

Priest Rapids Hydroelectric Project (P-2114)

**2021 AQUATIC INVASIVE SPECIES
CONTROL AND PREVENTION PLAN
ANNUAL REPORT**

License Article 401(a)(22)

By Nathan Dietrich

Public Utility District No. 2 of Grant County, Washington
Priest Rapids Hydroelectric Project
FERC Project No. 2114

February 2022

Executive Summary

The Aquatic Invasive Species Control and Prevention Program (AISP Program) activities for 2021 were conducted in accordance with the management plan titled, *Aquatic Invasive Species Control and Prevention Plan* (AISP; Grant PUD 2010)¹ and associated amendments (Keeler 2016)². Key components of the AISP include education and monitoring that are designed to help manage, regulate, and potentially prevent introduction and/or spread of existing/new aquatic invasive species (AIS) within Public Utility District No. 2 of Grant County's (Grant PUD's) Priest Rapids Hydroelectric Project (Project).

Monitoring activities for 2021 consisted of zebra/quagga mussel (*Dreissena polymorpha/Dreissena rostriformis bugensis*) sampling (artificial substrate, plankton tows, and shoreline monitoring), aquatic plant surveys at boat launches, and the use of environmental DNA (eDNA) as an early monitoring technique for the presence/absence of northern pike (*Esox lucius*). Educational activities for 2021 included AIS informational signage displayed at Grant PUD boat launches. Distribution of WDFW's AIS prevention permit flyer and WDFW AIS key chains and whistles also occurred at Project boat launches.

No northern pike were detected with the use of eDNA within the Project. No zebra/quagga mussel veliger, zebra/quagga mussels or New Zealand mudsnail (NZMS; *Potamopyrgus antipodarum*) were sampled during plankton tow samples or detected on artificial substrates or shoreline monitoring sites within the Project.

Voluntary boater surveys were not performed due to health and safety issues stemming from Grant PUD's Covid-19 pandemic response in 2021. Instead, Grant PUD Lands and Recreation staff distributed WDFW's AIS prevention permit flyer, WDFW AIS key chains, and whistles at Project boat launches.

Voluntary boater surveys will be conducted during Grant PUD's next regularly scheduled monitoring activities in 2023.

In 2021, the boat launch aquatic vegetation survey results mirrored the boat launch surveys from prior years, in that the boat launch areas have been primarily recolonized by native species overall, but also contain either Eurasian watermilfoil (*Myriophyllum spicatum*) and/or curly leaf pondweed (*Potamogeton crispus*) to a lesser extent. A new boat launch was established at Crescent Bar in 2018 and was included in the 2021 surveys.

¹ 132 FERC ¶ 62,016 (2010)

² 157 FERC ¶ 62,067 (2016)

