Study

Goals and Objectives

- Supplement the information collected during and used in support of the 1992-1993 entrainment study at the Projects.
- Characterize the occurrence, relative abundance, and size distribution of fish in proximity to the Projects' intakes.
- Characterize the entrainment and impingement potential for Projects' reservoirs fish community (Fisheries Study).
- Perform survival analysis for Projects' turbines.
- EPRI 1997 entrainment and turbine survival database review.

Study Area

- Swinging Bridge, Mongaup Falls, and Rio Projects

Updates

- Study report updated to reflect addition of minimum flow unit at Swinging Bridge Project.

EAGLE CREEK
RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Fish Entrainment and Turbine Survival Study

Methodology

<u>Entrainment and Impingement Characterization</u>

EPRI database review.

1) Trashrack clear spacing between 1.7 and 2.9 inches

2) Total powerhouse hydraulic capacities between 620 and 1,140 cfs

3) Operated in peaking or unknown mode

4) Same or surrogate fish species collected in the Projects' reservoirs (although not collected upstream of Rio Dam in 2018, American Eel is included); and

5) Summarized collection totals during the months of May – October.

Fish Entrainment and Turbine Survival Study

Methodology

Turbine Survival Analysis: Franke et al. 1997 blade strike model

$$P = \lambda \frac{N \cdot L}{D} \cdot \left[\frac{\sin\alpha_t \cdot \frac{B}{D_1}}{2Q_{\omega d}} + \frac{\cos\alpha_t}{\pi} \right]$$

S = 1- P

P = Probability of strike

S = Predicted Survival (≤26 in.)

N = Number of turbine blades

L = Fish length

D = Runner diameter

D_1 = Diameter of runner at inlet

λ = Strike mortality correlation factor (0.1, 0.15, and 0.2)

B = Runner height at inlet

Q_{wd} = Discharge coefficient

α_t = Angle to tangential of absolute flow upstream of runner

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Fish Entrainment and Turbine Survival Study

Methodology

Turbine Survival Analysis: Franke et al. 1997 blade strike model

Q_{wd} (Discharge coefficient) = $Q \div (\omega D^3)$

Q	=	Maximum turbine flow rate
ω	=	Rotational speed

α_t (Angle to tangential of absolute flow upstream of runner) =

$$\tan(90-\alpha_t) = \frac{2\pi E_{wd}\cdot\eta}{Q_{wd}}\cdot\frac{B}{D_1} + \frac{\pi\cdot 0.707^2}{2Q_{wd}}\frac{B}{D_1}\left(\frac{D_2}{D_1}\right)^2 - 4\cdot 0.707\cdot\tan\beta\frac{B}{D_1}\frac{D_1}{D_2}$$

E_{wd} (Energy coefficient)

$$E_{wd} = \frac{g\cdot H}{(\omega\cdot D)^2}$$

g = acceleration of gravity and H = the net head of the turbine

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Fish Entrainment and Turbine Survival Study

Methodology

Turbine Survival Analysis: Franke et al. 1997 blade strike model

α_t (Angle to tangential of absolute flow upstream of runner) =

$$\tan(90-\alpha_t)=\frac{2\pi E_{ad}\cdot\eta}{Q_{ad}}\cdot\frac{B}{D_1}+\frac{\pi\cdot 0.707^2}{2Q_{ad}}\frac{B}{D_1}\left(\frac{D_2}{D_1}\right)^2-4\cdot 0.707\cdot\tan\beta\frac{B}{D_1}\frac{D_1}{D_2}$$

Β (Relative flow angle at runner discharge) =

$$\tan\beta=\frac{0.707\cdot\frac{\pi}{8}}{\xi\cdot Q_{ad}opt\left(\frac{D_1}{D_2}\right)^3}$$

ξ	=	Ratio between Q with no exit swirl and Qopt
Qopt	=	Turbine discharge at best efficiency
D_2	=	Diameter of runner at discharge

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Fish Entrainment and Turbine Survival Study

Methodology

Turbine Survival Analysis

EPRI database review.

1) Vertical and horizontal Francis turbines
2) Rated heads between 98 and 170 feet
3) Turbine operating speeds between 240 and 720 rpm
4) Turbine runner diameters between 29 and 61 inches
5) Same or surrogate fish species as collected in the Projects' intake gill nets (although not collected upstream of Rio Dam in 2018, American Eel is included)

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Fish Entrainment and Turbine Survival Study

Methodology

Turbine Specifications for Mongaup River Projects

	Swinging Bridge Powerhouse (Unit 2)	Swinging Bridge Minimum Flow Powerhouse (Unit 3)	Mongaup Falls Powerhouse (Units 1-4)	Rio Minimum Flow Powerhouse (Unit 3)	Rio Main Powerhouse (Units 1-2)
Number of Units	1	1	4	1	2
Type	Francis	Francis	Francis	Francis	Francis
Head	110 feet	127 feet	110 feet	98 feet	170 feet
Maximum Hydraulic Capacity	1,015 cfs	125 cfs	155 cfs (each unit)	120 cfs	435 cfs (each unit)
Operating Speed	240 rpm	720 rpm	360 rpm	720 rpm	360 rpm
Number of Blades	18	14	16	14	14
Runner Diameter	61 inches	29 inches	42 inches	29 inches	53 inches
Efficiency	86.8%	91.6%	82.6%	85.9%	84.3%

Fish Entrainment and Turbine Survival Study

Results

Intake Velocity Calculations

Trashrack Cross Sectional Velocity (V) = Total Hydraulic Capacity (Q) / Wetted Area of Trashrack (A)

Project	Maximum Hydraulic Capacity (cfs)	Trashrack Surface Area (square feet)	Cross Sectional Velocity at Maximum Hydraulic Capacity (feet/second)	Trashrack Clear Spacing (in)
Swinging Bridge (Units 2 & 3)	1140	711	1.60	2.6
Mongaup Falls	620	448	1.38	1.7
Rio	990	690	1.44	2.9

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Fish Entrainment and Turbine Survival Study

Results

Swinging Bridge Unit No 3. Turbine Survival Estimates

Fish Length (in)	Correlation Factor		
	0.10	0.15	0.20
1	95.5%	93.3%	91.0%
2	91.0%	86.6%	82.1%
3	86.6%	79.8%	73.1%
4	82.1%	73.1%	64.1%
5	77.6%	66.4%	55.2%
6	73.1%	59.6%	46.2%
7	68.6%	52.9%	37.2%
8	64.1%	46.2%	28.2%
9	59.6%	39.5%	19.3%
10	55.2%	32.7%	10.3%
11	50.7%	26.0%	1.3%
12	46.2%	19.3%	0.0%
13	41.7%	12.5%	0.0%
14	37.2%	5.8%	0.0%
15	32.7%	0.0%	0.0%
16	28.2%	0.0%	0.0%
17	23.8%	0.0%	0.0%
18	19.3%	0.0%	0.0%
19	14.8%	0.0%	0.0%
20	10.3%	0.0%	0.0%
21	5.8%	0.0%	0.0%
22	1.3%	0.0%	0.0%
23	0.0%	0.0%	0.0%
24	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
26	0.0%	0.0%	0.0%

Fish Entrainment and Turbine Survival Study

Results

Turbine survival estimates of fish species selected from EPRI database

Species	Immediate Survival	48 Hour Survival
American Eel	100.0%	93.6%
Bluegill	41.4%	31.8%
Brown Trout[1]	45.2%	NA
Golden Shiner	61.7%	56.1%
Largemouth Bass	66.6%	86.5%
Walleye[1]	38.2%	38.9%
White Sucker[1]	61.5%	64.3%
Yellow Perch	79.1%	78.4%

[1]Species collected in intake gill nets.

Fish Entrainment and Turbine Survival Study

Summary

The primary findings of the fish entrainment, impingement and turbine survival evaluation include:

1) A total of 26 individuals of seven different fish species were collected during the May 24, June 13, July 24, September 19, October 2, and October 17, 2018 intake gill net surveys at the Projects.

2) The lengths of the individuals collected in the 2018 intake gill nets from all species were between 10 and 25 inches.

3) The majority of the individuals caught during the 2018 intake gill nets were collected at the Mongaup Falls Reservoir.

4) Operations at the Projects did not appear to influence the number of individuals collected during the 2018 intake gill net surveys.

5) Persistent low DO concentrations existed at the depth of the intake at the Swinging Bridge Reservoirs from July through mid-September during water quality monitoring performed in 2018.

Fish Entrainment and Turbine Survival Study

Summary (cont.)

6) Burst swim speeds differ between life stages of each fish species found in the Projects' reservoirs. Because of this, the entrainment potential for each fish species depends on the life stage found in the vicinity of the Projects' intakes.

7) The intake trashracks at the Mongaup Falls Project exclude fishes of smaller sizes than the Swinging Bridge and Rio Projects.

8) The EPRI entrainment database search for sites similar to the Projects yielded five of the seven fish species collected during the Projects' 2018 intake gill net surveys; White Sucker and Bullhead less than 6 inches in length were the most abundant of all five species.

9) The highest turbine survival estimates for the longest individuals are at the Rio Main Powerhouse and lowest at the Rio Minimum Flow Powerhouse.

Fish Passage and Protection Study

Fish Passage and Protection Study

Goals and Objectives

- Discuss existing passage routes and mortality at each development;
- Focus on American shad and American eel.
- Identify potential measures to achieve safe upstream and downstream passage and fish protection;
- Provide cost estimates to install, operate, and maintain the fish passage measures; and
- Discuss the potential effects of introducing migratory fish upstream of the Mongaup River Hydroelectric Projects on the resident fish community.

Study Area

- Swinging Bridge, Mongaup Falls, and Rio Projects
- Includes all five developments associated with the three Projects.

Methodology

- Existing Fish Passage Routes and Mortality
- Potential Fish Passage Routes
- Estimated Costs for Potential Fish Passage Routes
- Effects of Introducing Migratory Species

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Fish Passage and Protection Study

Methodology

Existing Fish Passage Routes and Mortality

- Assessed attributes of each development.
- Reviewed fish passage literature for American shad and American eel.
- Though eels were not observed above Rio Dam each development was assessed as if eels were present.
- Shad passage assessed only at Rio Dam.
- Upstream and Downstream passage assessed.

Potential Fish Passage Routes

- Assessed attributes of each development.
- Reviewed fish passage literature for American shad and American eel.
- USFWS Fish Passage Design Criteria were reviewed.
- Potential measures selected based on conditions at each development.

Estimated Costs for Potential Fish Passage Routes

- Performed a Level V Cost estimate (Concept Screening Estimate).
- Literature review and review of similar projects.
- Where appropriate cost estimates are scaled.
- For some alternatives service providers or practitioners were contacted.

Fish Passage and Protection Study

Methodology

Effects of Introducing Migratory Species

- Conducted a review of project features, habitats, and compared to literature on habitat requirements for shad and eel.
- Assessed availability and suitability of habitat for shad and eel.
- Assessed potential ecological impact of (re)introducing shad and eel.
- Carrying capacity analysis conducted for shad.

Fish Passage and Protection Study

Results: Existing Upstream Passage at Rio

- 4.6 miles upstream from confluence with Delaware River.
- 101 ft high dam
- No passage structures

American Shad

- Mongaup Falls is historic upstream limit.
- Shad observed during 2018 surveys.
- At tail race of Rio Minimum Flow Unit.
- No existing upstream passage at Rio.

American Eel

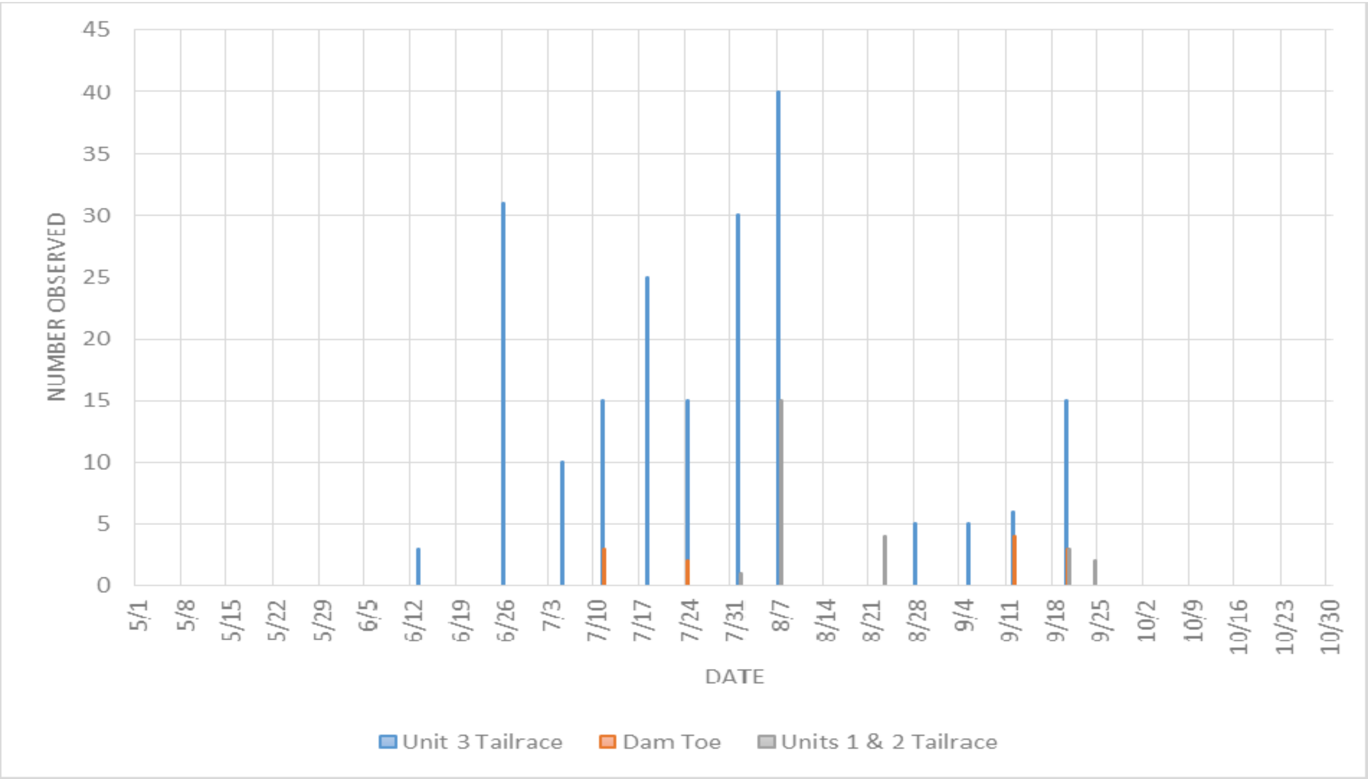
- Eel observed below Rio in 2018 studies.
- Dam surface wetted via leakage, rough, and non vertical slope.
- Eels observed climbing up to around 30ft above base of dam.
- While there is potential for passage via climbing, dam is 101 feet high.
- Passage likely inhibited for most eels.

Fish Passage and Protection Study

Fish Passage and Protection Study

Fish Passage and Protection Study

Number and location of Shad observed during 2018 Eel survey.



Fish Passage and Protection Study

Results : Existing Upstream Passage at Mongaup Falls

- 40 ft high dam built on top of a natural falls.
- No passage structures

American Shad

- Mongaup Falls historic upstream limit for shad

American Eel

- Eel not observed above Rio in 2018 studies.
- Dam surface wetted via leakage, rough, and non vertical slope.
- Passage likely limited to periods of low or moderate spill.

Fish Passage and Protection Study

Fish Passage and Protection Study

Results: Existing Upstream Passage at Black Brook Dam

- 10 ft high dam built on top of a natural falls.
- Approximately 1 mile upstream from confluence with Mongaup River.
- No passage structures

American Shad

- Black Brook smaller than habitat typically used by Shad.
- Historic falls and now dam represent barrier.

American Eel

- Dam surface wetted via spillage, rough, and non vertical slope.
- Juvenile eels likely able to pass

Fish Passage and Protection Study

Fish Passage and Protection Study

Results: Existing Upstream Passage at Swinging Bridge

- 135 ft high earthen dam. No spillage or leakage at dam.
- Non integrated concrete side channel spillway 750ft upstream.
- 1,300 ft of bedrock and boulders down into Black Lake Creek
- Infrequent spillage. Limited to high water events.
- Obermeyer and timber gates at top of spillway
- No passage structures

American Eel

- No passage at dam
- Limited potential for passage up spillway during low flow spill events.

Fish Passage and Protection Study

Fish Passage and Protection Study

Fish Passage and Protection Study

Results: Existing Upstream Passage at Cliff Lake

- 25 ft high dam on Black Lake Creek.
- Does not regularly spill.
- No passage structures

American Eel

- Limited potential for passage up spillway during low or moderate spill events.

Fish Passage and Protection Study

Fish Passage and Protection Study

Results: Existing Upstream Passage at Toronto Reservoir

- 103 ft high earthen dam on Blake Lake Creek.
- Bedrock side spillway at southwest end of dam.
- Does not regularly spill.
- 700-1000 ft of bedrock and boulders down into Black Lake Creek

American Eel

- No passage at dam
- Limited potential for passage up spillway during low flow spill events.

Fish Passage and Protection Study

Fish Passage and Protection Study

Results: Existing Downstream Passage at Rio Dam

- No dedicated downstream passage structures.
- Passage limited to spillway or through the penstock.
- Passage via spillway: 101ft drop to pool below dam.
  - Does not regularly spill.
  - Potential for mortality and injury.
- 2.9 inch trash racks on intake. Would not exclude shad or eels.
- Intake ~ 40 ft deep; varies with reservoir water elevation.
- 3 potential routes after entering the intake.
  - Minimum flow pipe
  - Minimum flow unit (Unit No. 3)
  - Main powerhouse (Units No. 1 and No. 2)

Fish Passage and Protection Study

Results: Existing Downstream Passage at Rio Dam

Minimum flow pipe

- Discharge 50 feet downstream of spillway.
- 25 foot drop from discharge into pool below dam or onto toe of dam.
- Controlled by a butterfly valve. Not regularly in operation.
- Pressure and flowpath unlikely to be conducive for passage and survival.

Minimum flow unit. Rio Unit No. 3

- 325 ft downstream of dam.
- Expected survival rates for fish from 1-6 inches would be 85.4-12.6% (λ=0.20)
- Fish greater than six inches would be expected to experience 0% survival (λ=0.20)
- λ = Strike Mortality Correlation Factor from Franke et al. 1997. This value typically ranges from 0.1 to 0.2, and this range was evaluated in the Fish Entrainment and Turbine Survival Study. The results using λ=0.2 are discussed here since they are the most conservative.

Rio Main Powerhouse: Unit No. 1 and 2.

- 1.4 miles through penstock before egress through either Unit 1 or 2.
- Expected survival rates for fish ranging from 1-26 inches in length were calculated and ranged from 96.8-15.6% (λ=0.20)

Fish Passage and Protection Study

Fish Passage and Protection Study

Results: Existing Downstream Passage at Mongaup Falls

- No dedicated downstream passage structures.
- Passage limited to spillway, minimum flow pipe or penstock.

Passage via spillway

- 40 ft drop to pool below dam.
- Potential for mortality and injury.

Passage via minimum flow pipe

- 3ft diameter pipe for 75ft discharging 70cfs.
- Flows controlled by two butterfly valves.
- Water expelled at high velocity into cascading section before plunge pool.
- Potential for mortality and injury

Passage via penstock: Units 1-4

- 1.7 inch trash racks would not exclude eels.
- Intake ~ 40 ft deep; varies with reservoir water elevation.
- 2,800 feet of penstock and then surge tower before entering powerhouse.
- Expected survival rates for fish from 1-19 inches would be 95.0-4.1% (λ=0.20)
- Fish larger than 19 inches, would be expected to experience 0% survival.

Fish Passage and Protection Study

Results: Existing Downstream Passage at Swinging Bridge Dam

- No dedicated downstream passage structures; Passage limited to spillway or through the penstock.

Passage via spillway:

- Does not regularly spill and unlikely to be available.
- Located 750ft upstream from dam.

Passage via penstock: Two alternative routes

- 2.6 inch trash racks would not exclude eels
- Intake ~50 ft; varies with reservoir water elevation.
- Passage through Unit No. 2 Powerhouse or Unit No. 3 Powerhouse

Swinging Bridge Unit No. 2

- Pass through 972 ft of penstock, surge tower, before entering powerhouse.
- Expected survival rates for fish from 1-18 inches would be 94.6-2.5% (λ=0.20)
- Fish greater than 18 inches would be expected to experience 0% survival (λ=0.20)

Minimum flow unit. Swinging Bridge Unit No. 3

- An additional 20 ft of penstock off of Unit No. 2 before entering powerhouse.
- Expected survival rates for fish from 1-11 inches would be 91-1.3% (λ=0.20)
- Fish greater than 11 inches would be expected to experience 0% survival (λ=0.20)

Fish Passage and Protection Study

- The survival rates discussed above are for fish that would potentially enter the intakes and pass through the turbines.
- For portions of the year, fish may be unlikely to enter the intake due the thermal stratification of the reservoir and low DO concentrations at the depth of the intake.
- The 1992 Order Issuing License determined that from mid-April to mid-November, Project reservoirs are stratified and DO levels in the vicinity of the intakes would be depressed, such that fish would avoid the area and would be unlikely to become entrained.
- In support of the 2018 Water Quality Study, continuous DO and water temperature data, as well as profile water quality data, were collected in the vicinity of the intakes in the Projects' reservoirs from late April through early November 2018.

Fish Passage and Protection Study

Rio Reservoir

- Thermal stratification in Rio Reservoir was evident throughout the entire monitoring period with variable strengths.
- By mid October, layers of stratification began to dissolve and move downward in the water column (with anoxic conditions near the bottom) as lake turnover occurred.
- For portions of August to September DO concentrations at the intake centerline elevation were below 4-5 mg/L, minimum thresholds for shad and eels.

Mongaup Falls Reservoir

- A weak and temporary thermocline began to develop in early June, became more established by mid-June, and primarily dissolved by early August. The thermocline remained above the intake depth through July.
- A strong DO stratification was established from late August to late September when DO concentrations at the surface rapidly decreased, then were relatively uniform with depth (including the intake depth) until decreasing near the bottom.
- DO concentrations at the intake depth generally remained above 6 mg/L between April and November.

Fish Passage and Protection Study

<u>Swinging Bridge Reservoir</u>

- Thermal stratification began to develop in early June, was strongly developed by mid-June, and continued through October.
- Depth of the thermocline moved over time, establishing above the intake in June, then at the intake in July, and gradually moving downward in August until it eventually dissolved by late October.
- Anoxic DO conditions occurring at the intake depth from late July to mid-September. By mid-October, the layers of stratification began to move downward in the water column as lake turnover occurred.
- For portions of June through October DO concentrations were at or below the reported minimum DO concentration for eels (>4 mg/L).

Fish Passage and Protection Study

Results: Existing Downstream Passage at Cliff Lake

- No dedicated downstream passage structures.
- Passage limited to spillway, minimum flow outlet structure.

Passage via spillway

- 25 ft drop to pool below dam.
- Potential for mortality and injury.
- Discharges to bedrock area before rejoining Black Lake Creek.

Passage via minimum flow outlet

- 4ft x 4ft gate with capacity of 460cfs at base of spillway.
- Manually operated gate.
- Potential passage route for down migrating eels.

Fish Passage and Protection Study

Results: Existing Downstream Passage at Toronto Reservoir

- No dedicated downstream passage structures.
- Passage limited to spillway, minimum flow outlet structure.

Passage via spillway

- 50-ft wide bedrock side channel spillway with 5-ft high flashboards. Extends 700ft
- Leads to bedrock and boulder cascade before reaching Black Lake Creek.
- Does not regularly spill.
- Potential for mortality and injury.

Passage via minimum flow outlet

- 8-ft x 8-ft conduit extends for 565 ft. Flow controlled by two gates.
- Upper gate 4-ft x 5-ft. Lower gate 3-ft x 5-ft.
- Potential passage route for down migrating eels.

Fish Passage and Protection Study

Results: Potential Upstream Shad Passage Measures

- Rio Dam 100 ft high
- Minimum flow powerhouse 300 ft downstream of dam; the tailrace is the primary source of flow in this reach and shad have been observed in the tailrace.
- Given site conditions and difficulty of passing shad in volitional fishways, fish lifts were focus of analysis.
- Full Elevation Fish Lift
- Partial Elevation Fish Lift in conjunction with transport program.

Fish Passage and Protection Study

Full Elevation Fish Lift

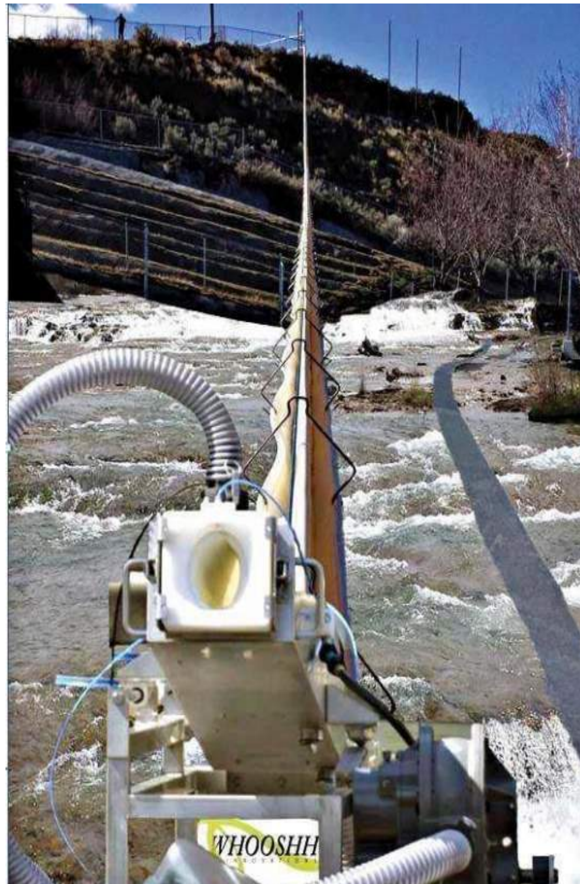
- Effective for Shad that are difficult to pass using traditional volitional styles.
- Fish attracted to entrance by flow.
- Crowded into a hopper.
- Lifted vertically within supporting tower for release into flume or headpond.
- Smaller footprint
- Require maintenance and potential exists for mechanical failure.
- Labor intensive unless lift operation is automated.

https://www.flickr.com/photos/chesbayprogram/21379123673

Fish Passage and Protection Study

Partial Elevation Fish Lift to Trap and Truck

- Preferred option for Rio
- Hopper lifted high enough to release fish to a sorting facility at elevation of adjacent roadway.
- From sorting facility fish transported upstream of dam in tank trucks.
- Also evaluated the use of Whoosh Fish Transport System which in experimental usage has successfully passed shad with high survival rates.



Fish Passage and Protection Study

Downstream Shad Passage at Rio

- Shad are primarily surface oriented. Intake 40ft below surface.
- Smaller trash rack spacing also considered.
- Passage via spill not a viable option.
- A surface bypass connected to a downstream conduit discharging into a plunge pool would be necessary.
- USFWS design guidelines of 2-5% of station hydraulic capacity. 20-50cfs at Rio.
- Potential for modest increase in water temperature downstream due to release of warmer surface waters.

