2022 Bradford Island Final Proposal

July 16, 2021

Background

Bonneville Dam was authorized by the Flood Control Act adopted June 28, 1938 (Public Law No. 761, House Resolution No. 10618) and was the first dam constructed on the Columbia River. The site is a multipurpose facility that consists of the first and second powerhouses, old and new navigation locks, and spillway (Figure 1). Historical disposal practices resulted in electric equipment and other waste being placed in the river on the north shore of Bradford Island (Figure 1), including transformers containing PCB oil. In 2012, a Remedial Investigation (RI) report was completed (URS 2012) which summarized previous investigation activities that had taken place over the previous 10 years and used the data collected to identify source areas at Bradford Island, define the nature and extent of environmental contamination, and identify the contaminants of potential concern for human health and ecological receptors. The 2012 Remedial Investigation reported results from smallmouth bass and crayfish collected in 2008 and 2011, with elevated levels of PCBs in some fish and crayfish. Based on the length of time since previous fish sampling, and given the 2018 Solid Phase Microextraction (SPME) results from the site, the U.S. Army Corps of Engineers (USACE) believed more current fish tissue sampling and tracking was needed to help inform and update the conceptual site model for the River OU. The USACE contracted with the U.S. Geological Survey (USGS) to collect crayfish and smallmouth bass samples and evaluate the movements of smallmouth bass near Bonneville Dam using acoustic telemetry during August–December 2020. This study supported a broader effort being conducted by USACE under the Comprehensive Environmental Response, Compensation, and Liability Act at Bradford Island. During the study, USGS collected smallmouth bass, crayfish and sculpin for tissue analysis and tagged 40 smallmouth bass with acoustic transmitters. The tagged bass were monitored in the forebay of Bonneville Dam and their movement patterns were assessed. The study showed that individual smallmouth bass exhibited high site fidelity and generally remained in close proximity to where they were released in the dam forebay (Kock et al., *in press*). These results provided insights into smallmouth bass behavior during late summer and fall. The USACE is also interested in behavior patterns during other times of the year and has decided to fund a second study to evaluate smallmouth bass behavior in the forebay of Bonneville Dam during spring and summer months in 2022. This will provide the opportunity to assess behavior as water temperature warms, smallmouth bass spawning occurs, and the spillway is operated, all of which could result in behavioral differences compared to observations from fall 2020. This document describes activities to be conducted as part of the field study and includes one optional element that the USACE could choose to fund, if desired. Approximate cost estimates for the various study elements are provided in Table 1.

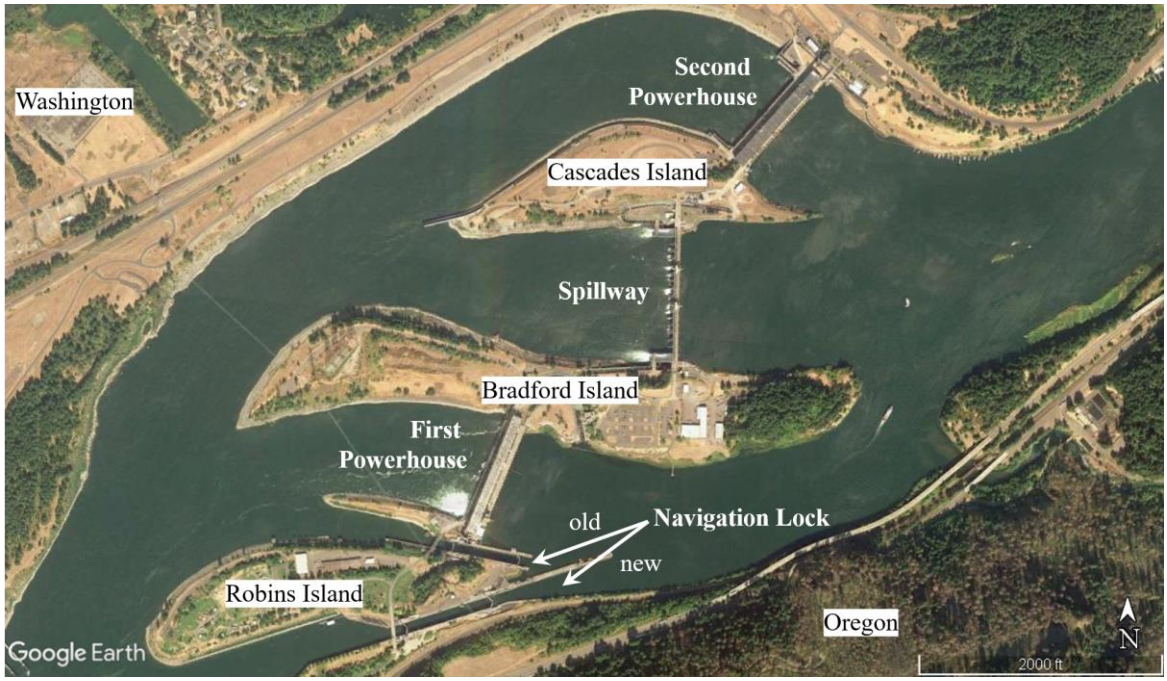

Figure 1. Image showing major structures and islands at Bonneville Dam.