Table of Contents

1.0 Introduction..... 1

 1.1 Objectives 1

 1.2 Priest Rapids Hydroelectric Project Description 1

2.0 Activities..... 4

 2.1 Education 4

 2.1.1 Educational Signage..... 4

 2.2 Monitoring 6

 2.2.1 Zebra/Quagga Mussel Sampling..... 6

 2.2.1.1 Plankton Tow Net 6

 2.2.1.2 Artificial Substrates 6

 2.2.1.3 Shoreline Surveys 6

 2.2.2 Aquatic Plant Surveys..... 7

 2.2.2.1 Boat-Based Surveys Methods 7

 2.2.3 Northern Pike Early Detection Monitoring..... 8

 2.2.3.1 Setlines 8

 2.2.3.2 Beach Seining 9

 2.2.3.3 Angling 9

 2.2.3.4 Video Fish Counting..... 9

 2.2.3.5 Fish Ladder and Turbine Dewatering 9

 2.2.3.6 Environmental DNA 9

 2.3 Local and Regional Coordination 9

 2.3.1 Annual Aquatic Invasive Species Meeting..... 10

 2.3.2 Flowering Rush Monitoring..... 10

3.0 Results..... 10

 3.1 Zebra/Quagga Mussel Monitoring..... 10

 3.1.1 Plankton Tow Net Results 10

 3.1.2 Artificial Substrate/Shoreline Survey Results 11

 3.2 Aquatic Plant Survey Results 11

 3.2.1 Boat Launch Transect Results 11

 3.3 Northern Pike Monitoring Results 14

4.0 Conclusion/Summary..... 14

Literature Cited..... 15

List of Figures

Figure 1 The Priest Rapids Hydroelectric Project with Project Boundary, mid-Columbia River, WA..... 2

Figure 2 Aerial photograph of Priest Rapids Dam, Priest Rapids Hydroelectric Project, mid-Columbia River, WA..... 3

Figure 3 Aerial photograph of Wanapum Dam, Priest Rapids Hydroelectric Project, mid-Columbia River, WA. 3

Figure 4 Informational/Educational signage configuration at the Vantage (Kittitas County) boat launch, Wanapum Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA 4

Figure 5 Updated Aquatic Invasive Species (AIS) signage for Priest Rapids Project Boat Launches. 5

Figure 6 Dominant species noted along transect points at Priest Rapids Project boat launches in 2021. 13

Figure 7 Sub-dominant species noted along transect points at Priest Rapids Project boat launches in 2021. 13

List of Tables

Table 1 Summary Results for Boat Launch Transect Monitoring, Priest Rapids Hydroelectric Project, mid-Columbia River, WA 12

List of Appendices

Appendix A Zebra/Quagga Mussel veliger sample results during 2021 Priest Rapids Hydroelectric Project, mid-Columbia River, WA A-1

Appendix B 2021 Northern Pike eDNA Results..... B-1

Appendix C Boat Launch Survey Maps Series for 2021 C-1

Appendix D Washington Department of Fish and Wildlife Comments and Grant PUD Responses..... D-1

Terms and Abbreviations

AIS	Aquatic Invasive Species
AISP	Aquatic Invasive Species Control and Prevention Plan
AISP Program	Aquatic Invasive Species Control and Prevention Program
CDFG	California Department of Fish and Game
FERC	Federal Energy Regulatory Committee
Grant PUD	Public Utility District No. 2 of Grant County, Washington
GIS	Geographic Information Systems
GPS	Global Positioning System
MW	Megawatt
NZMS	New Zealand Mudsail
PRFB	Priest Rapids Fish Bypass
PRFF	Priest Rapids Fish Forum
PRRA	Priest Rapids Recreation Area
Project	Priest Rapids Hydroelectric Project
RM	River Mile
USFWS	United States Fish and Wildlife Service
WFB	Wanapum Fish Bypass
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington Department of Ecology
WQC	Water Quality Certification

1.0 Introduction

Public Utility District No. 2 of Grant County, Washington (Grant PUD) owns and operates the Priest Rapids Hydroelectric Project (Project), located along the mid-Columbia River in central Washington state. The Project is authorized by the Federal Energy Regulatory Commission (FERC) under Project No. 2114³ and includes the Wanapum and Priest Rapids developments. A 401 Water Quality Certification (WQC) for the operation of the Project was issued by the Washington Department of Ecology (WDOE) on April 3, 2007, amended on March 6, 2008 (WDOE 2007), and directly incorporated into the FERC license to operate the Project on April 17, 2008 (FERC 2008).

The Aquatic Invasive Species Control and Prevention Program (AISP Program) activities for 2021 were conducted in accordance with the management plan titled, *Aquatic Invasive Species Control and Prevention Plan* (AISP; Grant PUD 2010) and associated amendments (Keeler 2016). The AISP was initially developed by Grant PUD in consultation with the Priest Rapids Fish Forum (PRFF), the WDOE's Freshwater Aquatic Weed Control Program, the Washington Department of Fish and Wildlife's (WDFW's) Aquatic Invasive Species Program, and in accordance with Section 6.6.4 of the 401 WQC (WDOE 2007) and Article 401(a)(22) of the FERC license (FERC 2008). The original AISP was submitted to FERC on March 3, 2010 and was approved on July 7, 2010. In June of 2016, Grant PUD requested an amendment to the 2010 AISP to incorporate modifications to the monitoring frequencies, which was approved by FERC in October of 2016⁴.