Fish Passage and Protection Study

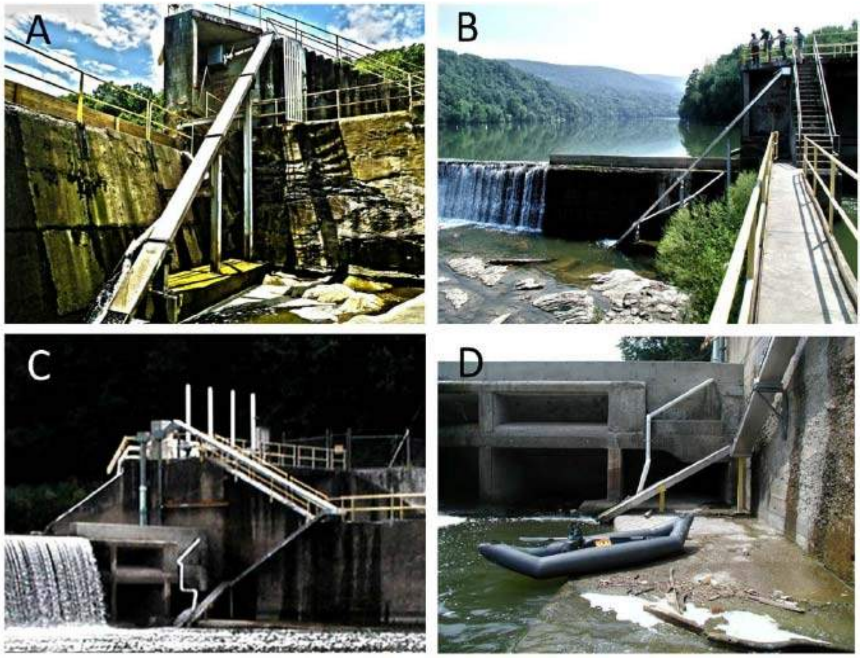
Results: Potential Upstream Eel Passage Measures

- Passage measures evaluated for all developments.
- Permanent Eel Pass Ladder or Trap
- Portable Eel Pass Trap and Transport.
- Delaware Style Trawl Net Pass
- Eels abundant below Rio and not observed above development during 2018 studies.
- Preferred strategy would entail capture of eels below Rio and controlled transport into upstream Project areas.

Fish Passage and Protection Study

Permanent Eel Ladder

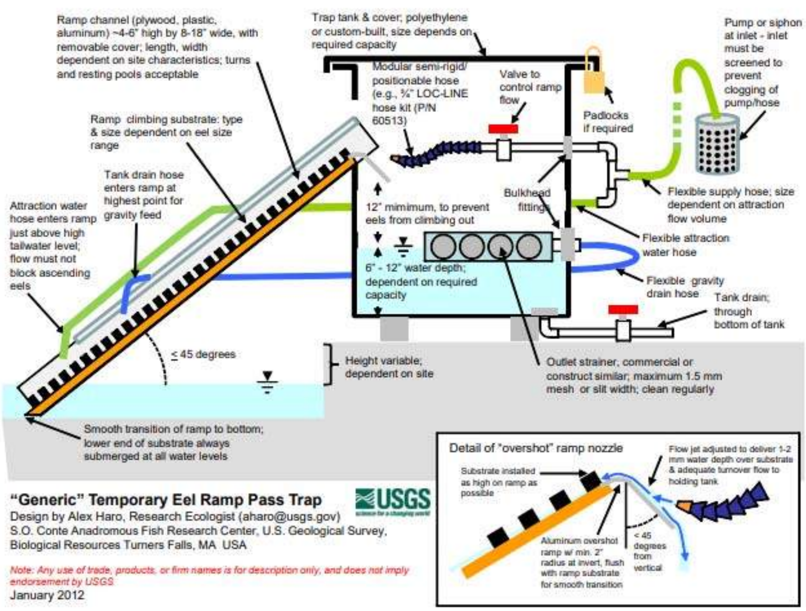
- Can pass eels directly to head pond or into a trap for collection and transport.
- Engineered structure typically made of sloped aluminum ramp with climbing substrates to match size classes of eels.
- Attraction and passage flow needed.
- Full height ladders not practical for tall dams such as Rio, Swinging Bridge, and Toronto.



Fish Passage and Protection Study

Portable Eelpass Trap

- Mobile option
- Temporary and long-term deployments
- Built with readily available materials
- Inexpensive.
- Attraction and passage flow needed.
- Useful for siting permanent installations.
- Suitable for provision of passage at all dams within Projects.



Fish Passage and Protection Study

Delaware Style Trawl Net Pass

- Simple and inexpensive.
- Trawl netting draped over bedrock or dam.
- Can be used to facilitate climbing in areas where eels are attempting to climb.
- Best suited for smaller dams.
- Not preferred option but could be used to enhance passage options.

Fish Passage and Protection Study

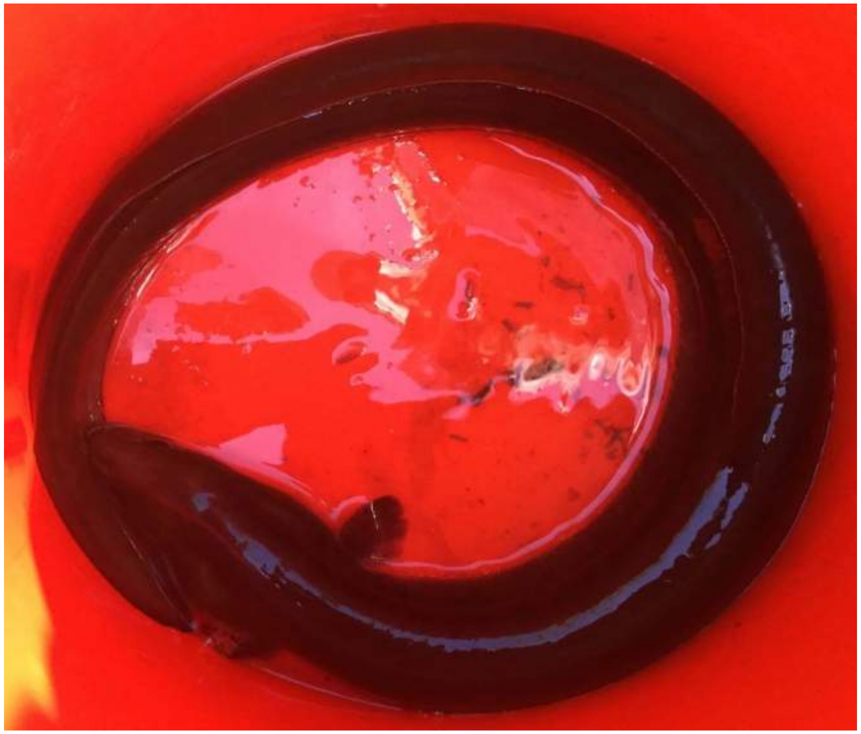
Results: Potential Downstream Eel Passage Measures

- Passage measures evaluated for all developments.
- Eels would not be excluded by existing trash racks at any Project and would be exposed to turbine mortality.
- Reduced trash rack spacing used in conjunction with innovative Conte Airlift Bypass preferred option for Rio, Mongaup Falls, and Swinging Bridge
- Potential to pass through minimum flow gates at Cliff Lake and Toronto Developments.

Fish Passage and Protection Study

Reduced Trash Rack Spacing

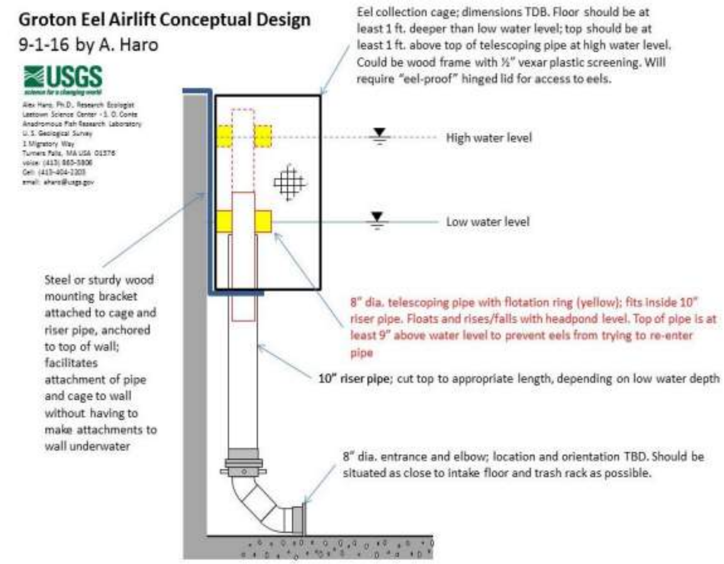
- USFWS Design Criteria of ¾ in.
- Existing racks range from 1.6- 2.9 in.
- Would deter silver eels from entering Project intakes and guide them toward alternative passage route.



Fish Passage and Protection Study

Conte Airlift Bypass (CAB)

- Included in 2019 USFWS Design Criteria. Relatively inexpensive.
- Developed at Silvio Conte Diadromous Fish Research Lab (USGS).
- Air injected into submerged PVC conduit creating upward flow, suction, and attraction flow. Eels readily enter and pass during experimental testing.
- Discharges into floating pen at surface where silver eels are collected and water returns to headpond.
- Successfully deployed in CT. More than 1,200 eels at one site in fall 2019.



(above) *Conceptual design of the Groton Eel Airlift.*

Fish Passage and Protection Study

Fish Passage and Protection Study

Potential Shad Passage Measures Summary

Project	Upstream	Downstream
RIO PROJECT	Partial elevation fish lift in conjunction with trap and truck program	Surface bypass into pipe

Potential Eel Passage Measures Summary

Project	Upstream	Downstream
RIO PROJECT	Permanent eel pass trap to collect eels for distribution into upstream habitats. A portable eel trap should be used to help locate a suitable location for a permanent trap.	Conte Airlift Bypass (CAB) combined with reduced bar spacing (3/4-inch) trashracks
MONGAUP FALLS PROJECT	Portable eel pass trap and/or Delaware-style trawl net pass.	Spillway or CAB combined with reduced bar spacing (3/4-inch) trashracks
SWINGING BRIDGE PROJECT		
Swinging Bridge Development	Portable eel pass trap	CAB combined with reduced bar spacing (3/4-inch) trashracks
Cliff Lake Development	Portable eel pass trap	Existing bottom release gate
Toronto Reservoir Development	Portable eel pass trap	Existing bottom release gate

Fish Passage and Protection Study

Summary of Class V Cost Estimate Information

Passage and Protection Measure	Estimated Cost	Considerations	Reference(s)
Full Elevation Fish Lift	$25 to $30 million	Maintenance costs for mechanical equipment and personnel to operate lift. Innovative use of aerial tram system may lower costs for full elevation lifts.	Based on recent fish lift, including sorting features and studies.
Partial Elevation Fish Lift	$7 to $12 million	Maintenance costs for mechanical equipment and personnel to operate lift.	Based on an 18-ft-high lift to a sorting facility
Trap and Truck	$0.5 to $1 million	Staff to operate and maintain transport vehicle.	Storage tanks, elevated sorting and holding facilities, and multiple transport vehicles.
Whooshh Fish Transport	$1 to $2 million	Maintenance and operation of specialized equipment. Staff necessary to manually load transport system.	--
Permanent Eel Ladder Trap	$200,000 to $350,000	Rugged design for permanent installation and water supply, including access to trap, includes design. Price will vary with access requirements. Staff needed for maintenance and eel handling.	--
Portable Eel Ladder Trap	$200 - $2,000	Battery powered pumps and solar panels can be necessary if gravity fed attraction flow or electricity to power pumps are not available or practical. Staff needed to maintain and check trap.	--
Downstream Surface Bypass	$250,000 to $2 million	High head downstream passage requires significant piping to meet USFWS criteria for safe passage. May involve construction of pools at point of discharge to achieve required depth.	--
CAB	$20,000 to $70,000	--	--
Trashrack Modifications	$300 per square foot of rack area	--	Based on 30 feet of head without structural support; 2006 pricing escalated to 2020.

Fish Passage and Protection Study

Results: Effects of (Re)introducing Shad above Rio

Availability of Habitat

- ~4.5 miles of habitat above Rio Dam (3.22 of Reservoir and 1.25 of River)
- 460 acres of reservoir to 6.97 acres of Mongaup River.
- Black Brook would contribute another mile and 5.22 acres of riverine habitat.
- Below Rio Dam 4.6 miles and 49.1 acres of riverine habitat.

Suitability of Habitat for Shad Spawning and Rearing

- Flowing water an important factor necessary in determining the suitability of spawning habitat.
- Current velocity between 0.3 to 0.9 meters per second or 1 to 3 feet per second for spawning.

Fish Passage and Protection Study

- Reservoir habitat not suitable for spawning.
- Assessed the number of spawning shad that could be supported in each habitat reach using a range of carrying capacities identified in the literature.

River Segment (downstream to upstream)	Length (miles)	Area (acres)	No. Shad Supported at 19.75 Shad/Acre Carrying Capacity	No. Shad Supported at 50 Shad/Acre Carrying Capacity
CURRENTLY AVAILABLE SHAD SPAWNING HABITAT DOWNSTREAM OF RIO DAM				
Mongaup River from Delaware River to Rio Dam	4.6	49.1	970	2,455
POTENTIAL SHAD SPAWNING HABITAT UPSTREAM OF RIO DAM				
Mongaup River from head of Rio Reservoir to Mongaup Falls	1.25	6.97	138	349
Black Brook from Mongaup River to Black Brook Dam	1.06	5.22	103	261
Total Upstream of Rio Dam	2.31	12.19	241	610

Fish Passage and Protection Study

Results: Effects of (Re)introducing Shad above Rio

Passage Effects

- Passage of shad above barriers can lead to increased migratory delay and mortality for adult shad.
- Shad populations in the northeast are predominantly iteroparous.
- Repeat spawners tend to be larger, more fecund, and are important to populations.
- Multiple studies and modeling efforts found that provision of upstream passage for shad lead to lower rates of repeat spawning.
- In CT River reductions in overall population fecundity and recruitment observed following implementation of upstream shad passage enhancements.
- Population increased frequently are not realized despite provision of upstream passage.
- High rates of downstream passage necessary for upstream passage to result in population growth.
- Due to site conditions Rio Reservoir likely a challenging location for downstream shad passage.

Fish Passage and Protection Study

Passage Effects (cont.)

- Population increased frequently are not realized despite provision of upstream passage.
- Limited spawning area upstream of Rio may not offset increased mortality of spawning adults.
- High rates of downstream passage necessary for upstream passage to result in population growth.
- Due to site conditions Rio Reservoir likely a challenging location for downstream shad passage.

Fish Passage and Protection Study

Ecological Effects: Shad

- Adult shad general do feed during migrations.
- Adults potential prey for eagles. More vulnerable in open reservoir habitat.
- Juvenile shad would seasonally provide an additional prey resource for resident species.
- Juveniles occupy a similar niche as the landlocked alewifes. Increased competition for prey resources.
- Due to limited available spawning habitat production of juvenile shad unlikely to be large enough to cause trophic impacts in reservoir.

Fish Passage and Protection Study

Results: Effects of (Re)introducing Eels above Rio

Availability and Suitability of Habitat

- All project reservoirs and river segments would be suitable for eels.
- Adaptable to wide range of habitats and prey resources.

Passage Effects

- Release from density dependent mechanisms that limit growth and reproductive potential.
- Exposure to increased turbine mortality risk. Particularly if passing multiple dams.
- Modeling efforts on Susquehanna indicate that cumulative downstream survival past multiple dams must be at least 33 percent to have a population benefit.

Fish Passage and Protection Study

Ecological Effects: Eels

- Can represent a significant portion of fish biomass in systems where they are present.
- Potential increase in growth rate once high densities of eels concentrated below Rio are redistributed upstream.
- High densities below barriers can skew sex ratios toward smaller males. Female eels more common in upstream habitats with lower densities.
- Generalist predators. Potential for increased competition for prey resources with resident species.
- Larger eels can eat smaller fish, leading to increased predation pressure.

Fish Passage and Protection Study

Summary for Shad

- Limited amount of suitable shad spawning habitat above Rio and currently no means of passage.
- Area above Rio potentially capable of supporting 200-600 spawning shad.
- Downstream passage of adult shad at Rio likely to be challenging.
- Upstream and downstream passage programs for shad would represent significant capital costs and long term costs for operation and maintenance.

Summary for Eels

- Abundance of suitable eel habitat.
- Trap and transport of eels would be most efficient means of upstream eel passage given the presence of multiple dams over 100ft in height.
- Silver eels would be able to enter all existing intakes and would likely experience significant turbine mortality.
- To pass silver eels downstream passage measures would be necessary at all developments with the exception of Cliff Lake and Toronto Reservoir

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Goals and Objectives

- Obtain information about the condition of existing recreation facilities and access sites at the Projects and three non-Project NYSDEC access areas located downstream of Rio Dam that are utilized by fishermen and whitewater boaters as take-outs.
- Obtain information on the existing recreation use, access, and demand at the Projects.
- Conduct an assessment of the need to enhance recreation opportunities and access at the Projects.
- Quantify and map the relationship between reservoir surface area and reservoir levels (obtained from the operations model).

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

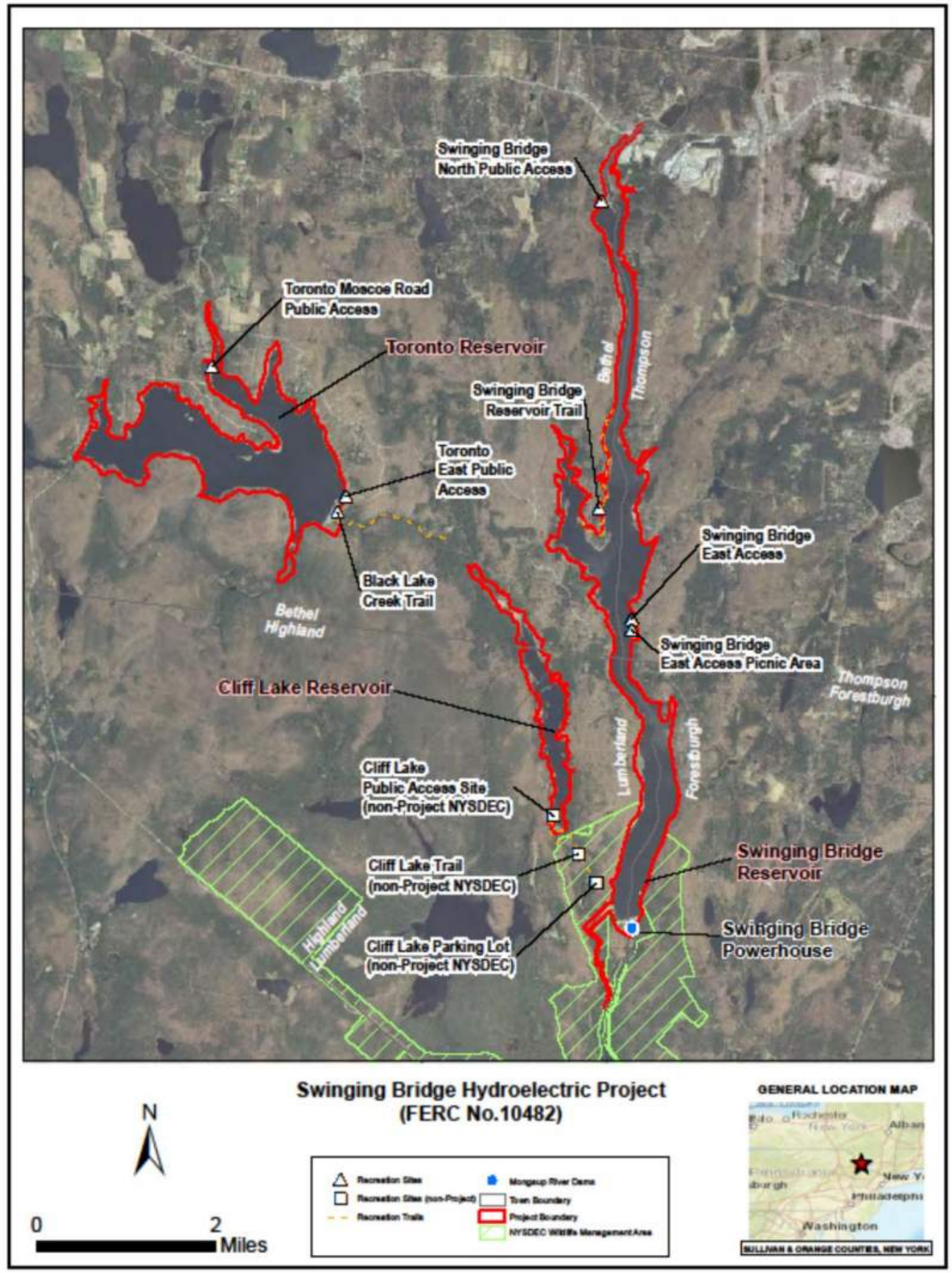
Study Area

Existing recreation sites associated with the Projects

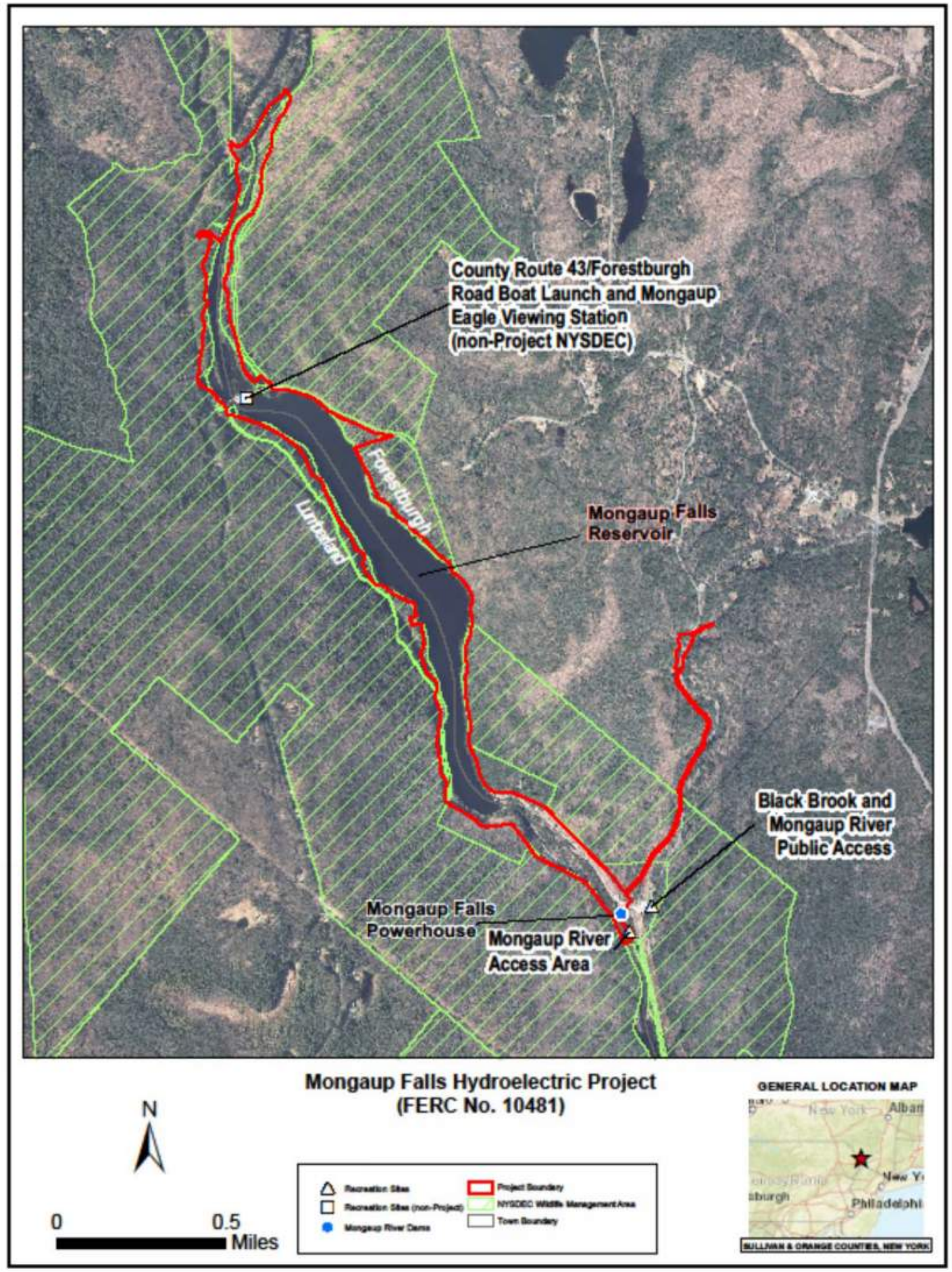
MONGAUP RIVER PROJECTS RECREATION SITES

Swinging Bridge Project
Swinging Bridge North Public Access
Swinging Bridge Reservoir Trail (Swinging Bridge Peninsula Trail)
Swinging Bridge East Access
Swinging Bridge East Access Picnic Area
Toronto Moscoe Road Public Access
Toronto East Public Access
Black Lake Creek Trail (Toronto East Parking Lot Trail)
Cliff Lake Trail
Cliff Lake Parking Lot
Cliff Lake Public Access Site
Mongaup Falls Project
County Route 43/Forestburgh Road Boat Launch
Mongaup Eagle Viewing Station
Black Brook and Mongaup River Public Access Area
Mongaup River Access Area
Rio Project
Rio Boat Launch
Rio Eagle Viewing Station
Shoreline Fishing Access (western shoreline of Mongaup River downstream of the Rio Reservoir)
Shoreline Fishing Access (western shoreline of Mongaup River downstream of the Rio Reservoir)
Rio Carry-In Boat Launch and Shoreline Fishing Access
Rio Hand Boat Launch
Whitewater Boating Access
Shoreline Fishing Access (adjacent to Whitewater Boating Access)
Downstream of Rio Main Powerhouse
NYSDEC Mongaup River Access County Rt. 31 (upstream of the Rt. 97 Mongaup River Bridge)
NYSDEC Rt. 97 Parking Area East of Mongaup River Bridge (provides parking for take-out on Mongaup River at the Rt. 97 Bridge and take-out areas on the Delaware River downstream of the confluence with the Mongaup River)
NYSDEC Rt. 97 Delaware River Access (upstream of the confluence with the Mongaup River)