Table 1. Cost estimates for a study to assess behavior and movement patterns of adult smallmouth bass in the forebay of Bonneville Dam during 2022. Cost estimates for additional elements that could be included are provided as well.

Element	Description	Estimated cost
Acoustic telemetry study	Collect, tag, release and monitor 40 adult smallmouth bass in the forebay of Bonneville Dam, and track fish movements in the area extend upstream and downstream ~15 miles from Bonneville Dam	$417,699
Fish collection for tissue analysis	Collect smallmouth bass, crayfish, and sculpin for tissue contaminant analysis	TBD

Methods

Acoustic telemetry study

An acoustic telemetry study will be conducted during March–September 2022 to describe: (1) movement patterns of smallmouth bass in the forebay of Bonneville Dam; and (2) dispersal patterns of tagged fish up to 15 miles upstream and downstream of the dam. Fish will be tagged in March and transmitters will emit signals until early September when their batteries will expire. A total of 40 adult smallmouth bass will be collected (by anglers), surgically tagged with an acoustic transmitter (Model SS4000, Advanced Telemetry Systems, Isanti, MN), and released. Angling crews will use two boats to collect fish for tagging and a third boat will be positioned nearby to serve as the tagging vessel. When fish are captured anglers will mark the position using a GPS, place fish into a container filled with fresh river water and transport the fish to the tagging vessel. Fish will be transferred to the tagging vessel and placed into an anesthetic bath. Once the fish loses equilibrium it will be measured (fork length, in centimeters) and surgically tagged using methods described in Kock et al., (*in press*). After tagging, fish will be transferred

to the angling boat, placed into a transport container filled with fresh river water, and allowed to recover. Once recovered, tagged fish will be released at the point of capture and the angling crew will resume sampling until all fish have been tagged.

A total of 27 acoustic receivers (Model SR5000, Advanced Telemetry Systems, Isanti, MN) will be deployed prior to tagging and will operate continuously throughout the study period. Fifteen receivers will be deployed within 1.5 miles of the Bonneville Dam forebay to detect fish moving near the dam (Figure 2). Acoustic receivers can reliably detect tagged fish that are located within 100–200 m of the receiver location, so this array was designed to maximize detection probability (>95%) of tagged fish near Bonneville Dam. The array was used during 2020 and provided robust detection probabilities of tagged fish near the dam (Kock et al., *in press*). Receivers will be deployed to detect fish in specific zones of interest: receivers 1 and 2 will form a gate that can be used to determine when fish move downstream and out of the array near Powerhouse 1; receivers 3, 4, and 5 will detect fish near North Bradford Island; receivers 6 and 7 will detect fish at Cascades Island; receivers 9 and 11 will detect fish near Boat Island; receivers 8, 10, 13, and 14 will detect fish near Goose Island, and receivers 12 and 15 will detect fish on the North Shore. Additionally, receivers 14 and 15 will form a gate to determine when tagged fish leave the array and move upstream. This configuration of monitoring sites is identical to the 2020 study which will allow for direct comparisons of fish behavior between the two studies. Acoustic transmitters will have an estimated operating life of ~156 d during the 2022 study which is approximately twice as long as transmitters used during 2020 (~71 d). This will allow us to collect information on smallmouth bass behavior over a longer time period during the 2022 study.