This annual report summarizes activities conducted in implementation year 2021 under the AISP Program.

1.1 Objectives

As identified in the AISP, the primary objective is to address methods to monitor and manage aquatic invasive flora and fauna in the Project. Key components of the AISP include education and monitoring that are designed to help manage, regulate, and potentially prevent introduction and/or spread of new/existing aquatic invasive species (AIS) within the Project.

1.2 Priest Rapids Hydroelectric Project Description

The downstream boundary of the Project is located approximately three miles below Priest Rapids Dam (river mile [RM] 397.1) and extends upriver to the Rock Island Dam tailrace at RM 453.5 (Figure 1).

The Priest Rapids development consists of a 7,725-acre reservoir and a 10,103-foot-long by 179.5-foot-high dam spanning the Columbia River. The dam consists of left and right embankment sections; left and right concrete gravity dam sections; a left and right fish passage structure, each with an upstream fish ladder; a gated spillway; a downstream fish passage structure (the Priest Rapids Fish Bypass (PRFB)); and a powerhouse containing ten vertical shaft integrated Kaplan turbine/generator sets with a total authorized installed capacity of 675 MW (best gate) (Figure 2).

The Wanapum Development consists of a 14,680-acre reservoir and an 8,637-foot-long by 186.5-foot-high dam spanning the Columbia River. The dam consists of left and right

³ 123 FERC ¶ 61,049 (2008)

⁴ 157 FERC ¶ 62,067 (2016)

embankment sections; left and right concrete gravity dam sections; a left and right fish passage structure, each with an upstream fish ladder; a gated spillway; a downstream fish passage structure (the Wanapum Fish Bypass (WFB)); and a powerhouse containing ten vertical shaft integrated Kaplan turbine/generator sets with a total authorized installed capacity (best gate) of 735 MW (Figure 3).