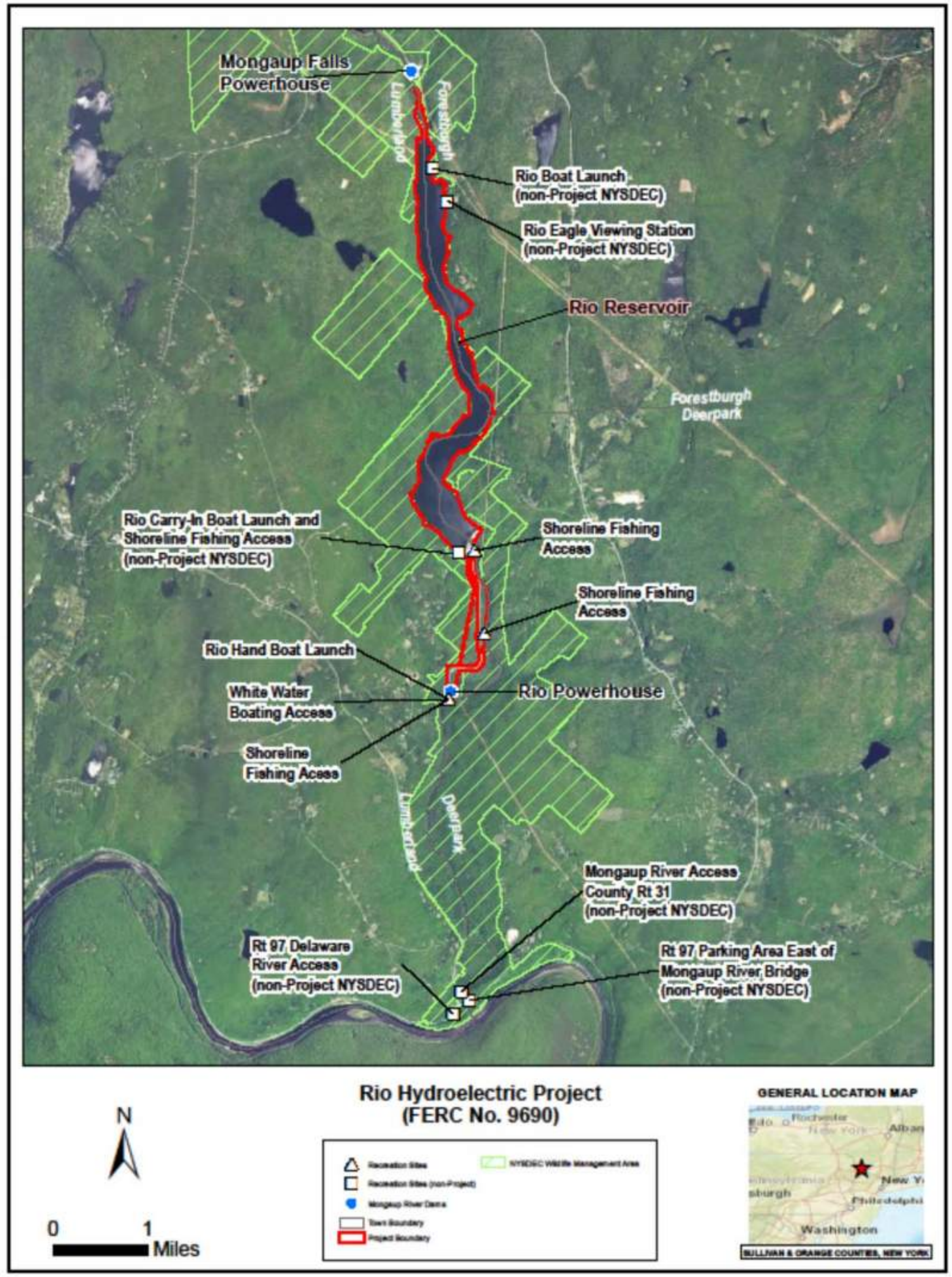
Swinging Bridge Hydroelectric Project



Mongaup Falls Hydroelectric Project



Rio Hydroelectric Project



Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Methodology

Recreation Facility Inventory

- A site assessment and facility inventory for each recreation site was performed in 2018.
- A standardized form was used to evaluate each recreation site to determine the general condition of the facilities and available amenities.
  - Photos of the recreation sites were taken and a GPS datapoint was recorded in the field for each facility at the recreation area.
  - For privately-owned public recreation sites within and abutting the Project reservoirs, background research was conducted and their owners were consulted to obtain information on the site's available amenities, services, and hours of operation.
  - Photos of these sites were taken and a GPS data point was recorded.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Methodology

Recreation Use and Needs Assessment

- Conducted using a combination of methods – spot counts, visitor intercept surveys, and actual use numbers for recreation sites (where available). The field work for this assessment began in April 2018 and is was complete in March 2019.
- Spot Counts
  - Conducted at each formal and informal recreation site.
  - Conducted at each survey location on 2 weekdays and 2 weekend days a month and on 1 day of the following holiday weekends between April and March: Memorial Day, Independence Day (weekend closest to July 4th), Labor Day, Columbus Day, the opening day of Trout season (April 1), Thanksgiving weekend, New Year's Eve, and President's Day.
  - Sampling days were randomly selected and survey routes are completed on a rotating basis and at different times of day to account for time-of-use patterns and to eliminate sampling bias.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Methodology

- User Contact Survey
  - The survey was developed to determine the nature of recreation use of the Projects and users' perceptions with respect to their recreation use of the formal and informal recreation sites at the Projects.
  - The survey was offered to recreationists encountered during the spot count site visits to the formal and informal recreation sites and administered to recreationists agreeing to the survey.
- Actual Use Records
  - Actual use records for the Whitewater Boating Access and the Mongaup Eagle Viewing Station were also utilized as an additional method of determining the level of recreation use.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Methodology

<u>Future Recreation Demand</u>

- Future recreation demand at the Projects under current Project operations was estimated based on both expected population growth in the region and on expected changes in recreation participation.

<u>Quantification of the Relationship between Reservoir Surface Area and Reservoir Levels</u>

- Bathymetry data was used to produce bathymetry maps for each reservoir and also quantify the relationship between reservoir surface area and reservoir levels for the range of operation (full pool to minimum reservoir elevation level) at each Project reservoir.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

<u>Recreation Facility Inventory</u>

- The field portion of the recreation site/facility inventory was completed on July 19-20, 2018. The evaluation of private recreation sites was conducted on June 2, 2019.
- Private recreation sites include the Starlight Marina and Swinging Bridge Marina located on the Swinging Bridge Reservoir.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

<u>Recreation Facility Inventory</u>

- Swinging Bridge Project






EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

<u>Recreation Facility Inventory</u>

- Mongaup Falls Project





Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

<u>Recreation Facility Inventory</u>

- Rio Project

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Recreation Facility Inventory

- Downstream of Rio Main Powerhouse






Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Recreation Facility Inventory

- Private Recreation Sites

Starlight Marina

Swinging Bridge Marina

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

<u>Recreation Use and Needs Assessment</u>

- Field work for the recreation use and needs assessment, spot counts, and user contact surveys was completed on March 31, 2019.
- 121 user surveys were collected from April 2018 through March 2019, with an additional 41 declined surveys, and 7 recreationists who had previously been surveyed.
- User survey field days were lengthened in an effort to collect as many surveys as possible from users at the recreation sites.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Recreation Use and Needs Assessment

MONGAUP RIVER PROJECTS SPOT COUNT/USER SURVEY DATES

Month	Dates
April 2018	1, 7, 19, 22, 24
May 2018	2, 12, 20, 23, 26
June 2018	2, 11, 16, 22
July 2018	4, 7, 14, 18, 26, 28
August 2018	6, 12, 26, 29
September 2018	1, 8, 11, 16, 17, 29
October 2018	6, 12, 20, 28, 31
November 2018	7, 10, 18, 25, 30
December2018	5, 13, 16, 29, 31
January 2019	5, 25, 26, 28
February 2019	3, 7, 18, 23, 27
March 2019	2, 13, 18, 31

Results

Recreation Use and Needs Assessment

Recreation Use by Season:

- The total annual recreation use of surveyed recreation and access sites at the Mongaup River Projects was estimated to be 38,591 recreation days.
- Total recreation use at the downstream sites was estimated to be 16,041 recreation days.
- 1,026 spot counts were made at public recreation and access sites, representing 327 recreationists.
- Individuals from 169 parties representing an estimated 458 recreationists were encountered.

ESTIMATED USE AT THE SWINGING BRIDGE, MONGAUP FALLS, AND RIO PROJECT RECREATION SITES; ANNUAL TOTAL USE FOR 2018-2019 AND BY SEASON[1]

Recreation Site	Annual Use	Spring Use	Summer Use	Fall Use	Winter Use
Swinging Bridge Project					
Swinging Bridge North Public Access	477	0	261	164	52
Swinging Bridge Reservoir Trail (Swinging Bridge Peninsula Trail)	89	0	53	36	0
Swinging Bridge East Access	10,406	1,483	6,960	1,254	709
Toronto Moscoe Road Public Access	5,613	754	3,110	1,231	518
Toronto East Public Access	3,786	267	2,997	43	479
Cliff Lake	692	66	420	154	52
Total, Swinging Bridge Project	*21,063*	*2,570*	*13,800*	*2,881*	*1,812*
Mongaup Falls Project					
County Route 43/Forestburgh Rd Boat Launch	3,152	198	2,167	787	No Use Observed
Mongaup Eagle Viewing Station	3,615	46	586	88	2,895
Black Brook and Mongaup River Public Access Area	No Use Observed	No Use Observed	No Use Observed	No Use Observed	No Use Observed
Mongaup River Access Area	1,232	91	No Use Observed	37	1,104
Total, Mongaup Falls Project	*7,999*	*335*	*2,753*	*912*	*4,000*
Rio Project					
Rio Eagle Viewing Station	236	No Use Observed	33	No Use Observed	202
Rio Boat Launch	6,042	1,062	3,792	1,152	35
Shoreline Fishing Access (Western Shore Below Rio Reservoir)	455	205	180	No Use Observed	69
Rio Carry-in Boat Launch/Shoreline Fishing Access	1,122	380	708	34	No Use Observed
Rio Hand Boat Launch/Fishing Access/Whitewater	1,675	459	886	330	No Use Observed
Total, Rio Project	*9,529*	*2,107*	*5,599*	*1,517*	*307*
Total, Mongaup River Projects					
All Recreation Sites	*38,591*	*5,012*	*22,152*	*5,310*	*6,119*
Percentages	-	*13.0%*	*57.4%*	*13.8%*	*15.9%*
Downstream of Rio Main Powerhouse					
Mongaup River Access Rt. 31	349	122	176	51	-
NYSDEC Rt. 97 Delaware River Access	13,360	187	12,293	518	362
NYSDEC Rt. 97 Parking Area East of Bridge	2,332	460	678	472	722
Total, Downstream of Rio Main Powerhouse	*16,041*	*769*	*13,146*	*1,042*	*1,084*
Percentages		*4.8%*	*82.0%*	*6.5%*	*6.8%*

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

<u>Recreation Use and Needs Assessment</u>

PERCENT OF RECREATION USE BY ACTIVITY AT EACH SITE[1]: SWINGING BRIDGE PROJECT

Recreation Site	Motor Boat	Non-Motor Boat	Fish	Ice Fish	Picnic	Swim	Hunt	Walk/ Hike/Jog	Bird Watch	Snow-mobile	Sight-seeing	Other Rec
Swinging Bridge North Public Access	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
Swinging Bridge Reservoir Trail[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Swinging Bridge East Access	25%	5%	26%	6%	7%	6%	0%	1%	0%	0%	5%	18%
Toronto Moscoe Road Public Access	37%	31%	22%	5%	0%	0%	0%	0%	0%	2%	2%	1%
Toronto East Public Access	0%	4%	7%	9%	10%	43%	0%	17%	0%	0%	7%	3%
Cliff Lake	0%	14%	86%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Project-Wide Recreation Activity	***23%***	***12%***	***23%***	***6%***	***6%***	***11%***	***0%***	***4%***	***0%***	***1%***	***5%***	***10%***

[1] Percentages of estimated use may not sum to 100% due to rounding.

[2]No recreation use was directly observed at the Swinging Bridge East Access area or recorded during user surveys.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Recreation Use and Needs Assessment

PERCENT OF RECREATION USE BY ACTIVITY AT EACH SITE[1]: MONGAUP FALLS PROJECT

Recreation Site	Motor Boat	Non-Motor Boat	Fish	Ice Fish	Picnic	Swim	Hunt	Walk/ Hike/Jog	Bird Watch	Snow-mobile	Sight-seeing	Other Rec
County Route 43/Forestburgh Rd Boat Launch	0%	69%	0%	0%	0%	0%	0%	0%	0%	0%	31%	0%
Mongaup Eagle Viewing Station	0%	2%	6%	0%	0%	0%	0%	6%	82%	0%	4%	0%
Black Brook and Mongaup River Public Access Area	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mongaup River Access Area	0%	0%	8%	0%	0%	0%	0%	0%	92%	0%	0%	0%
Project-Wide Recreation Activity	***0%***	***28%***	***4%***	***0%***	***0%***	***0%***	***0%***	***3%***	***51%***	***0%***	***14%***	***0%***

[1] Percentages of estimated use may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Recreation Use and Needs Assessment

PERCENT OF RECREATION USE BY ACTIVITY AT EACH SITE: RIO PROJECT

Recreation Site	Motor Boat	Non-Motor Boat	Fish	Ice Fish	Picnic	Swim	Hunt	Walk/ Hike/Jog	Bird Watch	Snow-mobile	Sight-seeing	Other Rec
Rio Eagle Viewing Station	0%	2%	3%	0%	0%	0%	0%	5%	87%	0%	3%	0%
Rio Boat Launch	11%	36%	40%	0%	0%	0%	0%	6%	3%	0%	1%	3%
Shoreline Fishing Access (Western Shore Below Rio Reservoir)	0%	0%	85%	0%	0%	0%	0%	4%	11%	0%	0%	0%
Rio Carry-in Boat Launch/Shoreline Fishing Access	4%	9%	49%	0%	0%	9%	0%	0%	0%	0%	28%	0%
Rio Hand Boat Launch/Fishing Access/Whitewater	0%	73%	23%	0%	0%	0%	0%	0%	0%	0%	4%	0%
Project-Wide Recreation Activity	***7%***	***37%***	***39%***	***0%***	***0%***	***1%***	***0%***	***4%***	***4%***	***0%***	***5%***	***2%***

[1] Percentages of estimated use by activity at each recreation site may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Recreation Use and Needs Assessment

PERCENT OF RECREATION USE BY ACTIVITY AT EACH SITE: DOWNSTREAM OF RIO MAIN POWERHOUSE

Recreation Site	Motor Boat	Non-Motor Boat	Fish	Ice Fish	Picnic	Swim	Hunt	Walk/ Hike/Jog	Bird Watch	Snow-mobile	Sight-seeing	Other Rec
Mongaup River Access Rt. 31	0%	0%	17%	0%	0%	0%	0%	32%	0%	0%	50%	0%
NYSDEC Rt. 97 Delaware River Access	0%	85%	0%	0%	0%	0%	0%	13%	0%	0%	0%	2%
NYSDEC Rt. 97 Parking Area East of Bridge	0%	39%	18%	0%	0%	0%	0%	42%	0%	0%	0%	1%
Recreation Activity of Sites Downstream of the Rio Main Powerhouse	***0%***	***77%***	***2%***	***0%***	***0%***	***0%***	***0%***	***19%***	***0%***	***0%***	***1%***	***1%***

[1] Percentages of estimated use by activity at each recreation site may not sum to 100% due to rounding.

Results

Recreation Use and Needs Assessment

User Surveys:

- 121 surveys were completed representing ~327 recreationists.

MONGAUP RIVER PROJECTS SUMMARY OF USER SURVEYS

Site	Surveys Completed[1]	Declined	Surveyed Previously	Parties Contacted/ Surveys Offered
Swinging Bridge Project				
Swinging Bridge North Public Access	0	0	0	0
Swinging Bridge Reservoir Trail (Swinging Bridge Peninsula Trail)	0	0	0	0
Swinging Bridge East Access	36	11	1	48
Swinging Bridge East Picnic Area	0	0	0	0
Toronto Moscoe Rd Public Access	6	1	0	7
Toronto East Public Access	4	2	0	6
Black Lake Creek Trail (Toronto East Parking Lot Trail)	0	0	0	0
Cliff Lake Trail	0	0	0	0
Cliff Lake Parking Lot, Access site, and trails	1	2	0	3
Cliff Lake Public Access Site	0	0	0	0
Mongaup Falls Project				
County Rt. 43/Forestburgh Road Boat Launch	1	0	1	2
Mongaup Eagle Viewing Station	18	7	1	26
Black Brook and Mongaup River Public Access Area	0	0	0	0
Mongaup River Public Access Area	0	0	0	0
Rio Project				
Rio Boat Launch	27	10	1	38
Rio Eagle Viewing Station	0	0	0	0
Shoreline Fishing Access (western shoreline of Mongaup River at toe of Rio Dam)	6	1	0	7
Rio Hand Boat Launch	2	0	0	2
Whitewater Boating Access	3	0	1	4
Shoreline Fishing Access (adjacent to Whitewater Boating Access)	0	0	0	0
Downstream of Rio Main Powerhouse				
NYSDEC Mongaup River Access County Route 31 (upstream of the Rt. 97 Mongaup River Bridge)	0	0	0	0
Route 97 Parking Area East of Mongaup River Bridge	3	0	0	3
Route 97 Delaware River Access (upstream of the confluence with the Mongaup River)	14	7	2	23
TOTAL	**121**	**41**	**7**	**169**

[1]Not all respondents chose to answer every question. Surveys with omissions are included in the *Surveys Completed* column. The number of responses is provided for each question as it is presented in the discussions that follow.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: <u>Recreation Use and Needs Assessment</u>

Swinging Bridge Project

- Average age 48, 73% male
- Average group size 2.3 people with 1.1 vehicles
- 94% had previously visited the project (average number of visits being 21)
- Average distance travelled is 42 miles
- Most popular activities were fishing from a boat followed by fishing, power boating, and kayaking

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF WATER LEVELS THIS TRIP, REPORTED AS PERCENT OF RESPONDENTS[1]

Water Level This Trip		Number of Responses	5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Swinging Bridge East Access		36	31%	11%	28%	19%	11%
Comments:	Too low (rated *Slightly Satisfied*—3 responses; rated *Not Satisfied at All*—4 responses) Better when high (rated *Satisfied*—1 response; rated *Slightly Satisfied*—2 responses) “Boat launch” (rated *Slightly Satisfied*) Need more cover on banks for fish (not rated)						
Toronto Moscoe Road		6	0%	50%	50%	0%	0%
Comments:	No comments received						
Toronto East Public Access		6	33%	33%	33%	0%	0%
Comments:	No comments received						
Cliff Lake		1	100%	0%	0%	0%	0%
Comments:	“Nice and high” (rated as *Satisfied*)						
Project-wide		***47***	***30%***	***17%***	***30%***	***15%***	***9%***

[1] Percentages shown may not sum to 100% due to rounding.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER PERCEPTION AND RATINGS OF RANGE OF WATER LEVELS OVER PAST 5 YEARS, REPORTED AS PERCENT OF RESPONDENTS[1]: SWINGING BRIDGE PROJECT

Perception of Range of Water Level Past 5 Years	Number of Responses	5 Very High	4 High	3 Normal	2 Low	1 Very Low
Swinging Bridge East Access	32	3%	9%	56%	28%	3%
Toronto Moscoe Road	6	0%	0%	67%	33%	0%
Toronto East Public Access	3	33%	0%	67%	0%	0%
Cliff Lake	0	N/A	N/A	N/A	N/A	N/A
Project-wide	***41***	***5%***	***7%***	***59%***	***27%***	***2%***
Rating of Range of Water Level Past 5 Years	**Number of Responses**	**5 Extremely Satisfied**	**4 Moderately Satisfied**	**3 Satisfied**	**2 Slightly Satisfied**	**1 Not Satisfied at All**
Swinging Bridge East Access	33	9%	24%	48%	18%	0%
Comments:	Too much fluctuation (rated *Satisfied*—1 response; rated *Slightly Satisfied*—3 responses) Low (rated *Satisfied*—1 response; rated *Slightly Satisfied*—2 responses) High (rated *Moderately Satisfied*) Nice and high (rated *Moderately Satisfied*)					
Toronto Moscoe Road	6	0%	33%	33%	17%	17%
Comments:	Low water (rated *Not Satisfied at All*)					
Toronto East Public Access	4	50%	0%	50%	0%	0%
Comments:	No comments received					
Cliff Lake	1	100%	0%	0%	0%	0%
Comments:	No comments received					
Project-wide	***44***	***14%***	***23%***	***45%***	***16%***	***2%***

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

Recreation User Response to Water Levels Affecting Use: Swinging Bridge Project

Do water levels affect your use of the Reservoir?	Number of Responses	Yes	No	Comments	
Swinging Bridge East Access	34	50%	50%	Boating/launching issues if low	10
				Fish impacted	1
				No swimming if low	1
				Higher water	1
				"If drained again"	1
				Leave if low	1
Toronto Moscoe Road	5	80%	20%	Not used when low	3
Toronto East Public Access	4	25%	75%	Poor access when low	1
Cliff Lake	0	N/A	N/A	No comments received	
Project-wide	***43***	***51%***	***49%***		

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF NUMBER OF THE FACILITIES, PERCEIVED LEVEL OF USE, AND RECREATIONAL CONFLICTS, REPORTED AS PERCENT OF RESPONDENTS[1]: SWINGING BRIDGE EAST ACCESS

Topic	Number of Responses	Respondents' Ratings				
		5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Number of Facilities	36	6%	22%	47%	17%	8%
Comments:	Would like more facilities (4 responses) Would like access on other side of reservoir (1 response) Wants a dock for ease of launching (1 response) Not good for public access (1 response) Clean bathrooms (1 response)					
		5 Extremely Crowded	4	3 Somewhat Crowded	2	1 Not Crowded
Level of Use	36	3%	17%	22%	14%	44%
		5 Extreme Amount of Conflicts	4	3 Moderate Amount of Conflicts	2	1 No Conflicts
Recreational Conflicts	36	0%	8%	11%	14%	67%
Comments:	Heavy use/limited space (3 responses) Better signage (1 response) Swimming issues (1 response)					

[1] Percentages shown may not sum to 100% due to rounding.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF RECREATION SITES, FACILITIES AND AMENITIES, REPORTED AS PERCENT OF RESPONDENTS[1]: SWINGING BRIDGE EAST ACCESS

Site/Facility/Amenity	Number of Responses	5 Excellent	4	3 Fair	2	1 Poor
Parking	36	17%	28%	44%	8%	3%
Facility Condition	36	19%	44%	19%	6%	11%
Variety of Amenities	36	17%	22%	31%	11%	19%
Toilets/Restrooms	36	25%	19%	22%	14%	19%
River Access	25	24%	40%	28%	4%	4%
Reservoir Access	34	21%	35%	26%	12%	6%
Overall Quality	36	22%	47%	28%	3%	0%

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF NUMBER OF THE FACILITIES, LEVEL OF USE, AND PERCEPTION OF CONFLICTS, REPORTED AS PERCENT OF RESPONDENTS[1]: TORONTO MOSCOE ROAD

<table>
<tr><th rowspan="2">Topic</th><th rowspan="2">Number of Responses</th><th colspan="5">Respondents' Ratings</th></tr>
<tr><th>5
Extremely Satisfied</th><th>4
Moderately Satisfied</th><th>3
Satisfied</th><th>2
Slightly Satisfied</th><th>1
Not Satisfied at All</th></tr>
<tr><td>Number of Facilities</td><td>5</td><td>0%</td><td>20%</td><td>20%</td><td>40%</td><td>20%</td></tr>
<tr><td>Comments:</td><td colspan="6">Would like more 1
Need boat ramp 1</td></tr>
<tr><th></th><th></th><th>5
Extremely Crowded</th><th>4</th><th>3
Somewhat Crowded</th><th>2</th><th>1
Not Crowded</th></tr>
<tr><td>Level of Use</td><td>6</td><td>17%</td><td>0%</td><td>33%</td><td>17%</td><td>33%</td></tr>
<tr><th></th><th></th><th>5
Extreme Amount of Conflicts</th><th>4</th><th>3
Moderate Amount of Conflicts</th><th>2</th><th>1
No Conflicts</th></tr>
<tr><td>Recreational Conflicts</td><td>6</td><td>0%</td><td>0%</td><td>0%</td><td>0%</td><td>100%</td></tr>
<tr><td>Comments:</td><td colspan="6">No comments received</td></tr>
<tr><td colspan="7">[1] Percentages shown may not sum to 100% due to rounding.</td></tr>
</table>

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF RECREATION SITES, FACILITIES AND AMENITIES, REPORTED AS PERCENT OF RESPONDENTS[1]: TORONTO MOSCOE ROAD

Site/Facility/Amenity	Number of Responses	5 Excellent	4	3 Fair	2	1 Poor
Parking	6	0%	0%	17%	67%	17%
Facility Condition	6	0%	33%	0%	67%	0%
Variety of Amenities	5	20%	20%	0%	0%	60%
Toilets/Restrooms	6	0%	0%	0%	0%	100%
River Access	4	25%	25%	50%	0%	0%
Reservoir Access	6	17%	33%	50%	0%	0%
Overall Quality	6	17%	50%	0%	33%	0%
[1] Percentages shown may not sum to 100% due to rounding.						

EAGLE CREEK RENEWABLE ENERGY – EXCELLENCE IN HYDRO –

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF NUMBER OF THE FACILITIES REPORTED AS PERCENT OF RESPONDENTS[1]: TORONTO EAST PUBLIC ACCESS

Topic	Number of Responses	Respondents' Ratings				
		5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Number of Facilities	4	0%	0%	100%	0%	0%
Comments:	Map Would like more Trail maintenance		1 1 1			
		5 Extremely Crowded	4	3 Somewhat Crowded	2	1 Not Crowded
Level of Use	4	0%	0%	0%	50%	50%
		5 Extreme Amount of Conflicts	4	3 Moderate Amount of Conflicts	2	1 No Conflicts
Recreational Conflicts	4	0%	0%	0%	25%	75%
Comments:	No comments received					

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF RECREATION SITES, FACILITIES AND AMENITIES, REPORTED AS PERCENT OF RESPONDENTS[1]: TORONTO EAST PUBLIC ACCESS

Site/Facility/Amenity	Number of Responses	5 Excellent	4	3 Fair	2	1 Poor
Parking	4	75%	25%	0%	0%	0%
Facility Condition	4	75%	25%	0%	0%	0%
Variety of Amenities	4	50%	0%	50%	0%	0%
Toilets/Restrooms	4	50%	25%	25%	0%	0%
River Access	3	33%	33%	33%	0%	0%
Reservoir Access	4	50%	50%	0%	0%	0%
Overall Quality	4	50%	50%	0%	0%	0%

[1] Percentages shown may not sum to 100% due to rounding.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF SITE AS PUBLIC RECREATION OPPORTUNITY, PLANS FOR RETURNING, AND SERVING INTERESTS, REPORTED AS PERCENT OF RESPONDENTS[1]: TORONTO EAST PUBLIC ACCESS

Topic	Number of Responses	Respondents' Ratings				
		5 High Value	4	3 Some Value	2	1 No Value at All
Recreation Site as a Public Recreation Opportunity	4	75%	25%	0%	0%	0%
		Yes	No			
Would you return over the next year?	4	100%	0%			
		Yes	No			
Does this recreation site/facility serve your interests?	4	100%	0%			

[1] Percentages shown may not sum to 100% due to rounding.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

Mongaup Falls Project

- Average age 61, 74% male
- Average group size 3.5 people with 1.7 vehicles
- 100% had previously visited the project (average number of visits being 14)
- Average distance travelled is 38 miles
- Most popular activities were eagle viewing, kayaking, birding, dog walking

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF WATER LEVELS THIS TRIP, REPORTED AS PERCENT OF RESPONDENTS[1]

Water Level This Trip	Number of Responses	5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Mongaup Eagle Viewing Station	18	11%	39%	44%	6%	0%
Comments:	Varies (rated as *Satisfied*) Low (rated as *Slightly Satisfied*)					
Route 43 Boat Launch	1	100%	0%	0%	0%	0%
Comments:	No comments received					
Project-wide	***19***	***16%***	***37%***	***42%***	***5%***	***0%***
[1] Percentages shown may not sum to 100% due to rounding.						