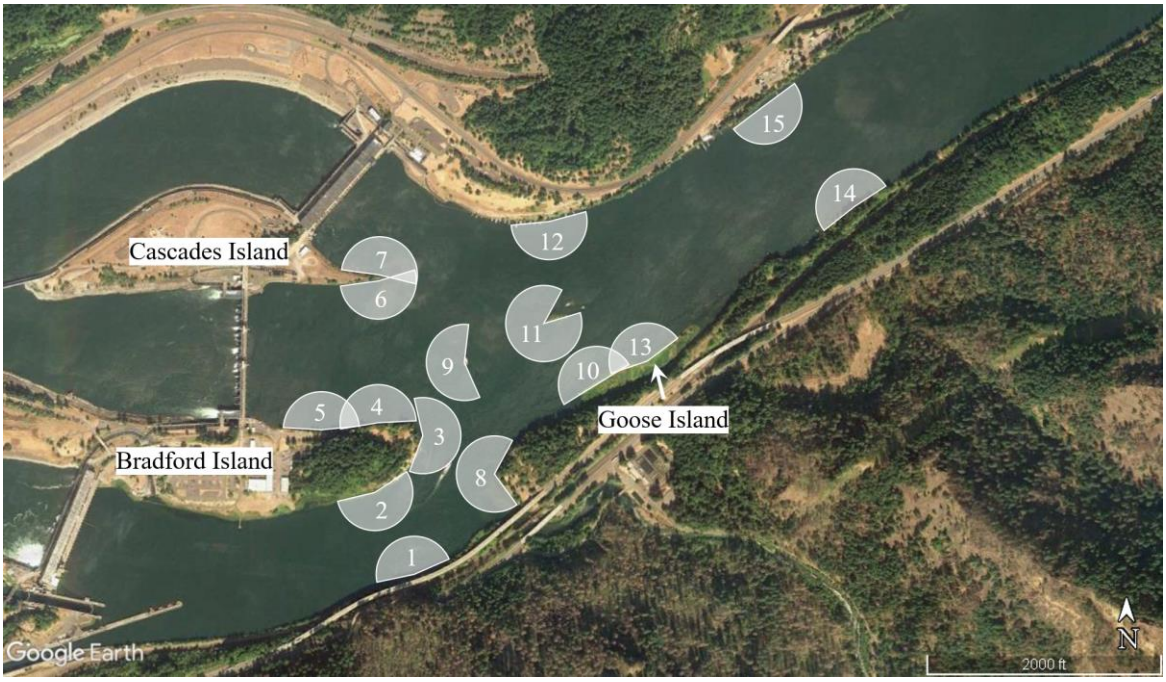

Figure 2. Locations of acoustic telemetry monitoring sites and approximate detection ranges in the forebay of Bonneville Dam during an acoustic telemetry study in August–December 2020. Actual detection ranges of telemetry receivers exceeded ranges shown in this figure.

During the 2020 study we found that 16 tagged smallmouth bass moved upstream and out of the array and 9 tagged fish moved downstream and out of the array before their transmitters expired. Because our array was focused specifically on assessing behavior in the forebay of Bonneville Dam we were unable to determine if any fish passed downstream of the dam, or how far upstream tagged fish moved. Additional sites will be deployed upstream and downstream of Bonneville Dam to assess dispersal patterns of smallmouth bass from the forebay of the dam in 2022. We will deploy 12 receivers to create 6 detection gates (2 receivers per gate; 3 gates upstream of the dam, 3 gates downstream of the dam) approximately 5, 10, and 15 miles upstream and downstream of Bonneville Dam. Detections of tagged fish at these gates will be used to determine if smallmouth bass move substantial distances away from the Bonneville Dam forebay, provide information on the extent of movement, and provide insights into the proportion of fish that move extended distances away from the dam.

At Bonneville Dam, spill occurs continuously from April 10 to August 31 each year and boats are not allowed in the exclusion zone located upstream of the spillway when it is in operation. We understand this access limitation and have planned our sampling and monitoring activities accordingly. Fish will be collected, tagged, and released in the exclusion zone prior to the start of spill operations and monitoring equipment will be accessible from the shore so that boat access to the exclusion zone will not be require when spill is occurring.

Additional Elements for Funding Consideration

Fish collection for tissue analysis

During the 2020 study (Kock et al., *in press*) USGS collected crayfish, sculpin, and smallmouth bass which were evaluated for contaminants analysis. Samples were collected in the forebay of Bonneville Dam, and at a reference site near Stevenson, Washington, using angling and baited traps. We were able to meet or exceed sample size requests from USACE in this effort. Similar collection efforts could be implemented during the 2022 study, if desired.

Schedule

Table 2. Proposed activity schedule for various elements of the study.

Description	Period or due date
Consult with USACE to secure permission and credentials required to access areas for sampling and deploying acoustic telemetry monitoring sites.	December 1, 2021–February 15, 2022
Install acoustic telemetry monitoring sites.	March 1–March 15, 2022
Collect, tag, and release adult smallmouth bass	March 15–April 9, 2022
Acoustic telemetry sites in operation.	March 15–September 15, 2022
Remove acoustic telemetry sites.	September 16–30, 2022

Data analysis, reporting.	September 30–November 15, 2022
Draft report due.	December 15, 2022
Final report due.	April 15, 2023

Summary

The information provided in this document outlines plans and anticipated costs (detailed budget provided in a separate document) for a study designed to collect specific information for the USACE near Bonneville Dam. This document and associated costs for the study can be revised as requested. We appreciate the opportunity to conduct research to support the USACE at Bonneville Dam and other locations throughout the Pacific Northwest.

References

Kock, T.J., G.S. Hansen, and S.D. Evans. In press. Behavior and movement of smallmouth bass in the forebay of Bonneville Dam, Columbia River, August–December 2020. U.S. Geological Survey Open-File Report.

URS. 2012. Upland and River Operable Units Remedial Investigation Report. Bradford Island, Bonneville Dam Forebay, Cascade Locks, Oregon. June.

URS. 2016. Baseline human health and ecological risk assessment, river operable unit. Report to the U.S. Army Corps of Engineers, Portland, Oregon. April 2016. 88 p.

USACE. 2017. Final feasibility study: Bradford Island upland operable unit, Cascade Locks, Oregon. Report by the U.S. Army Corps of Engineers, Portland, Oregon. August 2017. 136 p.