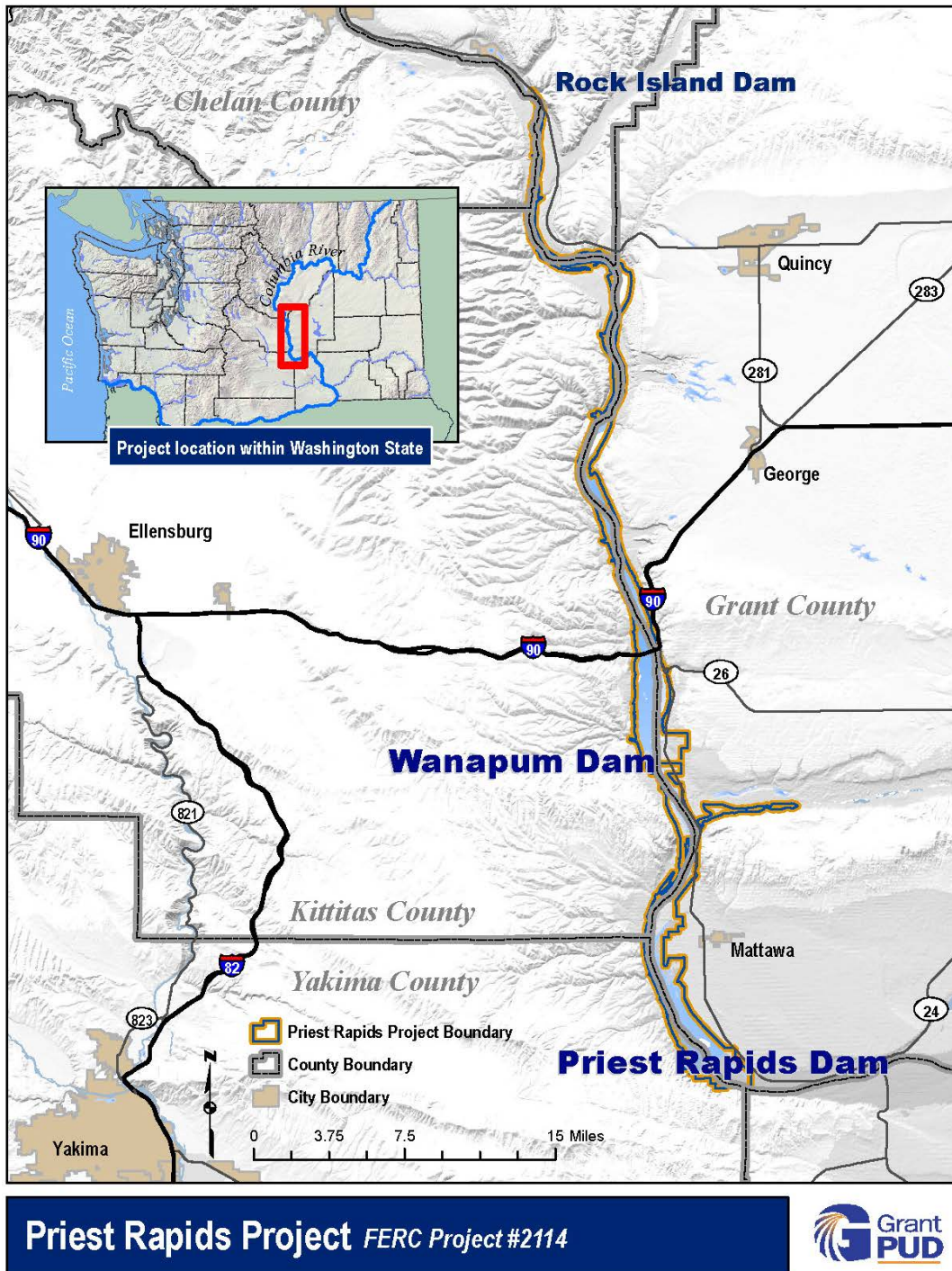


Figure 1 The Priest Rapids Hydroelectric Project with Project Boundary, mid-Columbia River, WA.