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER PERCEPTIONS AND RATINGS OF RANGE OF WATER LEVELS OVER PAST 5 YEARS, REPORTED AS PERCENT OF RESPONDENTS[1]: MONGAUP FALLS PROJECT

Perception of Range of Water Level Past 5 Years	Number of Responses	5 Very High	4 High	3 Normal	2 Low	1 Very Low
Mongaup Eagle Viewing Station	17	0%	18%	71%	12%	0%
Route 43 Boat Launch	1	0%	0%	100%	0%	0%
Project-wide	***18***	***0%***	***17%***	***72%***	***11%***	***0%***
Rating of Range of Water Level Past 5 Years	**Number of Responses**	**5 Extremely Satisfied**	**4 Moderately Satisfied**	**3 Satisfied**	**2 Slightly Satisfied**	**1 Not Satisfied at All**
Mongaup Eagle Viewing Station	18	6%	17%	50%	28%	0%
Comments:	Water levels vary (rated as *Slightly Satisfied*-2 respondents) Too low (rated as *Slightly Satisfied*) Water is low sometimes (rated as *Slightly Satisfied*) Hard to spot bald eagles when low (rated as *Slightly Satisfied*)					
Route 43 Boat Launch	1	0%	0%	100%	0%	0%
Comments:	No comments received					
Project-wide	***19***	***5%***	***16%***	***53%***	***26%***	***0%***

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER RESPONSE TO WATER LEVELS AFFECTING USE, REPORTED AS PERCENT OF RESPONDENTS[1]: MONGAUP FALLS PROJECT

Do water levels affect your use of the Reservoir?	Number of Responses	Yes	No	Comments	
Mongaup Eagle Viewing Station	18	11%	89%	Only on Delaware River	2
				Launching kayak	1
				Fishing better when lower	1
Route 43 Boat Launch	1	0%	100%	No comments received	
Project-wide	***19***	***11%***	***89%***		

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF NUMBER OF THE FACILITIES, PERCEIVED LEVEL OF USE, AND RECREATIONAL CONFLICTS, REPORTED AS PERCENT OF RESPONDENTS[1,2]: MONGAUP EAGLE VIEWING STATION

Topic	Number of Responses	Respondents' Ratings				
		5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Number of Facilities	18	33%	39%	17%	11%	0%
Comments[2]:	Plenty of facilities (2 responses) "More = more people" (1 response) Wants another eagle viewing blind (1 response) Could be a few more facilities (1 response) Improve maintenance/more trash bins (1 response)					
		5 Extremely Crowded	**4**	**3 Somewhat Crowded**	**2**	**1 Not Crowded**
Level of Use	18	0%	0%	6%	6%	89%
		5 Extreme Amount of Conflicts	**4**	**3 Moderate Amount of Conflicts**	**2**	**1 No Conflicts**
Recreational Conflicts	18	0%	0%	11%	17%	72%
Comments[2]:	People on the road/stopping on the road (4 responses) People under bridge (2 responses) People disobeying rules/in restricted area (2 response) Speeders (1 response)					

[1]Percentages shown may not sum to 100% due to rounding.
[2]Respondents could provide more than one comment.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF RECREATION SITES, FACILITIES AND AMENITIES, REPORTED AS PERCENT OF RESPONDENTS[1]: MONGAUP EAGLE VIEWING STATION

Site/Facility/Amenity	Number of Responses	5 Excellent	4	3 Fair	2	1 Poor
Parking	18	11%	56%	17%	6%	11%
Facility Condition	18	22%	72%	0%	6%	0%
Variety of Amenities	18	22%	72%	0%	0%	6%
Toilets/Restrooms	18	17%	39%	17%	22%	6%
River Access	18	17%	61%	6%	11%	6%
Reservoir Access	18	17%	61%	6%	11%	6%
Overall Quality	18	17%	83%	0%	0%	0%
[1] Percentages shown may not sum to 100% due to rounding.						

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results:

<u>Recreation Use and Needs Assessment</u>

Route 43 Boat Launch

- Users were satisfied, site was not crowded at all, no conflicts experienced
- Overall quality and parking, rated as Excellent-Fair.
- Facility condition rated as Excellent
- Variety of amenities and toilets/restrooms rated Poor.
- Reservoir access rated as Fair-Poor.

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: <u>Recreation Use and Needs Assessment</u>

Rio Project

- Average age 56, 72% male
- Average group size 2.6 people with 1.4 vehicles
- 92% had previously visited the project (average number of visits being 14)
- Average distance travelled is 35 miles
- Most popular activities were kayaking, fishing from a boat, and fishing from shore

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF WATER LEVELS THIS TRIP, REPORTED AS PERCENT OF RESPONDENTS: RIO PROJECT[1]

Water Level This Trip	Number of Responses	5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Rio Boat Launch	26	38%	15%	42%	4%	0%
Comments:	Water level is nice and high (rated as *Satisfied*) Pretty low (rated as *Slightly Satisfied*) Could be deeper (not rated)					
Shoreline Fishing Access (Western Shore Below Rio Reservoir)	6	33%	33%	33%	0%	0%
Comments:	Nice and high (rated as *Moderately Satisfied*)					
Carry-in Boat Launch/ Shoreline Fishing Access	2	50%	0%	50%	0%	0%
Comments:	No comments received					
Rio Hand Boat Launch/Fishing Access/Whitewater	3	33%	33%	33%	0%	0%
Comments:	"Nice and high" (rated as *Satisfied*)					
Project-wide	***37***	***38%***	***19%***	***41%***	***3%***	***0%***

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER PERCEPTIONS AND RATINGS OF RANGE OF WATER LEVELS OVER PAST 5 YEARS, REPORTED AS PERCENT OF RESPONDENTS[1]: RIO PROJECT

Perception of Range of Water Level Past 5 Years	Number of Responses	5 Very High	4 High	3 Normal	2 Low	1 Very Low
Rio Boat Launch	26	0%	27%	54%	15%	4%
Shoreline Fishing Access (Western Shore Below Rio Reservoir)	6	0%	0%	83%	17%	0%
Rio Carry-in Boat Launch/Shoreline Fishing Access	2	0%	0%	100%	0%	0%
Rio Hand Boat Launch/Fishing Access/Whitewater	2	0%	50%	50%	0%	0%
Project-wide	***36***	***0%***	***22%***	***61%***	***14%***	***3%***

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

Rating of Range of Water Level Past 5 Years	Number of Responses	5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Rio Boat Launch	25	16%	16%	60%	8%	0%
Comments:	Water low over past 5 years (rated as *Satisfied*) Would like higher (rated as *Satisfied*) Average (rated as *Satisfied*) Not much water/fish (rated as *Slightly Satisfied*) Levels could be maintained higher (rated as *Slightly Satisfied*)					
Shoreline Fishing Access (Western Shore Below Rio Reservoir)	6	0%	0%	100%	0%	0%
Comments:	No comments received					
Carry-in Boat Launch/ Shoreline Fishing Access	2	50%	0%	50%	0%	0%
Comments:	No comments received					
Rio Hand Boat Launch/Fishing Access/Whitewater	2	0%	50%	0%	50%	0%
Comments:	Wants more 2-unit releases (rated as *Slightly Satisfied*)					
Project-wide	***35***	***14%***	***14%***	***63%***	***9%***	***0%***

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RESPONSE TO WATER LEVELS AFFECTING USE, REPORTED AS PERCENT OF RESPONDENTS[1]: RIO PROJECT

Do water levels affect your use of the Reservoir?	Number of Responses	Yes	No	Comments	
Rio Boat Launch	27	15%	85%	Fishing affected (low water = low number of fish) Boating access difficult with low water	2 2
Shoreline Fishing Access (Western Shore Below Rio Reservoir)	5	80%	20%	Level too high don't venture out Only the river Speed of river, danger if higher	1 1 1
Rio Carry-in Boat Launch/Shoreline Fishing Access	2	100%	0%	For access If it's too low	1 1
Rio Hand Boat Launch/Fishing Access/Whitewater	3	67%	33%	If not running don't fish Higher = better	1 1
Project-wide	***37***	***32%***	***68%***		

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF NUMBER OF THE FACILITIES, LEVEL OF USE, AND PERCEPTION OF CONFLICTS, REPORTED AS PERCENT OF RESPONDENTS[1,2]: RIO BOAT LAUNCH

Topic	Number of Responses	Respondents' Ratings				
		5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Number of Facilities	26	19%	15%	35%	31%	0%
Comments:	Would like more			5		
	Plenty/don't want more			2		
	Wants restroom/restroom sooner			2		
	Keep Toronto open			1		
		5 Extremely Crowded	**4**	**3 Somewhat Crowded**	**2**	**1 Not Crowded**
Level of Use	27	11%	22%	15%	7%	44%
		5 Extreme Amount of Conflicts	**4**	**3 Moderate Amount of Conflicts**	**2**	**1 No Conflicts**
Recreational Conflicts	27	0%	0%	0%	11%	89%
Comments:	Crowding at boat launch			1		
	Inconsiderate people			1		
	Space			1		

[1] Percentages shown may not sum to 100% due to rounding.

[2] Respondent could provide more than one comment.

EAGLE CREEK RENEWABLE ENERGY – EXCELLENCE IN HYDRO –

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF RECREATION SITES, FACILITIES AND AMENITIES, REPORTED AS PERCENT OF RESPONDENTS[1]: RIO BOAT LAUNCH

Site/Facility/Amenity	Number of Responses	5 Excellent	4	3 Fair	2	1 Poor
Parking	27	37%	44%	7%	7%	4%
Facility Condition	27	44%	52%	4%	0%	0%
Variety of Amenities	27	19%	30%	19%	11%	22%
Toilets/Restrooms	25	4%	4%	4%	4%	84%
River Access	18	50%	50%	0%	0%	0%
Reservoir Access	25	52%	48%	0%	0%	0%
Overall Quality	25	40%	60%	0%	0%	0%

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF SITE AS PUBLIC RECREATION OPPORTUNITY, PLANS FOR RETURNING, AND SERVING INTERESTS, REPORTED AS PERCENT OF RESPONDENTS[1]: RIO BOAT LAUNCH

Topic	Number of Responses	Respondents' Ratings				
		5 High Value	4	3 Some Value	2	1 No Value at All
Recreation Site as a Public Recreation Opportunity	27	59%	37%	4%	0%	0%
		Yes	No			
Would you return over the next year?	27	96%	4%			
		Yes	No			
Does this recreation site/facility serve your interests?	27	100%	0%			

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY – EXCELLENCE IN HYDRO –

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF NUMBER OF THE FACILITIES REPORTED AS PERCENT OF RESPONDENTS[1]: SHORELINE FISHING ACCESS (WESTERN SHORE BELOW RIO RESERVOIR)

Topic	Number of Responses	Respondents' Ratings				
		5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Number of Facilities	6	33%	33%	33%	0%	0%
Comments:	Boat launch wanted 1 "Not too many, not too crowded" 1					
		5 Extremely Crowded	**4**	**3 Somewhat Crowded**	**2**	**1 Not Crowded**
Level of Use	6	0%	17%	0%	17%	67%
		5 Extreme Amount of Conflicts	**4**	**3 Moderate Amount of Conflicts**	**2**	**1 No Conflicts**
Recreational Conflicts	6	0%	0%	0%	0%	100%
Comments:	No comments received					
[1] Percentages shown may not sum to 100% due to rounding.						

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

TABLE 5-105

RECREATIONAL USER RATINGS OF RECREATION SITES, FACILITIES AND AMENITIES, REPORTED AS PERCENT OF RESPONDENTS[1]: SHORELINE FISHING ACCESS (WESTERN SHORE BELOW RIO RESERVOIR)

Site/Facility/Amenity	Number of Responses	5 Excellent	4	3 Fair	2	1 Poor
Parking	6	50%	17%	17%	17%	0%
Facility Condition	6	67%	17%	17%	0%	0%
Variety of Amenities	6	17%	17%	50%	0%	17%
Toilets/Restrooms	4	25%	0%	25%	0%	50%
River Access	6	33%	17%	17%	17%	17%
Reservoir Access	4	25%	25%	25%	25%	0%
Overall Quality	6	67%	17%	17%	0%	0%

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF SITE AS PUBLIC RECREATION OPPORTUNITY, PLANS FOR RETURNING, AND SERVING INTERESTS, REPORTED AS PERCENT OF RESPONDENTS[1]: SHORELINE FISHING ACCESS (WESTERN SHORE BELOW RIO RESERVOIR)

Topic	Number of Responses	Respondents' Ratings				
		5 High Value	4	3 Some Value	2	1 No Value at All
Recreation Site as a Public Recreation Opportunity	6	67%	33%	0%	0%	0%
		Yes	**No**			
Would you return over the next year?	6	100%	0%			
		Yes	**No**			
Does this recreation site/facility serve your interests?	6	100%	0%			

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF NUMBER OF THE FACILITIES, PERCEIVED LEVEL OF USE, AND RECREATIONAL CONFLICTS, REPORTED AS PERCENT OF RESPONDENTS[1]: RIO CARRY-IN BOAT LAUNCH/SHORELINE FISHING ACCESS

Topic	Number of Responses	Respondents' Ratings				
		5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Number of Facilities	2	0%	0%	100%	0%	0%
Comments:	No comments received					
		5 Extremely Crowded	4	3 Somewhat Crowded	2	1 Not Crowded
Level of Use	2	0%	0%	0%	50%	50%
		5 Extreme Amount of Conflicts	4	3 Moderate Amount of Conflicts	2	1 No Conflicts
Recreational Conflicts	2	0%	0%	0%	0%	100%
Comments:	No comments received					
[1] Percentages shown may not sum to 100% due to rounding.						

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF RECREATION SITES, FACILITIES AND AMENITIES, REPORTED AS PERCENT OF RESPONDENTS[1]: RIO CARRY-IN BOAT LAUNCH/SHORELINE FISHING ACCESS

Site/Facility/Amenity	Number of Responses	5 Excellent	4	3 Fair	2	1 Poor
Parking	2	50%	50%	0%	0%	0%
Facility Condition	2	50%	0%	50%	0%	0%
Variety of Amenities	2	0%	0%	50%	50%	0%
Toilets/Restrooms	1	0%	0%	100%	0%	0%
River Access	1	100%	0%	0%	0%	0%
Reservoir Access	2	50%	0%	50%	0%	0%
Overall Quality	2	50%	50%	0%	0%	0%

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF SITE AS PUBLIC RECREATION OPPORTUNITY, PLANS FOR RETURNING, AND SERVING INTERESTS, REPORTED AS PERCENT OF RESPONDENTS[1]: RIO CARRY-IN BOAT LAUNCH/SHORELINE FISHING ACCESS

Topic	Number of Responses	Respondents' Ratings				
		5 High Value	4	3 Some Value	2	1 No Value at All
Recreation Site as a Public Recreation Opportunity	2	50%	50%	0%	0%	0%
		Yes	**No**			
Would you return over the next year?	2	100%	0%			
		Yes	**No**			
Does this recreation site/facility serve your interests?	2	100%	0%			

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY – EXCELLENCE IN HYDRO –

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF NUMBER OF THE FACILITIES, PERCEIVED LEVEL OF USE, AND RECREATIONAL CONFLICTS, REPORTED AS PERCENT OF RESPONDENTS[1]: RIO HAND BOAT LAUNCH/FISHING ACCESS/WHITEWATER

Topic	Number of Responses	5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Number of Facilities	3	33%	0%	33%	33%	0%
Comments:	Need more activities for kids (1 response)					
		5 Extremely Crowded	**4**	**3 Somewhat Crowded**	**2**	**1 Not Crowded**
Level of Use	3	0%	0%	33%	0%	67%
		5 Extreme Amount of Conflicts	**4**	**3 Moderate Amount of Conflicts**	**2**	**1 No Conflicts**
Recreational Conflicts	3	0%	0%	0%	0%	100%
Comments:	No comments received					
[1] Percentages shown may not sum to 100% due to rounding.						

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF RECREATION SITES, FACILITIES AND AMENITIES, REPORTED AS PERCENT OF RESPONDENTS[1]: RIO HAND BOAT LAUNCH/FISHING ACCESS/WHITEWATER

Site/Facility/Amenity	Number of Responses	5 Excellent	4	3 Fair	2	1 Poor
Parking	3	0%	100%	0%	0%	0%
Facility Condition	3	33%	33%	0%	33%	0%
Variety of Amenities	3	33%	67%	0%	0%	0%
Toilets/Restrooms	3	33%	67%	0%	0%	0%
River Access	3	67%	33%	0%	0%	0%
Reservoir Access	3	67%	33%	0%	0%	0%
Overall Quality	3	33%	67%	0%	0%	0%
[1] Percentages shown may not sum to 100% due to rounding.						

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF SITE AS PUBLIC RECREATION OPPORTUNITY, PLANS FOR RETURNING, AND SERVING INTERESTS, REPORTED AS PERCENT OF RESPONDENTS[1]: RIO HAND BOAT LAUNCH/FISHING ACCESS/WHITEWATER

Topic	Number of Responses	Respondents' Ratings				
		5 High Value	4	3 Some Value	2	1 No Value at All
Recreation Site as a Public Recreation Opportunity	3	67%	33%	0%	0%	0%
		Yes	No			
Would you return over the next year?	3	100%	0%			
		Yes	No			
Does this recreation site/facility serve your interests?	3	100%	0%			

[1] Percentages shown may not sum to 100% due to rounding.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: <u>Recreation Use and Needs Assessment</u>

Downstream of Rio Main Powerhouse

- Average age 41, 59% male
- Average group size 3.0 people with 1.2 vehicles
- 76% had previously visited the project (average number of visits being 13)
- Average distance travelled is 68 miles
- Most popular activities were tubing, fishing from shore, kayaking

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF WATER LEVELS THIS TRIP, REPORTED AS PERCENT OF RESPONDENTS: DOWNSTREAM OF RIO MAIN POWERHOUSE [1]

Water Level This Trip	Number of Responses	5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
NYSDEC Rt. 97 Delaware River Access	11	9%	9%	64%	18%	0%
Comments:	No comments received					
NYSDEC Rt. 97 Parking Area East of Bridge	3	0%	33%	33%	33%	0%
Comments:	Wants more consistency (rated as *Slightly Satisfied*)					
Project-wide	**14**	**29%**	**18%**	**45%**	**8%**	**0%**

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER PERCEPTIONS AND RATINGS OF RANGE OF WATER LEVELS OVER PAST 5 YEARS, REPORTED AS PERCENT OF RESPONDENTS[1]: DOWNSTREAM OF RIO MAIN POWERHOUSE

Perception of Range of Water Level Past 5 Years	Number of Responses	5 Very High	4 High	3 Normal	2 Low	1 Very Low
NYSDEC Rt. 97 Delaware River Access	11	0%	18%	73%	9%	0%
NYSDEC Rt. 97 Parking Area East of Bridge	3	67%	0%	33%	0%	0%
Project-wide	***14***	***14%***	***14%***	***64%***	***7%***	***0%***
Rating of Range of Water Level Past 5 Years	**Number of Responses**	**5 Extremely Satisfied**	**4 Moderately Satisfied**	**3 Satisfied**	**2 Slightly Satisfied**	**1 Not Satisfied at All**
NYSDEC Rt. 97 Delaware River Access	11	0%	0%	91%	9%	0%
Comments:	No comments received					
NYSDEC Rt. 97 Parking Area East of Bridge	3	0%	0%	33%	33%	33%
Comments:	No comments received					
Project-wide	***14***	***0%***	***0%***	***79%***	***14%***	***7%***

[1] Percentages shown may not sum to 100% due to rounding.

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

TABLE 5-138

RECREATIONAL USER RESPONSE TO WATER LEVELS AFFECTING USE, REPORTED AS PERCENT OF RESPONDENTS[1]: DOWNSTREAM OF RIO MAIN POWERHOUSE

Do water levels affect your use of the Reservoir?	Number of Responses	Yes	No	Comments	
NYSDEC Rt. 97 Delaware River Access	14	57%	43%	Higher is better for boating	2
				Leave if too fast	2
				Tubing	1
				Won't come if too high/low	1
NYSDEC Rt. 97 Parking Area East of Bridge	3	67%	33%	Affects amount of fishing if too low	1
Project-wide	***17***	***59%***	***41%***		

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF NUMBER OF THE FACILITIES, PERCEIVED LEVEL OF USE, AND RECREATIONAL CONFLICTS REPORTED AS PERCENT OF RESPONDENTS[1]: NYSDEC RT. 97 DELAWARE RIVER ACCESS

Topic	Number of Responses	Respondents' Ratings				
		5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Number of Facilities	14	0%	14%	64%	14%	7%
Comments:	Restroom needed Would like a campground Wants "more"	1 1 1				
		5 Extremely Crowded	4	3 Somewhat Crowded	2	1 Not Crowded
Level of Use	13	8%	46%	0%	0%	46%
		5 Extreme Amount of Conflicts	4	3 Moderate Amount of Conflicts	2	1 No Conflicts
Recreational Conflicts	14	0%	0%	0%	0%	100%
Comments:	No comments received					
[1] Percentages shown may not sum to 100% due to rounding.						

EAGLE CREEK RENEWABLE ENERGY – EXCELLENCE IN HYDRO –

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF RECREATION SITES, FACILITIES, AND AMENITIES, REPORTED AS PERCENT OF RESPONDENTS[1]: NYSDEC RT. 97 DELAWARE RIVER ACCESS

Site/Facility/Amenity	Number of Responses	5 Excellent	4	3 Fair	2	1 Poor
Parking	14	43%	14%	29%	7%	7%
Facility Condition	14	36%	36%	29%	0%	0%
Variety of Amenities	14	29%	36%	14%	0%	21%
Toilets/Restrooms	12	42%	25%	17%	0%	17%
River Access	11	18%	64%	0%	18%	0%
Reservoir Access	10	20%	70%	0%	10%	0%
Overall Quality	14	29%	64%	7%	0%	0%

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF SITE AS PUBLIC RECREATION OPPORTUNITY, PLANS FOR RETURNING, AND SERVING INTERESTS, REPORTED AS PERCENT OF RESPONDENTS[1]: NYSDEC RT. 97 DELAWARE RIVER ACCESS

Topic	Number of Responses	Respondents' Ratings				
		5 High Value	4	3 Some Value	2	1 No Value at All
Recreation Site as a Public Recreation Opportunity	14	43%	50%	7%	0%	0%
		Yes	No			
Would you return over the next year?	14	100%	0%			
		Yes	No			
Does this recreation site/facility serve your interests?	14	100%	0%			

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF NUMBER OF THE FACILITIES, PERCEIVED LEVEL OF USE, AND RECREATIONAL CONFLICTS REPORTED AS PERCENT OF RESPONDENTS[1]: NYSDEC RT. 97 PARKING AREA EAST OF BRIDGE

Topic	Number of Responses	Respondents' Ratings				
		5 Extremely Satisfied	4 Moderately Satisfied	3 Satisfied	2 Slightly Satisfied	1 Not Satisfied at All
Number of Facilities	3	33%	33%	33%	0%	0%
Comments:	No comments received					
		5 Extremely Crowded	**4**	**3 Somewhat Crowded**	**2**	**1 Not Crowded**
Level of Use	3	0%	0%	33%	33%	33%
		5 Extreme Amount of Conflicts	**4**	**3 Moderate Amount of Conflicts**	**2**	**1 No Conflicts**
Recreational Conflicts	3	0%	0%	0%	0%	100%
Comments:	No comments received					
[1] Percentages shown may not sum to 100% due to rounding.						

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

RECREATIONAL USER RATINGS OF RECREATION SITES, FACILITIES AND AMENITIES, REPORTED AS PERCENT OF RESPONDENTS[1]: NYSDEC RT. 97 PARKING AREA EAST OF BRIDGE

Site/Facility/Amenity	Number of Responses	5 Excellent	4	3 Fair	2	1 Poor
Parking	3	67%	33%	0%	0%	0%
Facility Condition	3	67%	33%	0%	0%	0%
Variety of Amenities	3	67%	0%	33%	0%	0%
Toilets/Restrooms	2	0%	50%	0%	50%	0%
River Access	3	67%	33%	0%	0%	0%
Reservoir Access	2	50%	50%	0%	0%	0%
Overall Quality	3	67%	33%	0%	0%	0%
[1] Percentages shown may not sum to 100% due to rounding.						

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results: Recreation Use and Needs Assessment

TABLE 5-153
RECREATIONAL USER RATINGS OF SITE AS PUBLIC RECREATION OPPORTUNITY, PLANS FOR RETURNING, AND SERVING INTERESTS, REPORTED AS PERCENT OF RESPONDENTS[1]: NYSDEC RT. 97 PARKING AREA EAST OF BRIDGE

Topic	Number of Responses	Respondents' Ratings				
		5 High Value	4	3 Some Value	2	1 No Value at All
Recreation Site as a Public Recreation Opportunity	3	67%	33%	0%	0%	0%
		Yes	**No**			
Would you return over the next year?	2	100%	0%			
		Yes	**No**			
Does this recreation site/facility serve your interests?	2	100%	0%			

[1] Percentages shown may not sum to 100% due to rounding.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

<u>Future Recreation Demand</u>

- Future recreation demand at the Projects under current Project operations was estimated based on expected population growth in the region and expected changes in recreation participation.
- Results of the user surveys suggest that most recreationists utilizing the Projects' recreation sites are local residents, or residents of the Project region, residing within 30 miles.
- The local area growth rate is projected to be 1.3%, which was then applied to the activity-specific growth rates on the next slide.

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Future Recreation Demand

DERIVATION OF PERCENT CHANGE IN RECREATION DAYS THROUGH 2060, LOCAL PROJECT AREA

Activity	Percent Change, Per Capita Rate	Percent Change, Per Capita Days	Percent Change Population (2018 to 2060) *Constant for All Activities*	Projected Change in Recreation Days
Motor Boating	112.4%	3.7%	1.3%	18.0%
Non-motor Boat	101.0%	0.0%	1.3%	2.2%
Fishing	97.6%	-4.4%	1.3%	-5.5%
Ice Fishing	97.6%	-4.4%	1.3%	-5.5%
Picnicking	102.1%	-1.2%	1.3%	2.1%
Swimming	108.8%	3.7%	1.3%	14.2%
Walk/Hike/Jog	107.7%	4.6%	1.3%	14.0%
Birding	105.8%	-3.2%	1.3%	3.8%
Snowmobiling	89.8%	-2.3%	1.3%	-11.2%
Sightseeing	100.5%	-9.2%	01.3%	-7.6%
Sources: See Table 5-158 and Table 5-159.				

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Results

Future Recreation Demand

ESTIMATED AND PROJECTED USE AT THE SWINGING BRIDGE, MONGAUP FALLS, AND RIO PROJECT RECREATION SITES AND SITES DOWNSTREAM OF THE RIO MAIN POWERHOUSE; ANNUAL TOTAL USE FOR 2018 AND 2060

Recreation Site	2018 Annual Use	2060 Projected Use	Percent Change
Swinging Bridge Project			
Swinging Bridge North Public Access	477	441	-7.6%
Swinging Bridge Reservoir Trail (Swinging Bridge Peninsula Trail)	89	93	4.6%
Swinging Bridge East Access	10,406	10,871	4.5%
Toronto Moscoe Road Public Access	5,613	5,919	5.5%
Toronto East Public Access	3,786	4,074	7.6%
Cliff Lake	692	662	-4.4%
Total, Swinging Bridge Project	*21,063*	*22,060*	*4.7%*
Mongaup Falls Project			
County Route 43/Forestburgh Rd Boat Launch	3,152	3,126	-0.8%
Mongaup Eagle Viewing Station	3,615	3,735	3.3%
Black Brook and Mongaup River Public Access Area	No Use Observed	N/A	N/A
Mongaup River Access Area	1,232	1,270	3.1%
Total, Mongaup Falls Project	*7,999*	8,130	1.6%
Rio Project			
Rio Eagle Viewing Station	236	241	2.2%
Rio Boat Launch	6,042	6,126	1.4%
Shoreline Fishing Access (Western Shore Below Rio Reservoir)	455	438	-3.7%
Rio Carry-in Boat Launch/Shoreline Fishing Access	1,122	1,094	-2.5%
Rio Hand Boat Launch/Fishing Access/Whitewater	1,675	1,677	0.1%
Total, Rio Project	*9,529*	*9,576*	*0.5%*
Total, Mongaup River Projects			
All Recreation Sites	*38,591*	*39,766*	*3.0%*
Downstream of Rio Main Powerhouse			
Mongaup River Access Rt. 31	349	348	-0.3%
NYSDEC Rt. 97 Delaware River Access	13,360	13,872	3.8%
NYSDEC Rt. 97 Parking Area East of Bridge	2,332	2,467	5.8%
Total, Downstream of Rio Main Powerhouse	*16,041*	*16,687*	*4.0%*

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Future Recreation Demand

PROJECTED RECREATION USE BY ACTIVITY TYPE AT SWINGING BRIDGE PROJECT, 2060

Recreation Activity	2060 Projected Use (Recreation Days)	Percent (%) of Recreation Use
Motor boating	5,464	25%
Fishing	4,541	21%
Swimming	2,615	12%
Non motor boating	2,574	12%
Other Recreation Use	2,208	10%
Sightseeing	1,301	6%
Ice Fishing	1,211	5%
Picnicking	1,163	5%
Walking/Hiking/Jogging	886	4%
Snowmobiling	97	0%
Birding	0	0%
Project Total	**22,060**	

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Future Recreation Demand

PROJECTED RECREATION USE BY ACTIVITY TYPE AT MONGAUP PROJECT, 2060

Recreation Activity	2060 Projected Use (Recreation Days)	Percent (%) of Recreation Use
Birding	4,274	53%
Non motor boating	2,286	28%
Sightseeing	1,031	13%
Fishing	290	4%
Walking/Hiking/Jogging	236	3%
Snowmobiling	13	0%
Motor boating	0	0%
Ice Fishing	0	0%
Picnicking	0	0%
Swimming	0	0%
Other Recreation Use	0	0%
Project Total	8,130	

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Future Recreation Demand

PROJECTED RECREATION USE BY ACTIVITY TYPE AT RIO PROJECT, 2060

Recreation Activity	2060 Projected Use (Recreation Days)	Percent (%) of Recreation Use
Non motor boating	3,585	37%
Fishing	3,544	37%
Motor boating	837	9%
Sightseeing	456	5%
Birding	435	5%
Walking/Hiking/Jogging	401	4%
Other Recreation Use	198	2%
Swimming	119	1%
Ice Fishing	0	0%
Picnicking	0	0%
Snowmobiling	0	0%
Project Total	9,576	

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Future Recreation Demand

PROJECTED RECREATION USE BY ACTIVITY TYPE AT SITES DOWNSTREAM OF THE RIO MAIN POWERHOUSE, 2060

Recreation Activity	2060 Projected Use (Recreation Days)	Percent (%) of Recreation Use
Non motor boating	12,544	75%
Walking/Hiking/Jogging	3,262	20%
Fishing	460	3%
Other Recreation Use	259	2%
Sightseeing	163	1%
Motor boating	-	0%
Ice Fishing	-	0%
Picnicking	-	0%
Swimming	-	0%
Birding	-	0%
Snowmobiling	-	0%
Total	**16,687**	

Recreation Facility Inventory, Recreation Use and Needs Assessment, and Reservoir Surface Area

Results

Quantification of the Relationship between Reservoir Surface Area and Reservoir Levels

- Area storage curves and tables showing the relationship between reservoir levels and surface area are provided in Attachment 7 of the report.
- Maps developed from the bathymetric data collected in 2018 show this relationship visually and in relationship to the reservoir shorelines (Attachment 8).

Whitewater Flow Assessment Study

Whitewater Flow Assessment Study

Goals and Objectives: Evaluate whitewater boating opportunities at the Rio Project.

Objectives

- Conduct a Level 2 single-flow assessment to evaluate the effects of a 250 cfs release (total flow that can be provided from the minimum flow powerhouse and minimum flow discharge valve) in the bypassed reach and on the existing whitewater boating releases in the lower Mongaup reach.

Goals

- Determine:

(1) the feasibility and quality of boating in the bypassed reach with a 250 cfs release;
(2) the effect of a 250 cfs release on the lower Mongaup reach under each flow release scenario, and;
(3) the potential minimum and optimal boating flows in the bypassed reach.

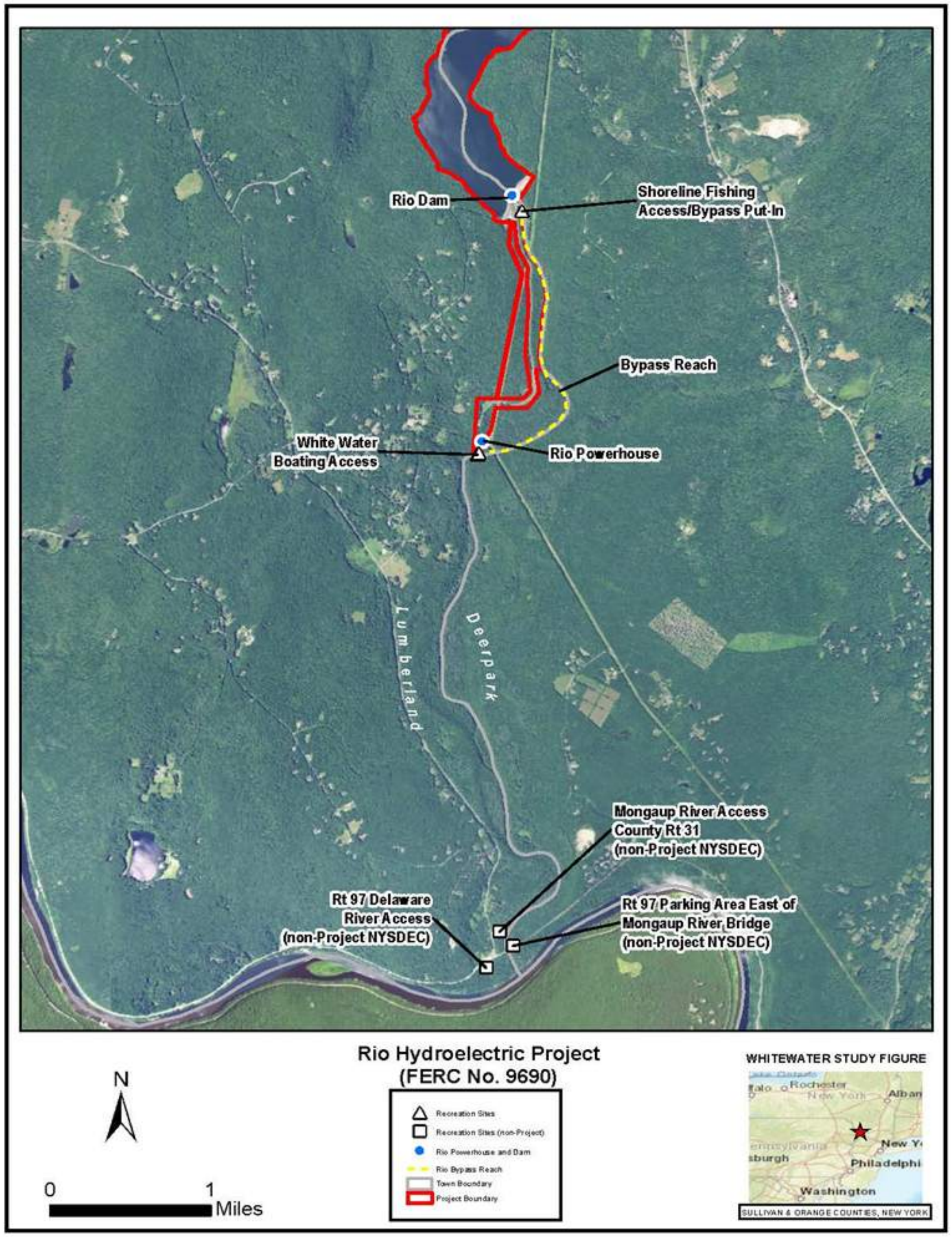
- An additional goal of the study was to identify operational constraints and potential effects each flow release scenario may have on other resources.

Whitewater Flow Assessment Study

Study Area

The study area included two reaches:

- 1.5-mile-long bypassed reach from Rio Dam to the Rio Main Powerhouse; and
- 3-mile river reach from the Rio Main Powerhouse to the Delaware River.



Whitewater Flow Assessment Study

Methodology

<u>Boating Feasibility Assessment</u>

- Evaluate the safety of the Rio Project's bypassed reach at a flow of 250 cfs and the potential hazards.
- Determine if (a) if the 250 cfs flow is boatable, and (b) if safe boating conditions exist.

<u>On-Water Boating Assessment</u>

- Evaluate the effects of a 250 cfs in the bypassed reach and on the existing whitewater boating releases in the lower Mongaup reach:
  - Boaters evaluated a target flow of 250 cfs in the bypassed reach and;
  - A target flow of 250 cfs and a one-unit release from the Rio Main Powerhouse in the lower Mongaup reach
- Prior to conducting the on-water assessment, participants completed a Pre-Run Survey.
- After each of the boating runs, participants completed a Post-Run Survey.

Whitewater Flow Assessment Study

Results

Boating Feasibility Assessment

- Eagle Creek collected video of the bypassed reach via an unmanned aerial drone during minimum flow conditions (i.e., 100 cfs). Eagle Creek reviewed the video with the boating groups prior to the on-water boating assessment.
- Per review of the video, the boating groups indicated that the reach appeared safe and largely passable for boating. The video also showed that there were a number of downed trees in and across the bypassed reach, some of which would require portage.

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Whitewater Flow Assessment Study

Results

<u>Pre-Run Surveys (n = 28)</u>

- Boaters ranged in age from 15 to 72 with a mean age of 51.
- Based on their home zip code, boaters traveled an average of 63 miles to participate in the whitewater flow assessment. The travel distance had a median of 56 miles and ranged from 15 to 185 miles.

Pre-Run Survey Question 1. How would you describe yourself as a boater (what type of boater are you)?

Type of Boater	Number of Responses
Class II-III	1
Class III	5
Class III-IV	3
Class IV	1
Class IV-V	2
Other	15*

*Not all participants responded to the question

- Additional responses to this question included boaters looking for steep creeks, big water, ledges, and drops, as well as one boater that identified as conservative and one that only boated occasionally.

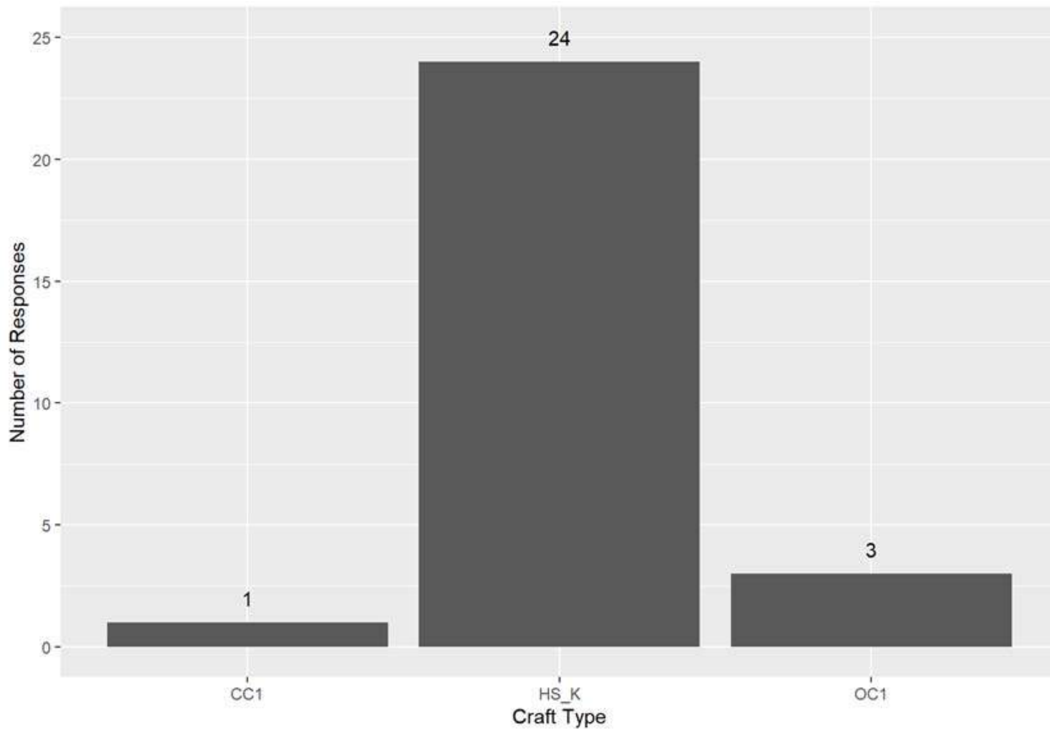
EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Whitewater Flow Assessment Study

Results

Pre-Run Surveys (n = 28)

Pre-Run Survey Question 2. What type of watercraft do you generally use?



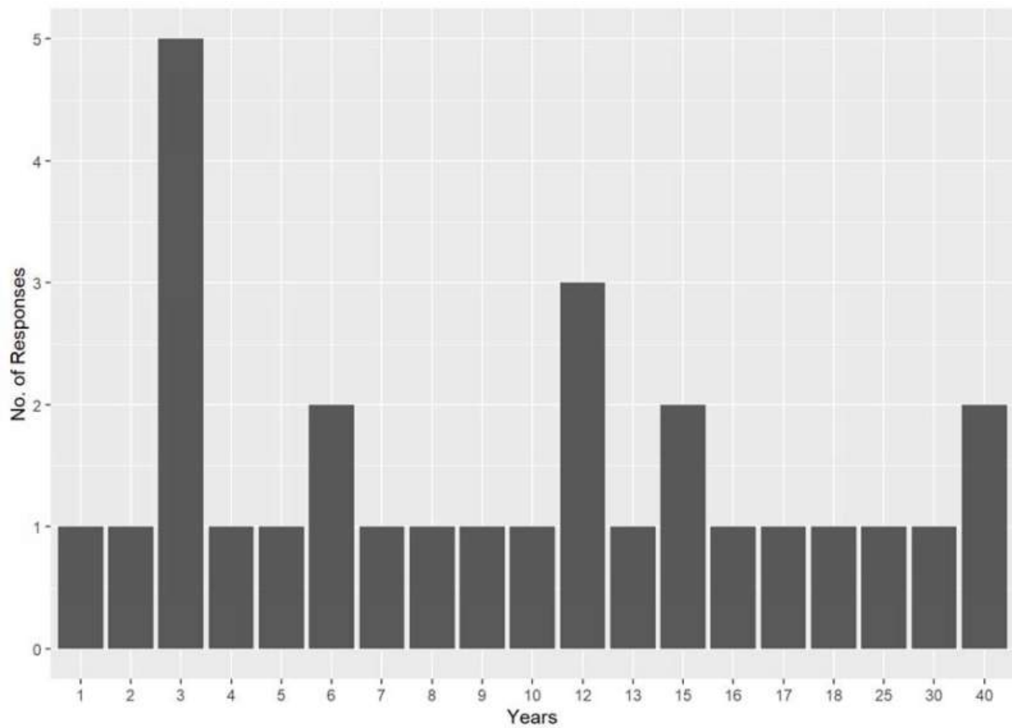
- CC1 = one-person closed canoe; HS_K = hard shell kayak; OC1 = one-person open canoe

Whitewater Flow Assessment Study

Results

Pre-Run Surveys (n = 28)

Pre-Run Survey Question 3. How many years have you been using this type of watercraft?



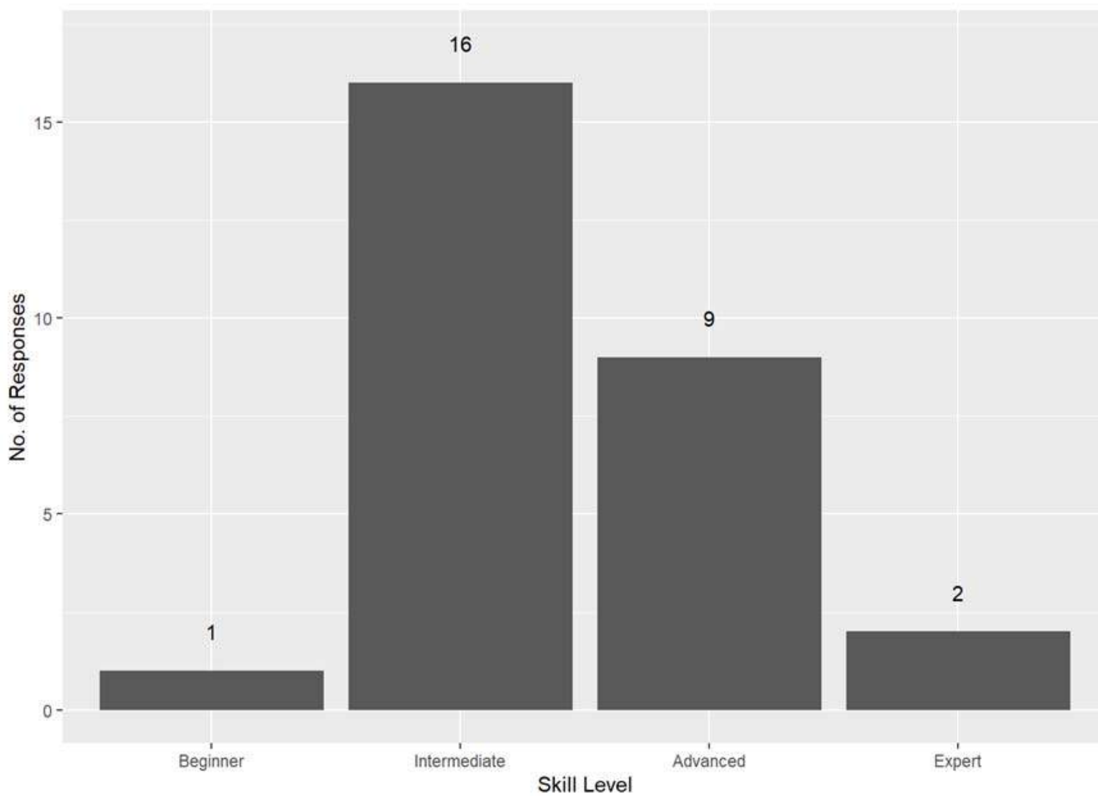
- Boaters responded to have been using their designated type of watercraft between 1 and 40 years, with a mean of 12 years.

Whitewater Flow Assessment Study

Results

Pre-Run Surveys (n = 28)

Pre-Run Survey Question 4. How would you rate your skill level with the type of watercraft you generally use?

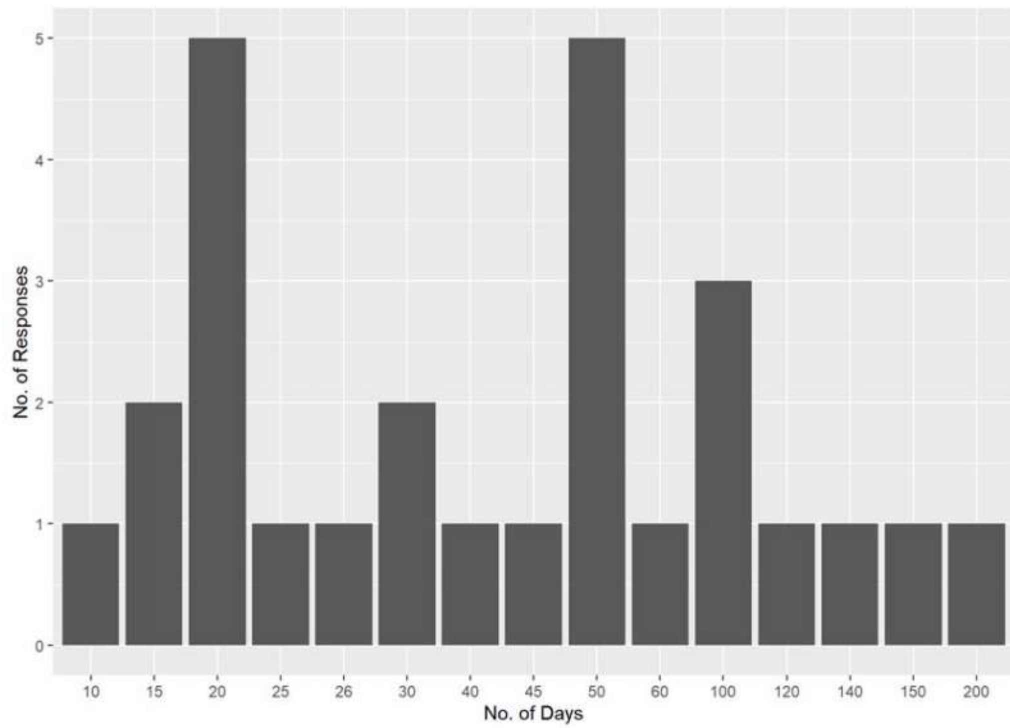


Whitewater Flow Assessment Study

Results

Pre-Run Surveys (n = 28)

Pre-Run Survey Question 5. In general, how many days per year do you spend boating?



- Boaters responded to spend a range from 10 to 200 days boating each year, with a mean number of 58 days spent per year boating.

Whitewater Flow Assessment Study

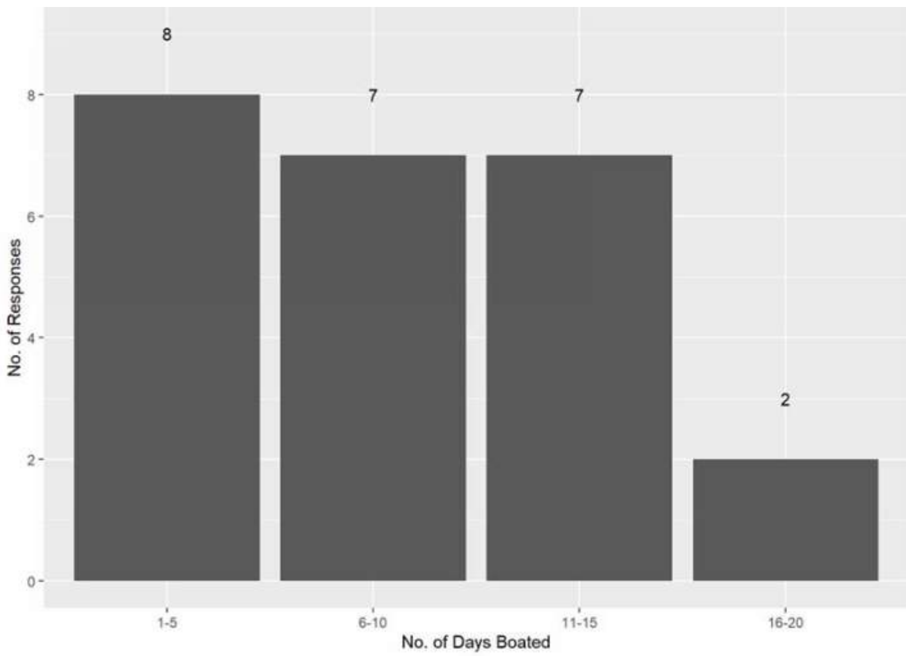
Results

Pre-Run Surveys (n = 28)

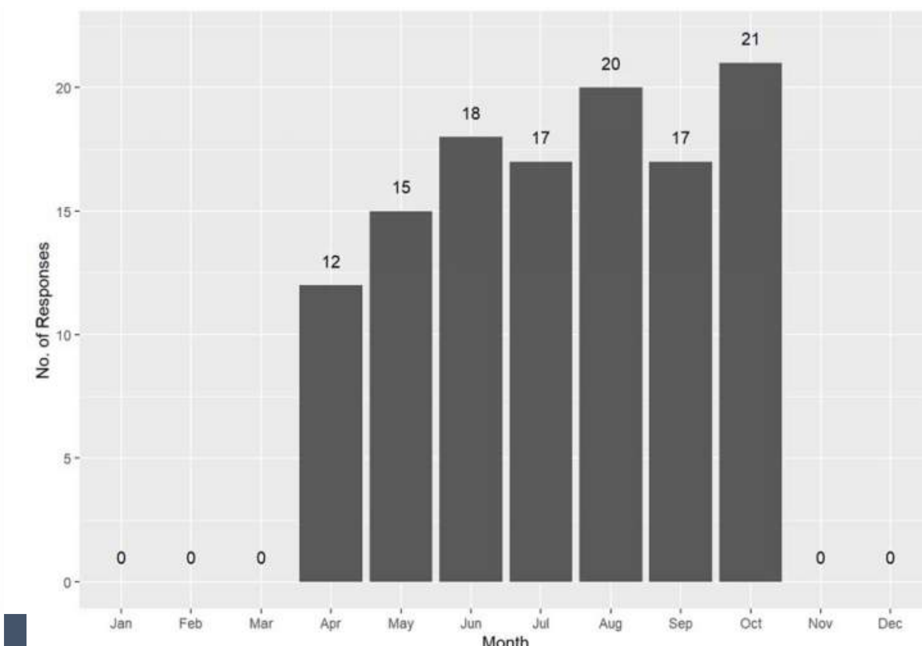
Pre-Run Survey Question 6. Have you boated the Mongaup River downstream from the Rio Dam before?