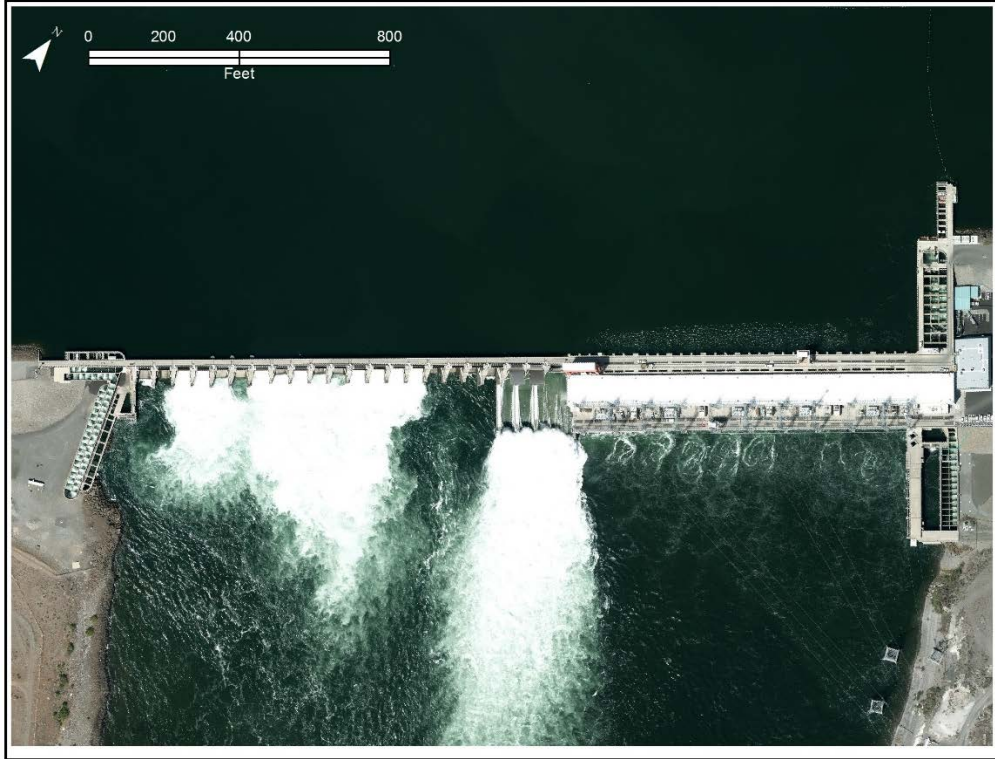


Figure 2 Aerial photograph of Priest Rapids Dam, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.



Figure 3 Aerial photograph of Wanapum Dam, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.

2.0 Activities

The following sections provide a summary of the activities conducted in 2021 for the AISP. These activities include elements of education, monitoring, and local and regional coordination. Each of these activities are discussed in more detail below.

2.1 Education

The educational activities implemented as part of the AISP for 2021 included, updating AIS educational signage at Project boat launches as needed. Grant PUD staff also distributed WDFW's AIS prevention permit flyer and WDFW AIS key chains and whistles at Grant PUD's project boat launches.

2.1.1 Educational Signage

Project boat launches outfitted with informational/educational signage during 2021 included Apricot Orchard and Upper Wanapum BL on the Wanapum Reservoir, and the Lower Wanapum BL on the Priest Reservoir. All Project boat launches during 2021 consisted of the approximate configuration of informational and educational signage as the example displayed in Figure 4 below. Grant PUD has updated all of its AIS educational signage at Project boat launches to be in line with the updated WDFW AIS signage as noted within Figure 5.



Figure 4 Informational/Educational signage configuration at the Vantage (Kittitas County) boat launch, Wanapum Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA

Protect Your Waters From Aquatic Invasive Species

BEFORE and AFTER launching boat

CLEAN

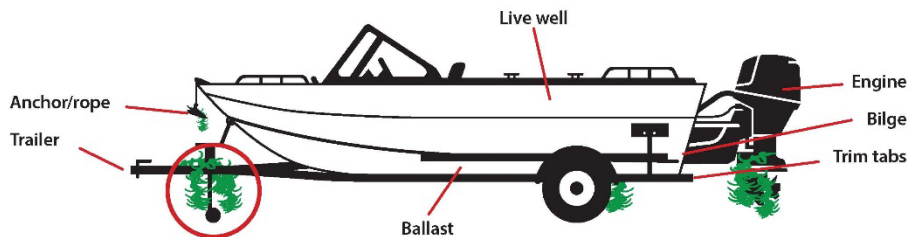
Clean interior/exterior of boat, trailer, & vehicle of any organic matter such as aquatic plants & mud. Dispose organic matter & unused bait in trash.

DRAIN

Drain bilge, ballast, wells & buckets before you leave area. Keep bilge plug out during transport.

DRY

Dry equipment before launching watercraft into another body of water.



For information on FREE boat inspections, call 1-888-WDFW-AIS (933-9247) or visit wdfw.wa.gov/ais.

Before you launch a boat that is not registered in Washington, you MUST purchase an Aquatic Invasive Species Prevention Permit.

How to buy:

- Online at fishhunt.dfw.wa.gov
- Find a license dealer near you at wdfw.wa.gov/licenses/dealers

Funds from permit sales supports efforts to keep Washington's waters free of aquatic invasive species and manage infestations when prevention fails.