- All 28 boaters responded that they have previously boated the lower Mongaup River, while 6 boaters responded that they have also previously boated the Rio bypassed reach.

Number of days in the last 12 months the lower Mongaup River was boated



Months that the lower Mongaup River was boated in the past 12 months

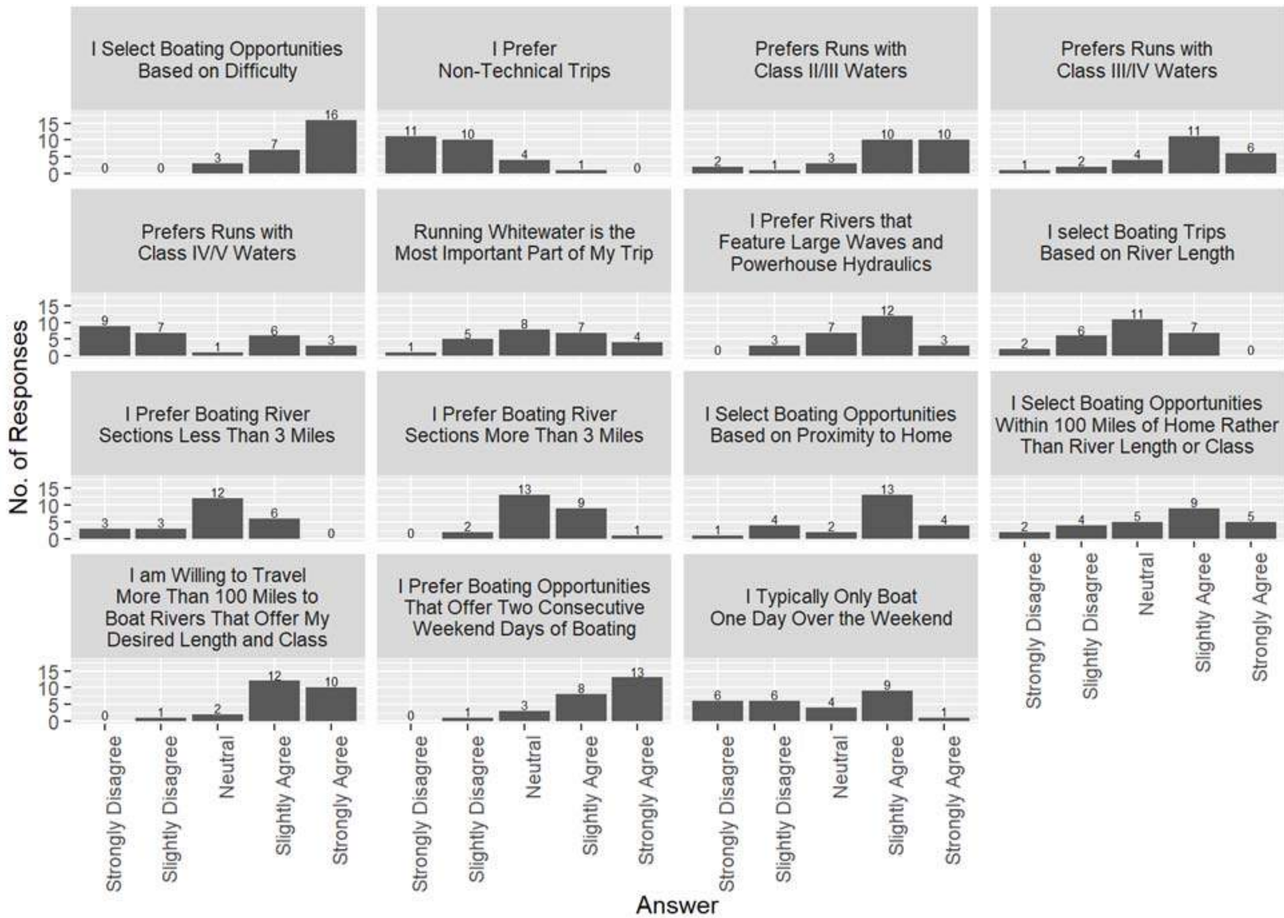


Whitewater Flow Assessment Study

Results

Pre-Run Surveys (n = 28)

Pre-Run Survey Question 7. Please respond to each of the following statements about your river-running preferences.



Whitewater Flow Assessment Study

Results

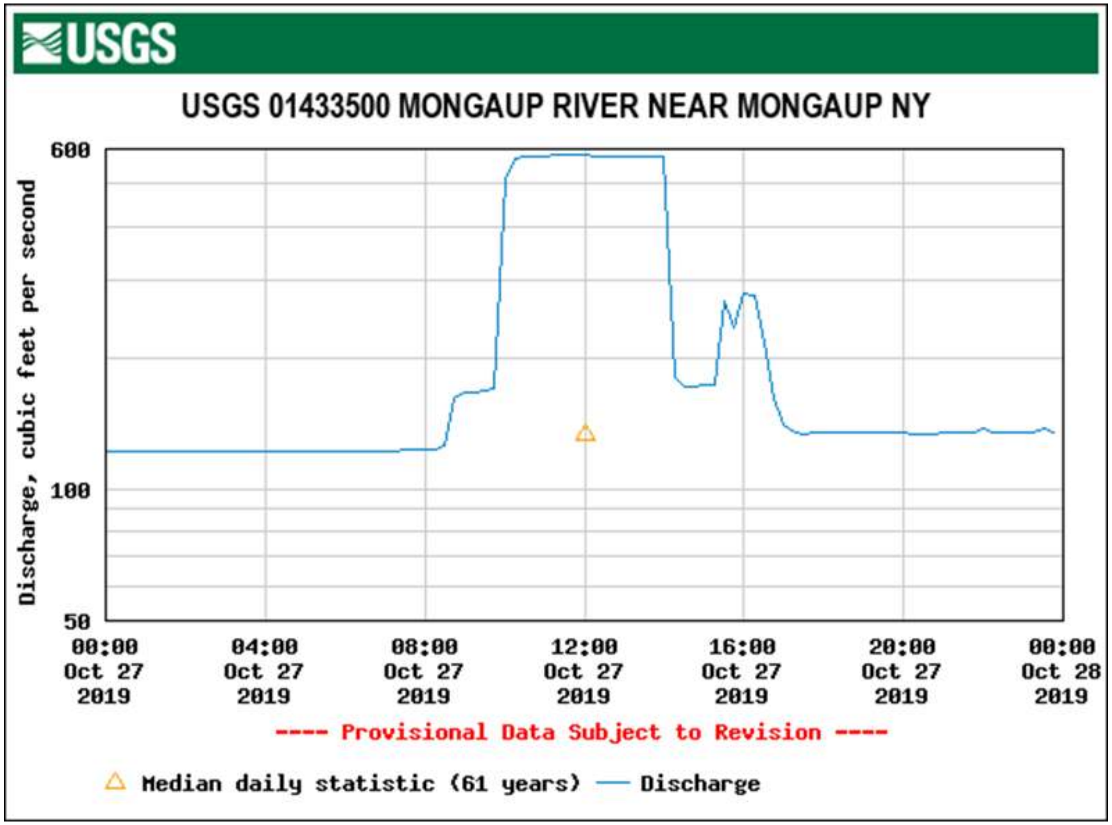
<u>Post-Run Surveys: Bypassed Reach (n = 23)</u>

- At approximately 10:00, boaters put-in below the Rio Minimum Flow Powerhouse to boat the bypassed reach.
- Boaters exited the bypassed reach between approximately 11:30 and 12:00 at the Rio Main Powerhouse.
- While the target flow for running the bypassed reach was 250 cfs, the actual flow was approximately 170 cfs as measured at the USGS Gage 01433500 located in the Mongaup River downstream of the Rio Main Powerhouse.
  - There was an issue with the opposing air pressures needed to fully open the discharge valve and, therefore, the valve did not fully open at approximately 09:00 resulting in a lower flow in the bypassed reach than targeted for the study.

Whitewater Flow Assessment Study

Results

<u>Post-Run Surveys: Bypassed Reach (n = 23)</u>



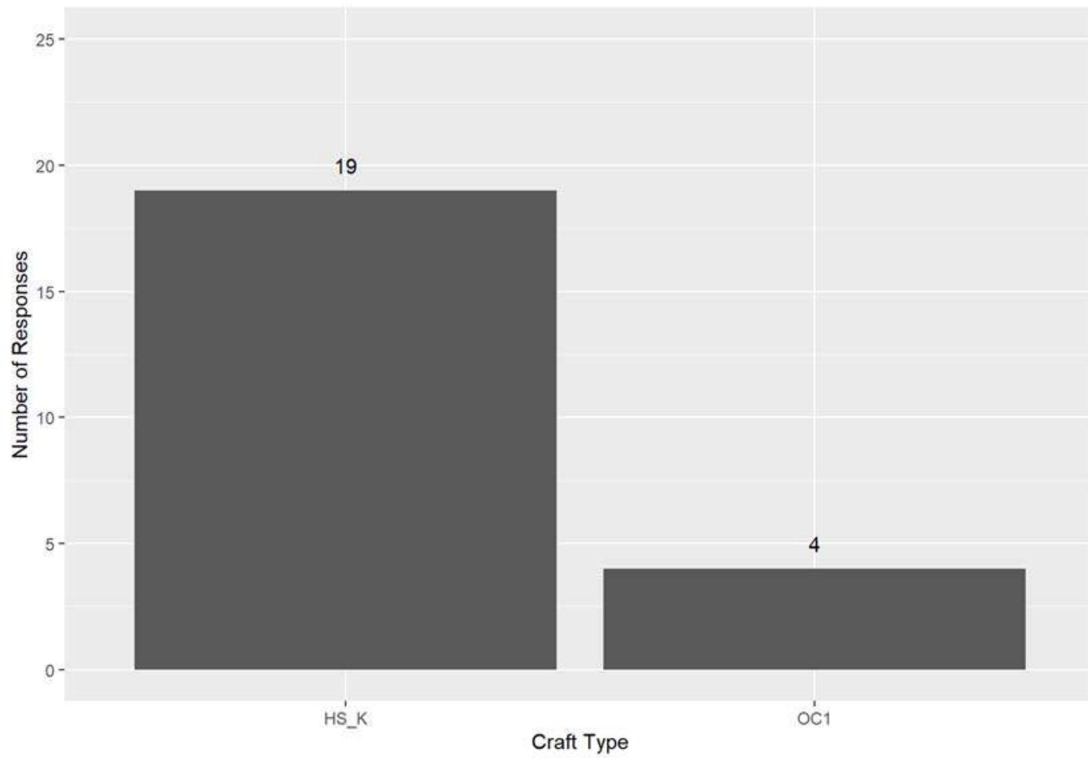
Time	Flow (cfs)
08:00 EST	123
08:15 EST	123
08:30 EST	125
08:45 EST	162
09:00 EST	166
09:15 EST	166
09:30 EST	168
09:45 EST	169
10:00 EST[1]	511
10:15 EST	573
10:30 EST	577
10:45 EST	577
11:00 EST	577
11:15 EST	585
11:30 EST	585
11:45 EST	581
12:00 EST	581
12:15 EST	577
12:30 EST	577
12:45 EST	577
13:00 EST	577
13:15 EST	577
13:30 EST	577
13:45 EST	577
14:00 EST[1]	577
14:15 EST	180
14:30 EST	171
14:45 EST	171
15:00 EST	173

Whitewater Flow Assessment Study

Results

Post-Run Surveys: Bypassed Reach (n = 23)

Post-Run Survey Question 2. What type of craft did you use for this run?



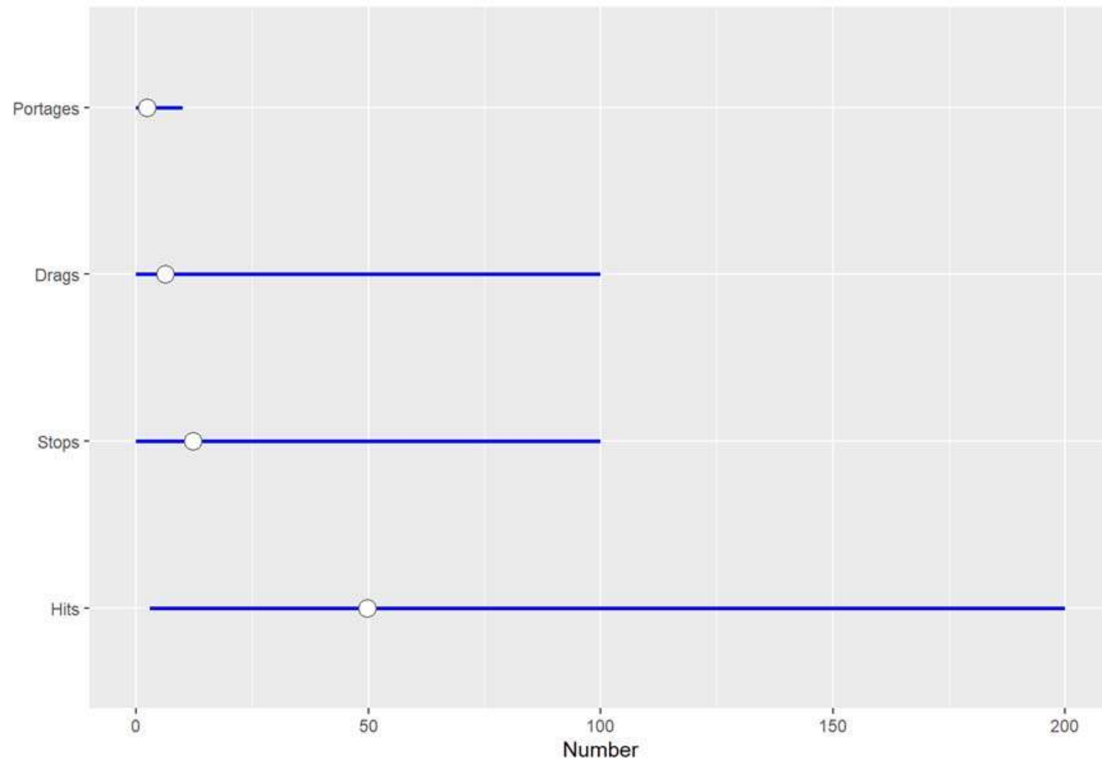
- HS_K = hard shell kayak; OC1 = one-person open canoe

Whitewater Flow Assessment Study

Results

Post-Run Surveys: Bypassed Reach (n = 23)

Post-Run Survey Question 4. Please estimate the number of unintended hits, stops, boat drags, and portages you had on this run.



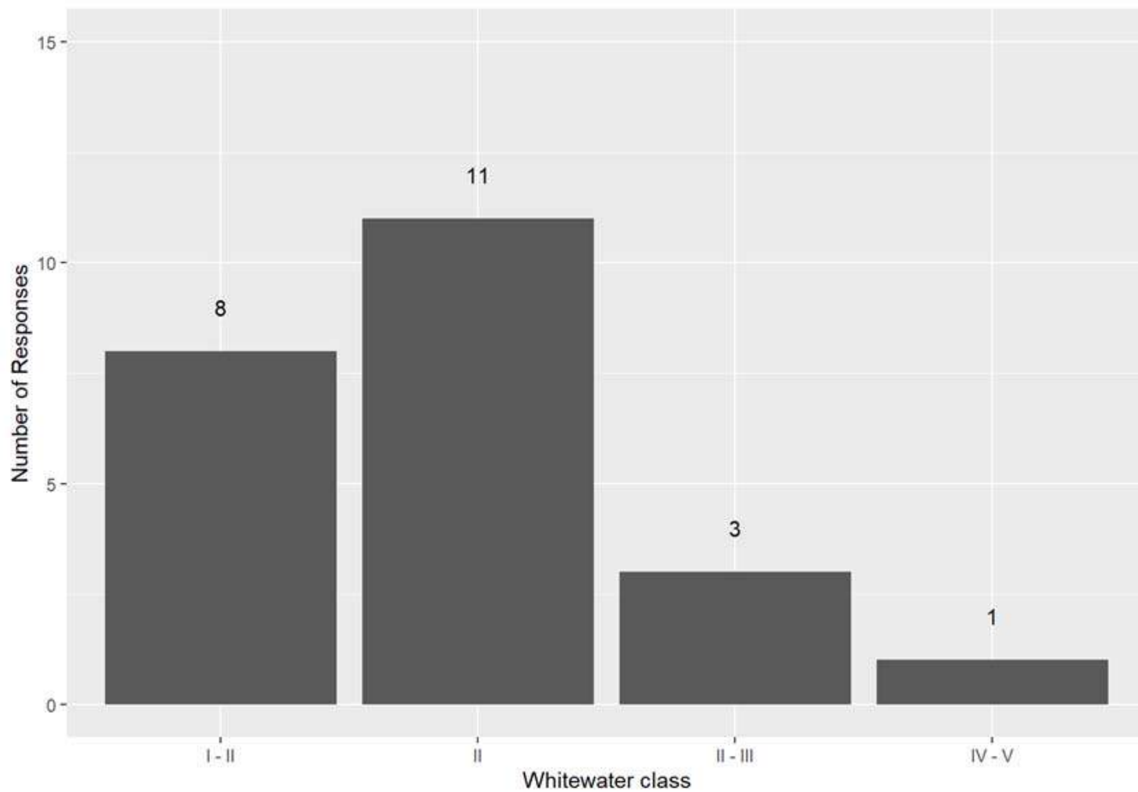
- Dot represents mean and line represents range

Whitewater Flow Assessment Study

Results

<u>Post-Run Surveys: Bypassed Reach (n = 23)</u>

Post-Run Survey Question 5. If you feel qualified to evaluate the whitewater class difficulty of the run at this flow, please indicate the general range (e.g., Class II – III).

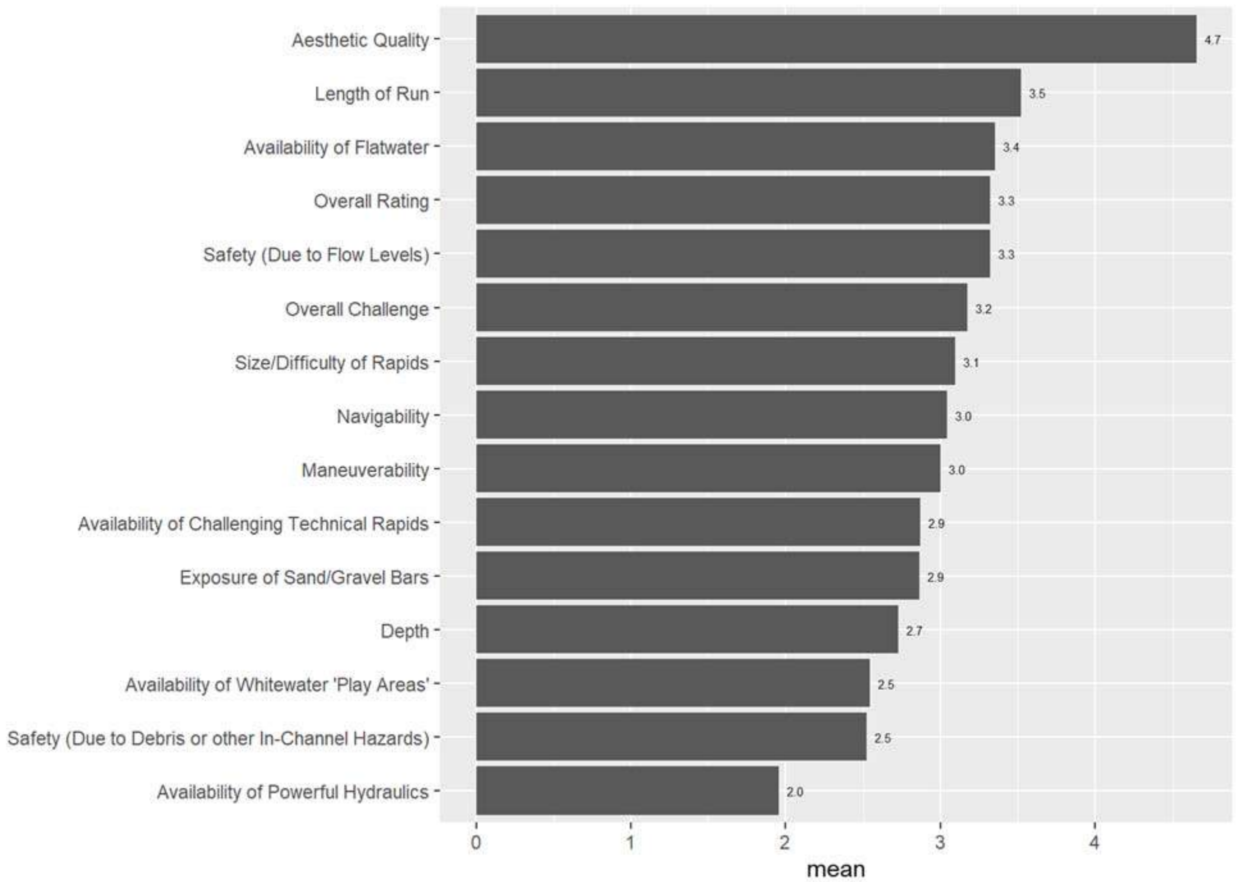


Whitewater Flow Assessment Study

Results

<u>Post-Run Surveys: Bypassed Reach (n = 23)</u>

Post-Run Survey Question 6. Please evaluate the flow on this trip for your craft and skill level for each of the following characteristics.

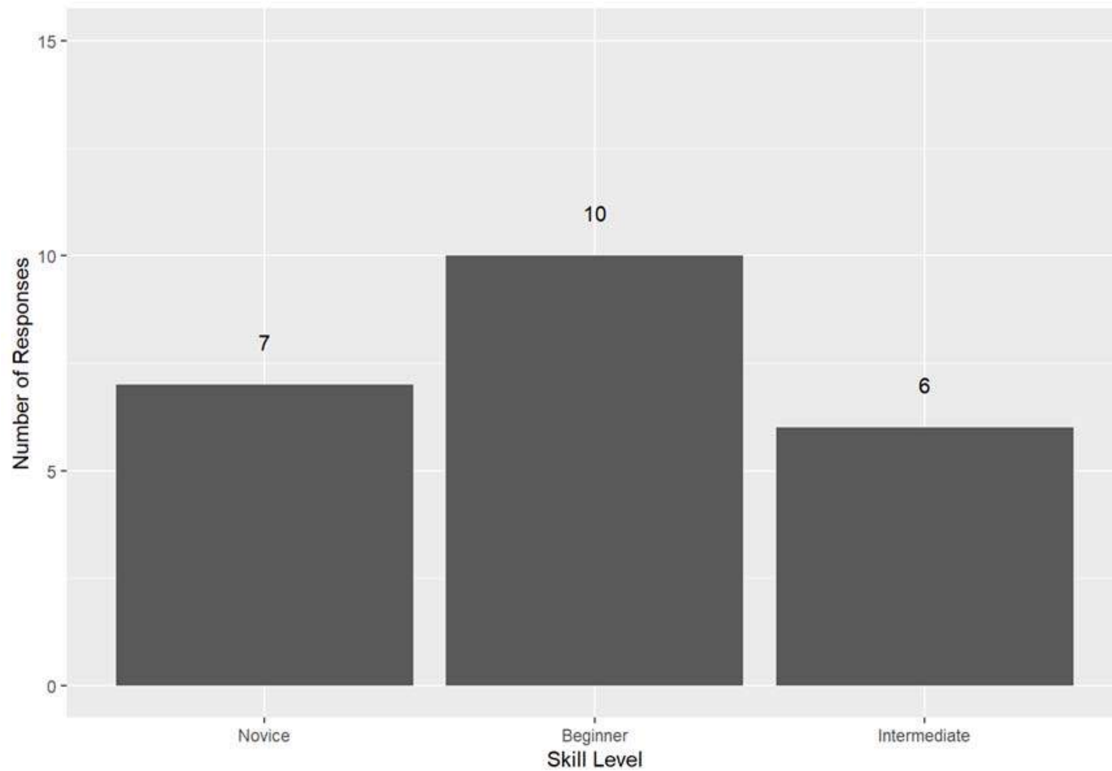


Whitewater Flow Assessment Study

Results

Post-Run Surveys: Bypassed Reach (n = 23)

Post-Run Survey Question 7. What is the minimal skill level necessary to successfully run this reach at this flow level?



EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Whitewater Flow Assessment Study

Results

<u>Post-Run Surveys: Bypassed Reach (n = 23)</u>

Post-Run Survey Question 8. What features or characteristics of this reach, at this flow, contributed to your overall rating in Question 6? Please describe the features/characteristics and their locations (if applicable).

- Low flow, not enough water
- Lots of wood and downed trees
- Scraped or scratched bottom
- Potential beginner or training run
- Too many exposed rocks
- Too many strainers and portages
- Would be a great run with more water and less trees and wood
- Interesting paths
- Fun technical run with eddies

Many boaters responded that the flow and water level was too low for this run, which exposed too many rocks and caused quite a bit of scratching and scraping on the bottom of their watercraft. Multiple boaters also indicated downed trees affected their experience on this run, but with more flow, it has the potential to be a good beginner or training run.

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Whitewater Flow Assessment Study

Results

Post-Run Surveys: Bypassed Reach (n = 23)

Post-Run Survey Question 9. List the primary advantages of this flow.

- Good class II run
- Not punchy
- Extends total run from 3 to 4.5 miles
- Beautiful scenery

Multiple boaters appreciated the scenery of the bypassed reach and that it extended the total run on the Mongaup River. They also stated that it was a good warm up or practice for the more difficult lower Mongaup River.

Whitewater Flow Assessment Study

Results

Post-Run Surveys: Bypassed Reach (n = 23)

Post-Run Survey Question 10. List the primary disadvantages of this flow.

- Flow and water level was too low
- Scratched and scraped a lot or got stuck
- Too many strainers
- Lots of wood and downed trees
- Too many exposed rocks

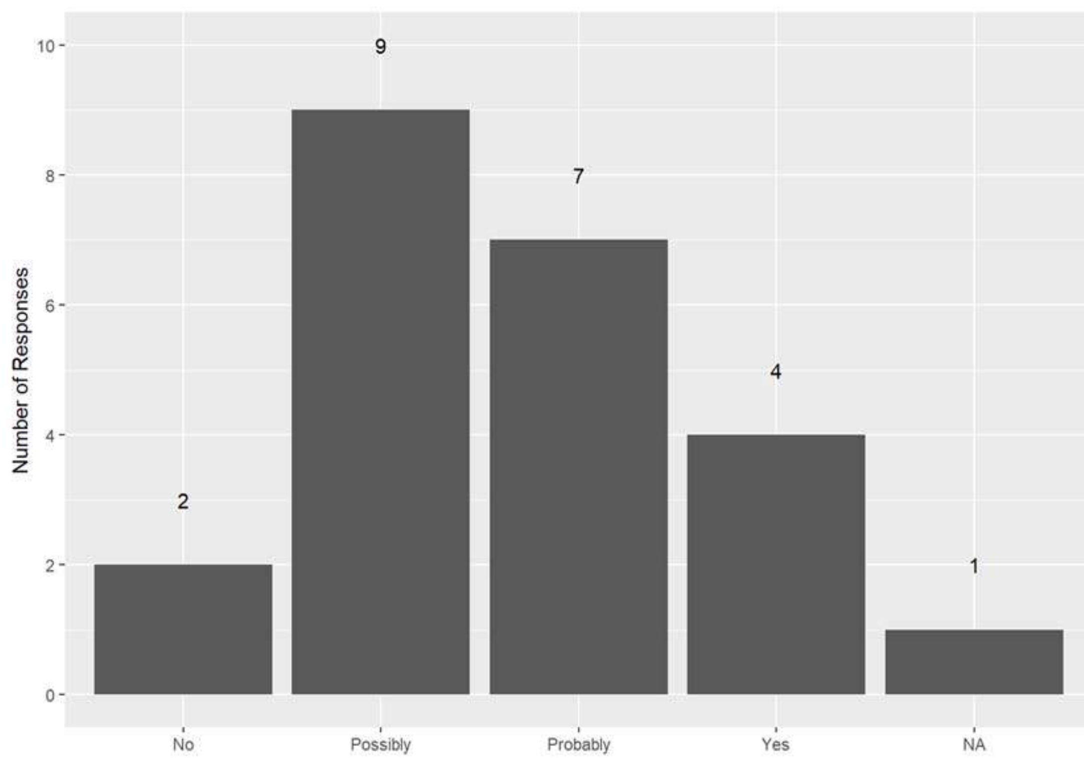
A majority of boaters said the main disadvantage of this flow was that it was too low, causing them to scrape or scratch the bottom on exposed rock.

Whitewater Flow Assessment Study

Results

Post-Run Surveys: Bypassed Reach (n = 23)

Post-Run Survey Question 11. Are you likely to return for future boat trips if this flow were to be provided or available?

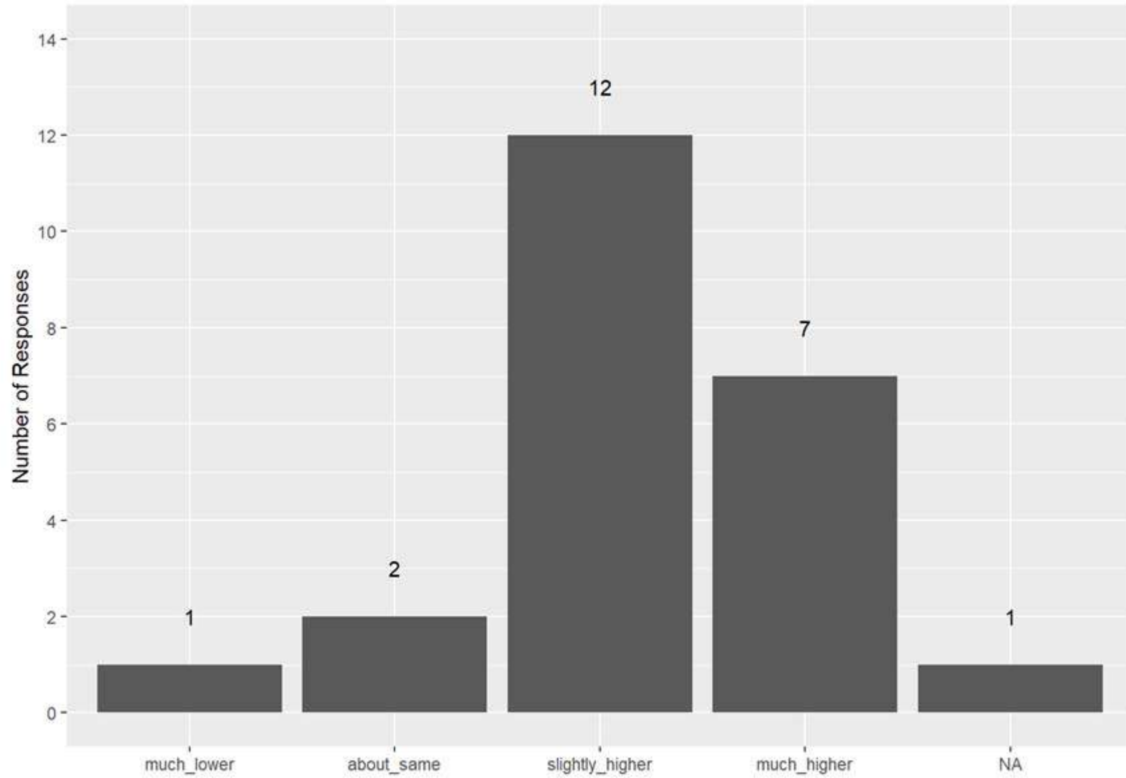


Whitewater Flow Assessment Study

Results

Post-Run Surveys: Bypassed Reach (n = 23)

Post-Run Survey Question 12. In general, would you consider the minimum acceptable flow (enough flow for an enjoyable recreation experience) to be higher, lower, or about the same as this flow for the features you like?



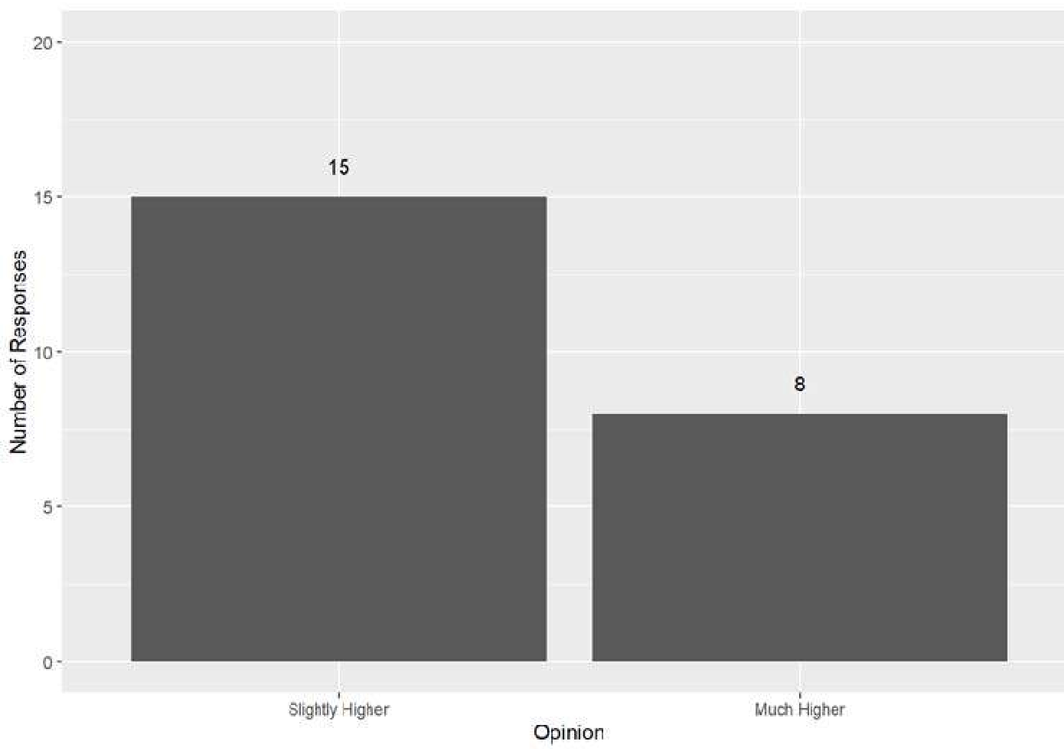
EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Whitewater Flow Assessment Study

Results

Post-Run Surveys: Bypassed Reach (n = 23)

Post-Run Survey Question 13. Was this flow optimal, or would you prefer a flow that was higher or lower than this flow?



Whitewater Flow Assessment Study

Results

Post-Run Surveys: Bypassed Reach (n = 23)

Post-Run Survey Question 14. Did you observe or experience any significant safety issues on your run (e.g., swims, pins, wrapped boats, constructed or natural river features, etc.)? If so, please explain and describe the approximate location.

- Downed trees
- Pins and strainers
- Put-in too steep, needs stairs
- Congested river, could be risky if boaters do not spread out

Nearly half of the participants said they did not observe any safety concerns.

Whitewater Flow Assessment Study

Results

Post-Run Surveys: Lower Mongaup River (n = 30)

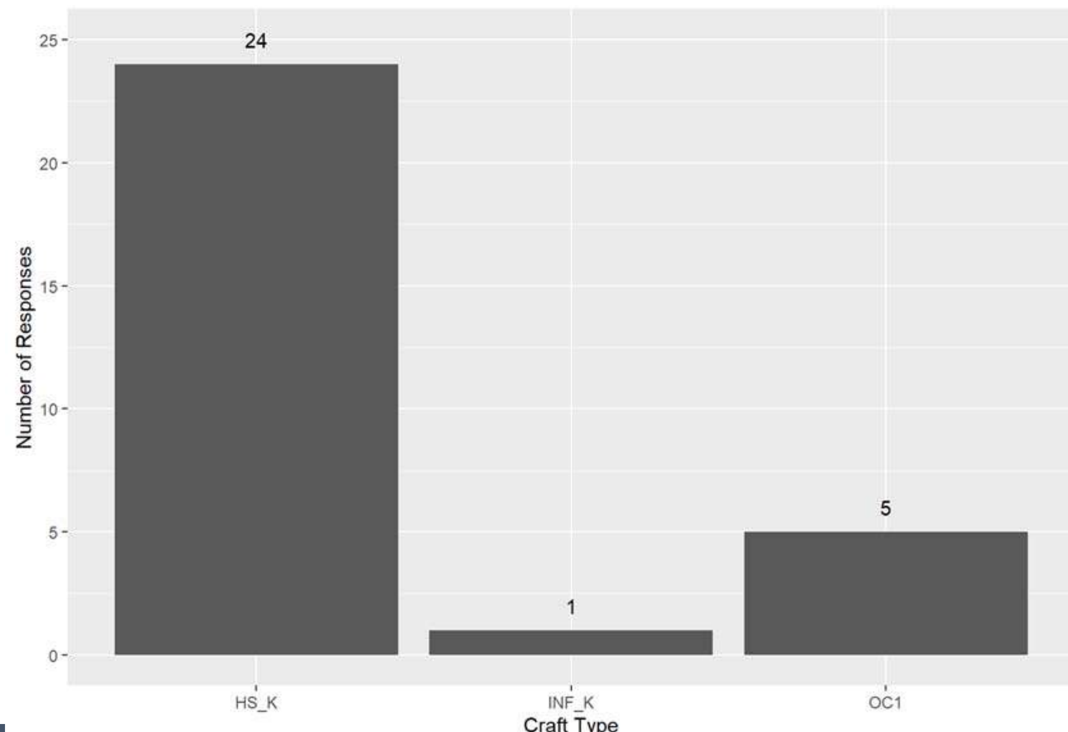
- While the target flow for this run was 685 cfs, the actual flow in the lower river during this run was approximately 580 cfs as measured at USGS gage 01433500 located in the Mongaup River downstream of the Rio Main Powerhouse.

Post-Run Survey Question 2. What type of craft did you use for this run?

HS_K = hard shell kayak

INF_K = inflatable kayak

OC1 = one-person open canoe

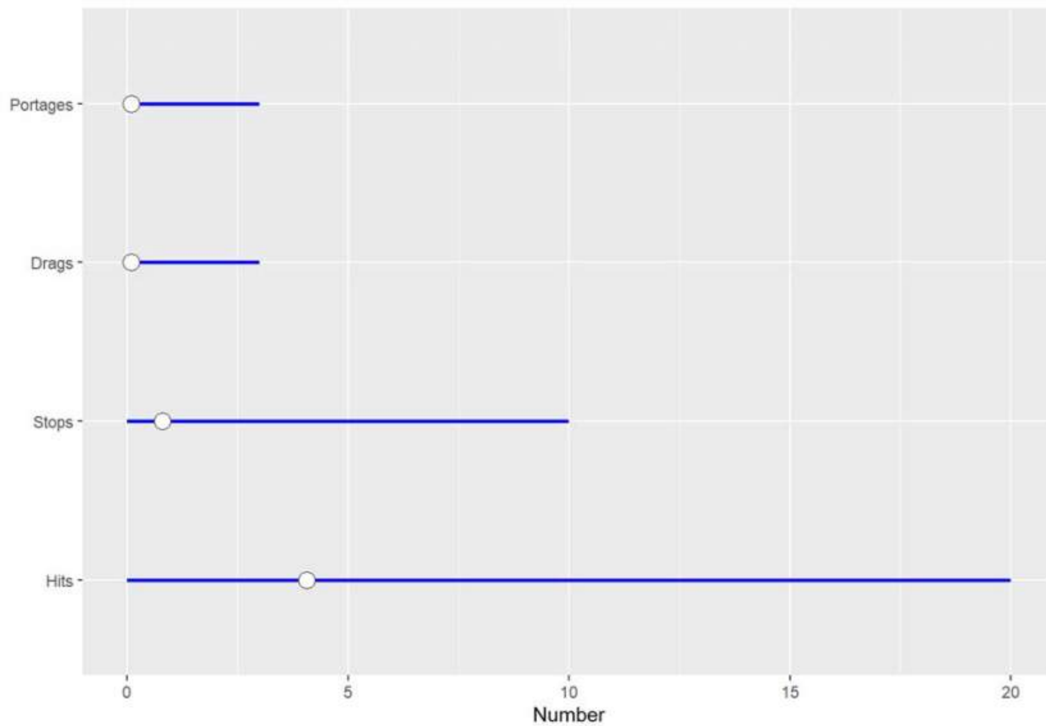


Whitewater Flow Assessment Study

Results

Post-Run Surveys: Lower Mongaup River (n = 30)

Post-Run Survey Question 4. Please estimate the number of unintended hits, stops, boat drags, and portages you had on this run.



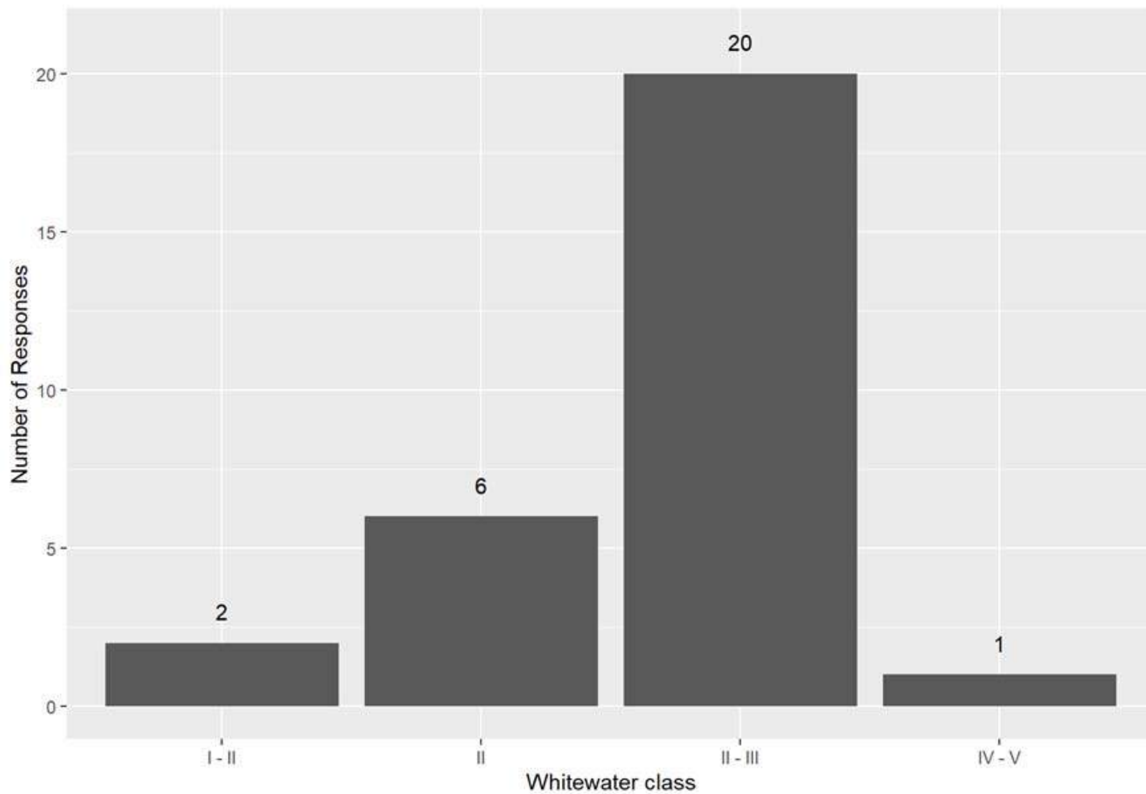
Dot represents mean and line represents range

Whitewater Flow Assessment Study

Results

<u>Post-Run Surveys: Lower Mongaup River (n = 30)</u>

Post-Run Survey Question 5. If you feel qualified to evaluate the whitewater class difficulty of the run at this flow, please indicate the general range (e.g. Class II – III).

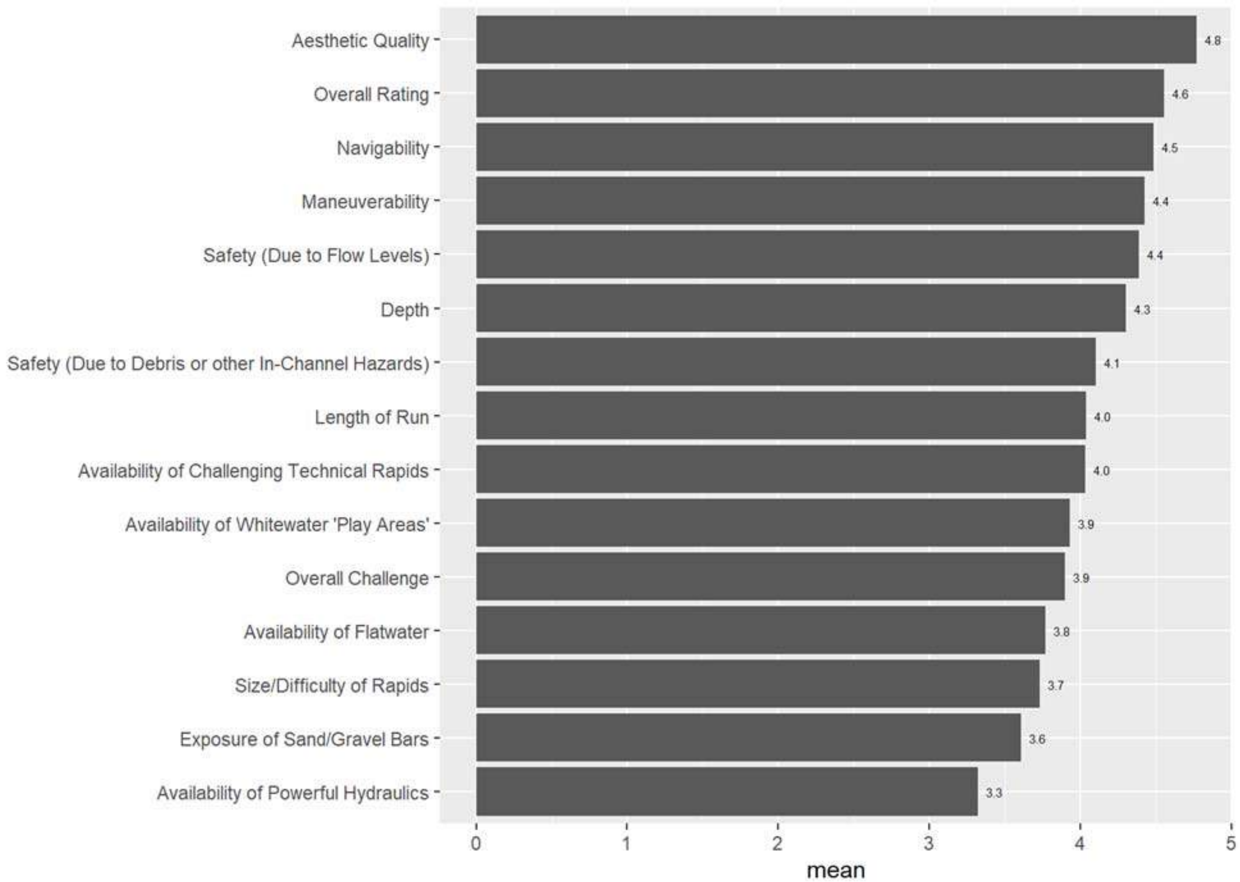


Whitewater Flow Assessment Study

Results

Post-Run Surveys: Lower Mongaup River (n = 30)

Post-Run Survey Question 6. Please evaluate the flow on this trip for your craft and skill level for each of the following characteristics.

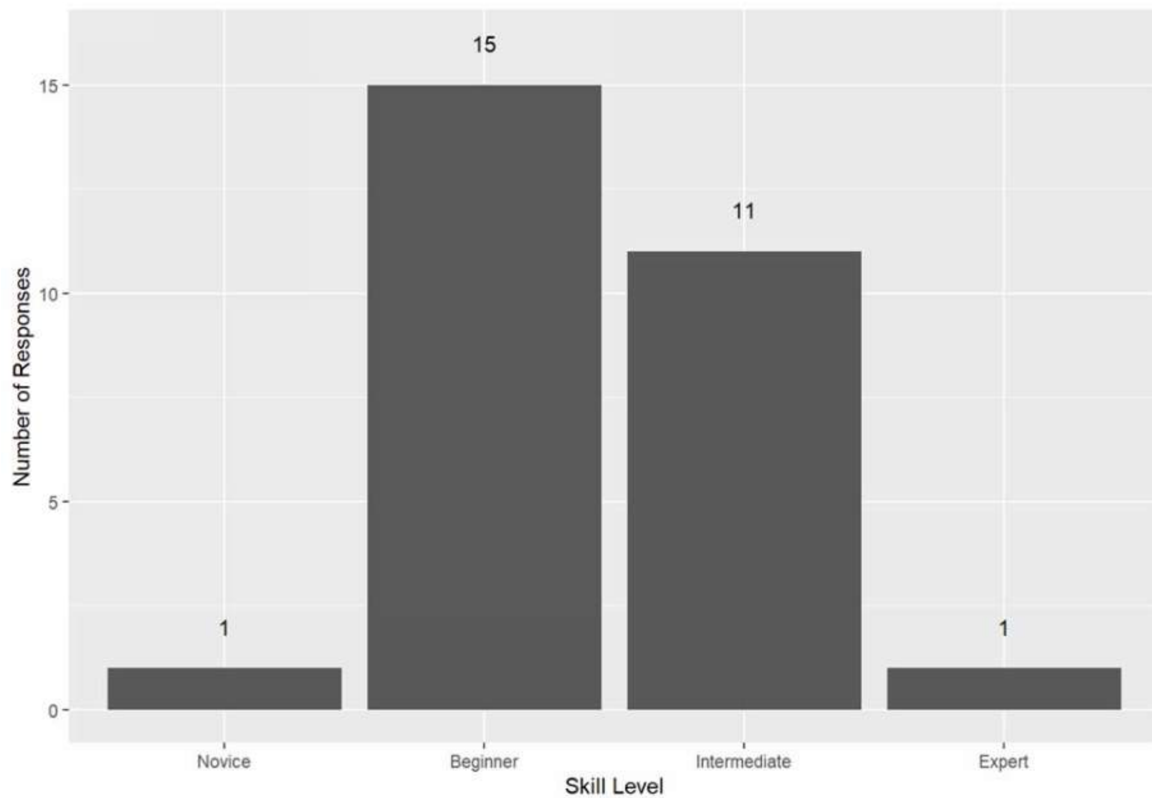


Whitewater Flow Assessment Study

Results

<u>Post-Run Surveys: Lower Mongaup River (n = 30)</u>

Post-Run Survey Question 7. What is the minimal skill level necessary to successfully run this reach at this flow level?



Whitewater Flow Assessment Study

Results

<u>Post-Run Surveys: Lower Mongaup River (n = 30)</u>

Post-Run Survey Question 8. What features or characteristics of this reach, at this flow, contributed to your overall rating in Question 6? Please describe the features/characteristics and their locations (if applicable).

- Nice water level and good flow
- Fun river with some challenge
- Excellent training or beginner run
- Play features - surf waves, eddies, oddities
- No powerful hydraulics or difficult rapids

Multiple boaters said that this flow provided a good water level with fun play features and a bit of challenge, making this a great training or beginner run. However, more experienced boaters said this flow did not provide powerful hydraulics or difficult rapid sections.

Whitewater Flow Assessment Study

Results

Post-Run Surveys: Lower Mongaup River (n = 30)

Post-Run Survey Question 9. List the primary advantages of this flow.

- Good water level with most rocks covered
- Fun river with play boating
- Excellent training run with a nice challenge

Whitewater Flow Assessment Study

Results

Post-Run Surveys: Lower Mongaup River (n = 30)

Post-Run Survey Question 10. List the primary disadvantages of this flow.

- Trees and wood in the river
- Not appealing to advanced or expert paddlers
- Few rocks exposed
- Strainers

Approximately half of the participants stated that there were no disadvantages associated with this flow.

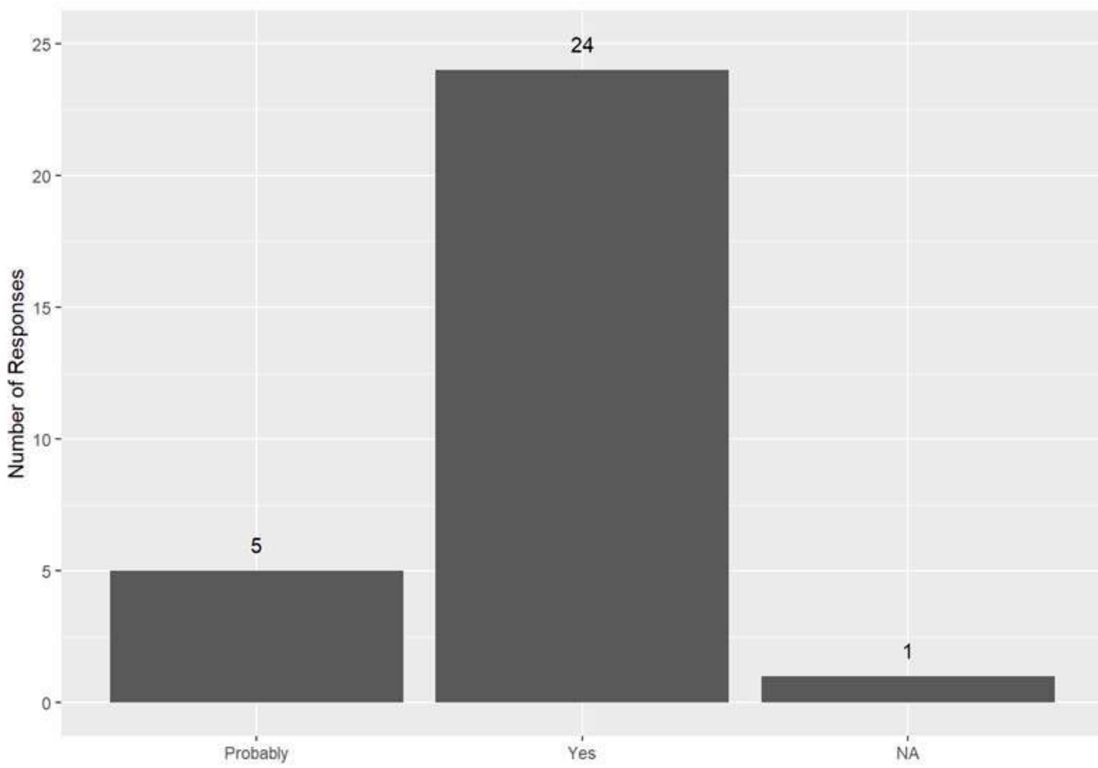
EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Whitewater Flow Assessment Study

Results

Post-Run Surveys: Lower Mongaup River (n = 30)

Post-Run Survey Question 11. Are you likely to return for future boat trips if this flow were to be provided or available?



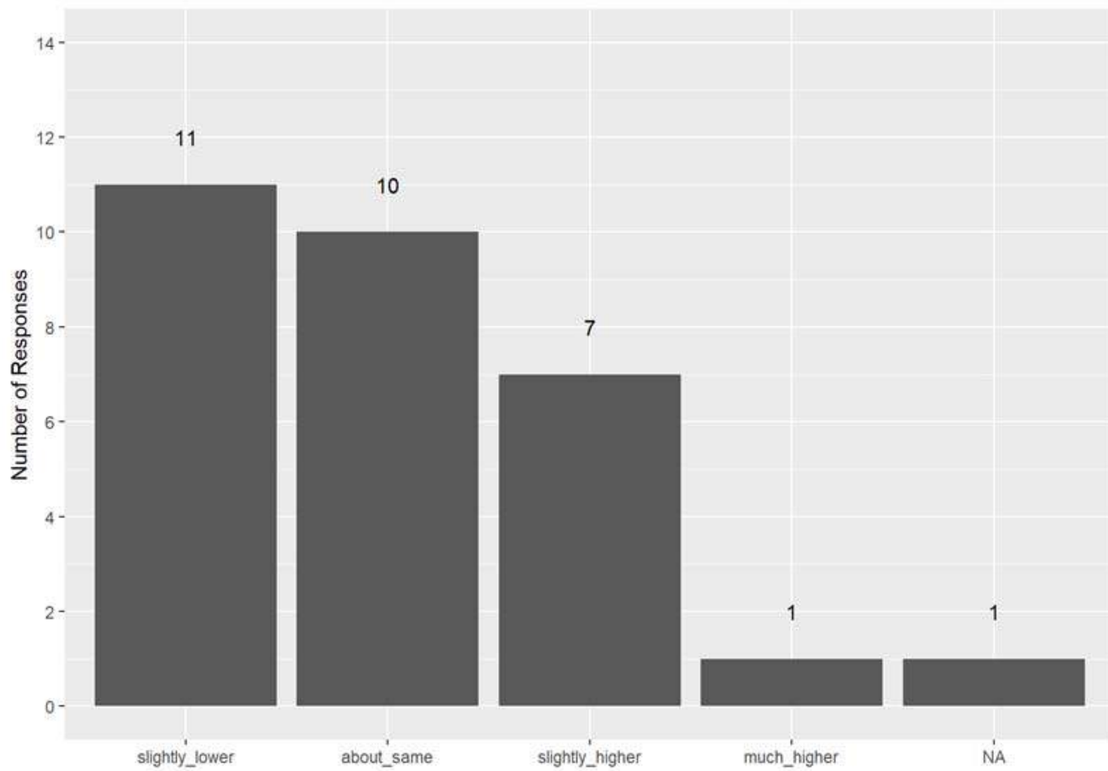
EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Whitewater Flow Assessment Study

Results

<u>Post-Run Surveys: Lower Mongaup River (n = 30)</u>

Post-Run Survey Question 12. In general, would you consider the minimum acceptable flow (enough flow for an enjoyable recreation experience) to be higher, lower, or about the same as this flow for the features you like?



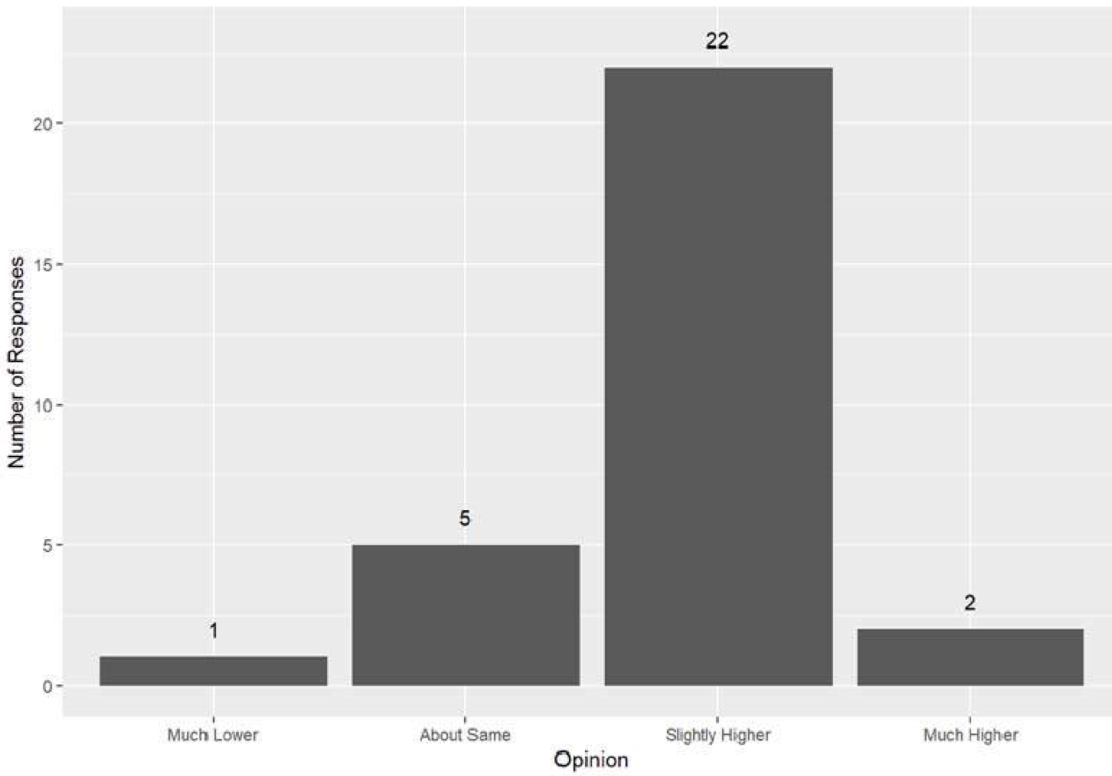
EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Whitewater Flow Assessment Study

Results

Post-Run Surveys: Lower Mongaup River (n = 30)

Post-Run Survey Question 13. Was this flow optimal, or would you prefer a flow that was higher or lower than this flow?



Whitewater Flow Assessment Study

Results

Post-Run Surveys: Lower Mongaup River (n = 30)

Post-Run Survey Question 14. Did you observe or experience any significant safety issues on your run (e.g., swims, pins, wrapped boats, constructed or natural river features, etc.)? If so, please explain and describe the approximate location.

- Downed trees
- Swims, a half stuck boat, rock spun me around and I boated backwards
- Caught on edge of strainer; lost paddle but was able to roll up
- Some strainers easily maneuvered around

Approximately three quarters of the boaters indicated that they did not observe any safety concerns while running the lower Mongaup River.

EAGLE CREEK RENEWABLE ENERGY — EXCELLENCE IN HYDRO —

Whitewater Flow Assessment Study

Results

Operational Constraints and/or Effects of Flow Releases

- Controlled and predictable flows into the bypassed reach are limited to those that can be provided by the minimum flow powerhouse and the minimum flow discharge valve at the dam.

- Any uncontrolled and unpredictable flows provided as spill over the sacrificial flashboards at Rio Dam are considered a public safety/risk concern.

- Additionally, surface water spill at Rio Dam during the summer months would likely provide undesirable warm water releases to the Mongaup River, which is classified as a cold water trout stream (as indicated by the NYSDEC during the February 14, 2019 ISR Meeting).

Whitewater Flow Assessment Study

Summary

Bypassed Reach

- Target flow = 250 cfs; Actual flow = 170 cfs (due to an issue with the opposing air pressures needed to fully open the discharge valve)
- Large range of hits, stops, and drags, with few portages (due to downed trees)
- Evaluated as class I-II; with a recommended skill level of beginners
- The overall rating of the bypassed reach was neutral to acceptable
- The run was rated highly for aesthetics and boaters stated that they enjoyed the extended length of the total run
- Boaters indicated that they would possibly or probably return to run the bypassed reach at 170 cfs
    - Minimum acceptable flow would be slightly or much higher

Therefore, it may be inferred that a slightly higher flow of 250 cfs, may be the minimum acceptable flow for boating the bypassed reach.

Whitewater Flow Assessment Study

Summary

<u>Lower Mongaup River</u>

- Target flow = 685 cfs; Actual flow = 580 cfs (due to problem with minimum flow discharge valve)
- Low numbers of stops and drags; much lower than the bypassed reach
- Rated class II-III, beginners to intermediate skill level required to complete the run
- High ratings in all categories, with aesthetics again being the highest rated characteristic
- Minimum acceptable flow would be slightly lower or the same as the provided 580 cfs
  - Majority of boaters stated that the optimal flow for this reach would be slightly higher

Operations Model Study

Operations Model Study

Goals and Objectives

The goals and objectives of this study are the following:

- Convene a technical conference with invited licensing stakeholders to identify alternative operating scenarios to run through the model and allow stakeholders to request operating scenarios within 30 days after the conference;
- Use the established Operations Model to evaluate the stakeholder-requested scenarios and present the results in the Updated Study Report.

Study Area

The five reservoirs (Toronto, Cliff Lake, Swinging Bridge, Mongaup Falls, and Rio) and associated downstream riverine reaches (Black Lake Creek and the Mongaup River) within the Mongaup River Projects system.

Operations Model Study

Methodology

<u>Development of Operations Model</u>

- 30 years of representative historic hydrology data (1988-2017)
- Reservoir area storage curves
- Predicts reservoir elevation, surface area, volume, and outflow along with corresponding Project generation.
- The Operations Model is capable of evaluating the requested operating scenarios in comparison to the established baseline conditions.
- Baseline1 contains the input conditions specified in Section 3 of the Model Logic and Verification Report (provided in the ISR filed with the Commission on February 8, 2019), except that it does not change the required continuous minimum flows based on low inflow conditions.
- Baseline2 uses Custom Logic, which triggers the model to implement the flow reductions protocol as specified in the Mongaup River Hydroelectric System Normal Conditions Operating Plan except for the part of the protocol allowing reductions below 60 cfs; the model does not reduce minimum flows below 60 cfs.

Operations Model Study

Methodology (cont.)

Use of Model to Evaluation Proposed Operating Scenarios

- On September 4, 2019, a technical conference was conducted with invited stakeholders in Monticello, NY.
- Stakeholders submitted written requests to Eagle Creek by October 4, 2019 for operating scenarios to be evaluated using the Operations Model.
- Eagle Creek reviewed the stakeholder-requested operating scenarios and has evaluated each scenario using the Operations Model.

Operations Model Study

Results

September 4, 2019 Conference

- Attended in person or via teleconference by representatives of FERC, USFWS, NPS, NYSDEC, DRBC, AW, AMC, NYTU, SBPOA, HOOT, Eagle Creek, and HDR.
- Eagle Creek and HDR reviewed the model so stakeholders could understand the basis for the model inputs and outputs as well as the purpose of the model in support of the Mongaup River Hydroelectric Projects FERC relicensings.

Stakeholder-Requested Operating Scenarios

- Eagle Creek provided stakeholders with a scenario-request form and asked that stakeholders provide Eagle Creek with their requests for operating scenarios by October 4, 2019.
- AW/AMC/KCCNY requested 8 scenarios, USFWS requested 8 scenarios, and HOOT/SBPOA requested 6 scenarios.
- The NYSDEC provided a letter indicating concurrence with the USFWS-requested scenarios.

EAGLE CREEK RENEWABLE ENERGY
— EXCELLENCE IN HYDRO —

Operations Model Study

Results

FWS – Requested Scenarios	
Baseline	• 10 cfs minimum flow below Toronto Dam and Cliff Lake Dam • 100 cfs minimum flow below Swinging Bridge Dam • 70 cfs minimum flow below Mongaup Falls Dam plus 20 cfs minimum flow below Mongaup Falls Powerhouse • 100 cfs minimum flow below Rio Dam • Baseline2 implements an "or inflow, but not less than 60 cfs" minimum flow provision at Swinging Bridge, Mongaup Falls, and developments
FWS1	• 125 cfs minimum flow below SWB, MON, RIO
FWS2	• 150 cfs minimum flow below SWB, MON, RIO
FWS3	• 175 cfs minimum flow below SWB, MON, RIO
FWS4	• 25 cfs minimum flow below TOR, CLF
FWS5	• 50 cfs minimum flow below TOR, CLF
FWS6	• 100 cfs minimum flow below TOR, CLF
FWS7	• During dry periods, cease recreation flow releases from Rio Project
FWS8	• Downstream fish passage flows
FWS8a_2	• Downstream fish passage flows of 2% of the total maximum hydraulic capacities of the Swinging Bridge, Mongaup Falls, an powerhouses year-round
FWS8a_5	• Downstream fish passage flows of 5% of the total maximum hydraulic capacities of the Swinging Bridge, Mongaup Falls, an powerhouses year-round
FWS8b_2	• Downstream fish passage flows of 2% of the total maximum hydraulic capacities of the Swinging Bridge, Mongaup Falls, an powerhouses from April 1 – November 30
FWS8b_5	• Downstream fish passage flows of 5% of the total maximum hydraulic capacities of the Swinging Bridge, Mongaup Falls, an powerhouses from April 1 – November 30

Operations Model Study

Results

AW/AMC/KCCNY – Requested Scenarios	
Baseline	• 15 WW release days between April 15 and October 31 • 4-hr releases (11:00 – 15:00) • All releases provided by the Rio Main Powerhouse • Releases occur on one day every other weekend and alternate between one-unit and two-unit releases • Releases are provided regardless of inflows or reservoir elevations • Baseline2 implements an “or inflow, but not less than 60 cfs” minimum flow provision at Swinging Bridge, Mongaup Falls, and Rio developments
AW1	• 30 WW release days • No additional flows into bypassed reach
AW2	• 30 WW release days • 280 cfs into bypassed reach during each release day
AW3	• 30 WW release days • 280 cfs into bypassed reach during one-unit release days
AW4	• 15 WW release days • 280 cfs into the bypassed reach during each release day
AW5	• 15 WW release days • 280 cfs into the bypassed reach during one-unit release days (total of 7)
AW6	• 30 WW release days • Half of the releases will consist of 500 cfs into the bypassed reach • Half of the releases will consist of two-unit release from the Rio Main Powerhouse
AW7	• 15 WW release days • 500 cfs into the bypassed reach during 7 release days • 500 cfs into the bypassed reach plus one-unit release from the Rio Main Powerhouse during 8 release days
AW8	• 30 WW release days • 500 cfs into the bypassed reach during 15 release days • 500 cfs into the bypassed reach plus one-unit release from the Rio Main Powerhouse during 15 release days

Operations Model Study

Results

HS – Requested Scenarios				
	Toronto Reservoir Elevations		Swinging Bridge Reservoir Elevations	
Baseline	Jan 1 – 1218 Feb 1 – 1202 Mar 1 – 1025 Apr 1 – 1212 May 1 - 2017 Jun 1 – 1217 Jul 1 – 1218	Aug 1 – 1212 Sep 1 - 1211 Oct 1 – 1211 Nov 1 – 1215 Dec 1 – 1217 Dec 10 – 1217.3 Dec 31 – 1218	Jan 1 – 1066 Feb 1 – 1066 Mar 1 – 1049 Apr 1 – 1053 Apr 15 – 1059.07 May 1 – 1066 Jun 1 – 1067	Jul 1 – 1066 Aug 1 – 1062 Sep 1 – 1061.5 Sep 30 – 1061.02 Oct 1 – 1061 Nov 1 – 1066 Dec 1 – 1066
HS1	• Modified elevations at TOR/SWB		• Winter minimum elevation of 1205/1052 at TOR/SWB through May • Memorial Day minimum elevation of 1220/1065 at TOR/SWB • Summer minimum elevation of 1218/1064 at TOR/SWB • October 1-15 minimum elevation of 1214/1062 at TOR/SWB • Maximum elevation of 1068 at SWB • Current minimum flows with “or inflow but not less than 60 cfs”	
HS2	• HS1 with modified maximum elevation at SWB		• Maximum elevation of 1070 at SWB	
HS3	• HS1 with modified minimum elevations at TOR/SWB		• Summer minimum elevation of 1216/1063 at TOR/SWB	
HS4	• HS1 with no winter minimums elevations at TOR/SWB			
HS5	• HS1 with non-winter minimum elevations to never fall below emergency drought storage elevations required by the Delaware River Basin Commission		• Winter minimum elevation of 1205/1052 at TOR/SWB through Mar • Minimum elevation of 1210/1057 at TOR/SWB Apr through May • Memorial Day minimum elevation of 1220/1065 at TOR/SWB • Summer minimum elevation of 1218/1064 at TOR/SWB • October 1-15 minimum elevation of 1214/1062 at TOR/SWB • Minimum elevation of 1210/1057 at TOR/SWB Oct 16 through Dec 31	
HS6	• HS1 with winter minimum elevations carried until Memorial Day		• Winter minimum elevation of 1205/1052 at TOR/SWB through May • Memorial Day minimum elevation of 1220/1065 at TOR/SWB	

Questions or Follow up

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Attachment B

Rio Whitewater Flow Release Dates (2011-2019)

Mongaup River Hydroelectric Projects FERC Relicensing
Rio Hydroelectric Project (FERC No. 9690)
Whitewater Boating Release Dates from 2011 – 2019

2011: All releases occurred as scheduled.

Date	Day	Time	# of Units	Notes (Differences)
4/17	Sun	11:00 – 15:00	1	
4/30	Sat	11:00 – 15:00	2	
5/15	Sun	11:00 – 15:00	1	
5/28	Sat	11:00 – 15:00	2	
6/12	Sun	11:00 – 15:00	1	
6/25	Sat	11:00 – 15:00	2	
7/10	Sun	11:00 – 15:00	1	
7/23	Sat	11:00 – 15:00	2	
8/7	Sun	11:00 – 15:00	1	
8/20	Sat	11:00 – 15:00	2	
9/4	Sun	11:00 – 15:00	1	
9/17	Sat	11:00 – 15:00	2	
10/2	Sun	11:00 – 15:00	1	
10/14	Sat	11:00 – 15:00	2	
10/30	Sun	11:00 – 15:00	1	

2012: All releases occurred as scheduled unless noted otherwise.

Date	Day	Time	# of Units	Notes (Differences)
4/15	Sun	11:00 – 15:00	1	
4/28	Sat	11:00 – 15:00	2	
5/13	Sun	11:00 – 15:00	1	
5/26	Sat	11:00 – 15:00	2	
6/10	Sun	11:00 – 15:00	1	
6/23	Sat	11:00 – 15:00	2	
7/8	Sun	11:00 – 15:00	1	
7/21	Sat	11:00 – 15:00	2	
8/5	Sun	11:00 – 15:00	1	
8/18	Sat	11:00 – 15:00	2	
9/2	Sun	11:00 – 15:00	1	
9/15	Sat	11:00 – 15:00	2	
9/30	Sun	11:00 – 15:00	1	
10/14	Sun	11:00 – 15:00	1	
10/27	Sat	11:00 – 15:00	2	Modified to a 1-unit release

Mongaup River Hydroelectric Projects FERC Relicensing
Rio Hydroelectric Project (FERC No. 9690)
Whitewater Boating Release Dates from 2011 – 2019

2013: All releases occurred as scheduled unless noted otherwise.

Date	Day	Time	# of Units	Notes (Differences)
4/20	Sat	11:00 – 15:00	2	
5/5	Sun	11:00 – 15:00	1	
5/18	Sat	11:00 – 15:00	2	
6/2	Sun	11:00 – 15:00	1	Release rescheduled to 6/9
6/15	Sat	11:00 – 15:00	2	
6/30	Sun	11:00 – 15:00	1	
7/13	Sat	11:00 – 15:00	2	
7/28	Sun	11:00 – 15:00	1	
8/10	Sat	11:00 – 15:00	1	
8/25	Sun	11:00 – 15:00	2	
9/7	Sat	11:00 – 15:00	1	
9/22	Sun	11:00 – 15:00	2	
10/5	Sat	11:00 – 15:00	1	
10/20	Sun	11:00 – 15:00	2	

2014: All releases occurred as scheduled unless noted otherwise.

Date	Day	Time	# of Units	Notes (Differences)
4/19	Sat	11:00 – 15:00	2	Release rescheduled to 4/26
5/4	Sun	11:00 – 15:00	1	
5/17	Sat	11:00 – 15:00	2	
6/1	Sun	11:00 – 15:00	1	
6/14	Sat	11:00 – 15:00	2	Modified to a 1-unit release
6/29	Sun	11:00 – 15:00	1	
7/12	Sat	11:00 – 15:00	2	Modified to a 1-unit release
7/27	Sun	11:00 – 15:00	1	
8/9	Sat	11:00 – 15:00	1	
8/24	Sun	11:00 – 15:00	2	
9/6	Sat	11:00 – 15:00	1	Modified to a 2-unit release
9/21	Sun	11:00 – 15:00	2	Modified to a 1-unit release
10/4	Sat	11:00 – 15:00	1	Modified to a 2-unit release
10/19	Sun	11:00 – 15:00	2	

Mongaup River Hydroelectric Projects FERC Relicensing
Rio Hydroelectric Project (FERC No. 9690)
Whitewater Boating Release Dates from 2011 – 2019

2015: All releases occurred as scheduled.

Date	Day	Time	# of Units	Notes (Differences)
4/18	Sat	11:00 – 15:00	2	
5/3	Sun	11:00 – 15:00	1	
5/16	Sat	11:00 – 15:00	2	
5/31	Sun	11:00 – 15:00	1	
6/13	Sat	11:00 – 15:00	2	
6/28	Sun	11:00 – 15:00	1	
7/11	Sat	11:00 – 15:00	2	
7/26	Sun	11:00 – 15:00	1	
8/8	Sat	11:00 – 15:00	1	
8/23	Sun	11:00 – 15:00	2	
9/5	Sat	11:00 – 15:00	1	
9/20	Sun	11:00 – 15:00	2	
10/3	Sat	11:00 – 15:00	1	
10/18	Sun	11:00 – 15:00	2	
10/31	Sat	11:00 – 15:00	1	

2016: All releases occurred as scheduled.

Date	Day	Time	# of Units	Notes (Differences)
4/16	Sat	11:00 – 15:00	2	
5/1	Sun	11:00 – 15:00	1	
5/14	Sat	11:00 – 15:00	2	
5/29	Sun	11:00 – 15:00	1	
6/11	Sat	11:00 – 15:00	2	
6/26	Sun	11:00 – 15:00	1	
7/9	Sat	11:00 – 15:00	2	
7/24	Sun	11:00 – 15:00	1	
8/6	Sat	11:00 – 15:00	1	
8/21	Sun	11:00 – 15:00	2	
9/3	Sat	11:00 – 15:00	1	
9/18	Sun	11:00 – 15:00	2	
10/1	Sat	11:00 – 15:00	1	
10/16	Sun	11:00 – 15:00	2	
10/29	Sat	11:00 – 15:00	1	

Mongaup River Hydroelectric Projects FERC Relicensing
Rio Hydroelectric Project (FERC No. 9690)
Whitewater Boating Release Dates from 2011 – 2019

2017: All releases occurred as scheduled unless noted otherwise.

Date	Day	Time	# of Units	Notes (Differences)
4/15	Sat	11:00 – 15:00	1	
4/30	Sun	11:00 – 15:00	2	
5/13	Sat	11:00 – 15:00	1	
5/28	Sun	11:00 – 15:00	2	
6/10	Sat	11:00 – 15:00	1	
6/25	Sun	11:00 – 15:00	2	
7/8	Sat	11:00 – 15:00	1	
7/23	Sun	11:00 – 15:00	2	
8/5	Sat	11:00 – 15:00	1	
8/20	Sun	11:00 – 15:00	2	
9/2	Sat	11:00 – 15:00	1	
9/17	Sun	11:00 – 15:00	2	
9/30	Sat	11:00 – 15:00	1	Rescheduled on 10/7
10/15	Sun	11:00 – 15:00	2	
10/28	Sat	11:00 – 15:00	1	

2018: All releases occurred as scheduled unless noted otherwise.

Date	Day	Time	# of Units	Notes (Differences)
4/15	Sun	11:00 – 15:00	1	
4/28	Sat	11:00 – 15:00	2	
5/13	Sun	11:00 – 15:00	1	
5/26	Sat	11:00 – 15:00	2	Modified to a 1-unit release
6/10	Sun	11:00 – 15:00	1	
6/23	Sat	11:00 – 15:00	2	Modified to a 1-unit release
7/8	Sun	11:00 – 15:00	1	Modified to a 2-unit release
7/21	Sat	11:00 – 15:00	2	
8/5	Sun	11:00 – 15:00	1	
8/18	Sat	11:00 – 15:00	2	
9/2	Sun	11:00 – 15:00	1	Modified to a 2-unit release
9/15	Sat	11:00 – 15:00	2	Modified to a 1-unit release
9/30	Sun	11:00 – 15:00	1	Modified to a 2-unit release
10/13	Sat	11:00 – 15:00	2	
10/28	Sun	11:00 – 15:00	1	

Mongaup River Hydroelectric Projects FERC Relicensing
Rio Hydroelectric Project (FERC No. 9690)
Whitewater Boating Release Dates from 2011 – 2019

2019: All releases occurred as scheduled unless noted otherwise.

Date	Day	Time	# of Units	Notes (Differences)
4/14	Sun	11:00 – 15:00	1	
4/27	Sat	11:00 – 15:00	2	
5/12	Sun	11:00 – 15:00	1	Modified to a 2-unit release
5/25	Sat	11:00 – 15:00	2	Modified to a 1-unit release
6/9	Sun	11:00 – 15:00	1	
6/22	Sat	11:00 – 15:00	2	
7/7	Sun	11:00 – 15:00	1	
7/20	Sat	11:00 – 15:00	2	
8/4	Sun	11:00 – 15:00	1	
8/17	Sat	11:00 – 15:00	2	
9/1	Sun	11:00 – 15:00	1	Mechanical failure caused shortened release; makeup release occurred on 9/22
9/14	Sat	11:00 – 15:00	2	
9/29	Sun	11:00 – 15:00	1	
10/12	Sat	11:00 – 15:00	2	
10/27	Sun	11:00 – 15:00	1	Occurred concurrent with Whitewater Boating Flow Assessment Study resulting in slightly higher flows than normal release