Avoid Citations or Fines

- Failure to possess an Aquatic Invasive Species Prevention Permit – Infraction — RCW 77.15.160
- Possession of aquatic conveyance not meeting clean drain requirements – Infraction — RCW 77.135.110
- Introduction or possession of prohibited species – up to class C felony — RCW 77.15.160 (4)



Washington
Department of
**FISH and
WILDLIFE**



Figure 5 Updated Aquatic Invasive Species (AIS) signage for Priest Rapids Project Boat Launches.

2.2 Monitoring

The monitoring activities implemented as part of the AISP for 2021 included zebra/quagga mussel sampling (including plankton tows, artificial substrates, and shoreline surveys), aquatic plant surveys at boat launches, and northern pike early detection monitoring. Descriptions of the monitoring activities applied during 2021 are presented in the following sections.

2.2.1 Zebra/Quagga Mussel Sampling

Zebra/quagga mussel(s) presence/absence were monitored throughout the Project by use of a plankton tow net, inspection of artificial substrates, and visual shoreline surveys adjacent to artificial substrate locations. Each of these monitoring methods is covered in the following sections.

2.2.1.1 Plankton Tow Net

Horizontal and vertical plankton tow net samples were collected throughout the Project. Samples were collected at Crescent Bar, Sunland Estates, Wanapum forebay, Crab Creek, Lake Geneva, and the Priest Rapids forebay. Samples were collected three times throughout the monitoring season (twice in July, one mid-month and another near the end of July, and August 2021, respectively).

Sample methods included the use of a Wisconsin plankton net (363 μ mesh net) drifted for 40-100 ft. at a depth of approximately 20 ft. for each location. The plankton tow net was thoroughly rinsed, and all sample materials were transferred to a 250 ml Teflon bottle and preserved with 70% isopropyl alcohol. A label was affixed to the sample bottle and appropriately filled out. Methods for collecting vertical tow samples were almost identical to the horizontal tow sampling method as described above, except that samples were taken from one meter above the bottom of the river up through the entire water column without drifting. The sampling procedures followed protocols developed by WDFW (Jesse Schultz, WDFW, pers. com).

After collection, samples were cataloged and shipped to Cameron Lange, a Senior Environmental Scientist located in the Great Lakes region of the United States familiar with the identification of zebra/quagga mussel veliger, for analysis. Results and more information of these analyses are presented in Section 3.1.1 and Appendix A.

2.2.1.2 Artificial Substrates

Grant PUD deployed artificial substrates at some Project boat launch areas as an additional monitoring technique during 2021 to monitor for zebra and quagga mussels (and other AIS) near areas with high boater traffic. Boat launches selected for substrate deployment included Huntzinger and Desert Aire (PRRA) in the Priest Rapids Reservoir and Kittitas County (Vantage) and Crescent Bar (off-island) in the Wanapum Reservoir. Grant PUD followed the artificial substrate monitoring protocols as established by the California Department of Fish and Game (CDFG 2008) and provided by the WDFW (Jesse Schultz, WDFW, pers. com). One substrate was deployed at each site. The substrates were kept at least one meter above the bottom of the river and were examined on the same schedule as the plankton tow net samples. Results from the artificial substrate monitoring are presented in Section 3.1.2.

2.2.1.3 Shoreline Surveys

A brief (~10 minute) shoreline survey occurred adjacent to the same high-traffic boat launches visited for the artificial substrate sampling schedule (see Section 2.2.1.2 above), and followed

protocols developed by the 100th Meridian Initiative – Columbia River Basin Team (WDFW Personal Comm.) to briefly survey the shoreline near boat launches for adult zebra/quagga mussels, or other adult AIS. Results from these surveys are presented in Section 3.1.3.

2.2.2 Aquatic Plant Surveys

Aquatic vegetation surveys conducted in 2021 focused on assessing aquatic plant distribution and species dominance within the projects boat launches. During the 2025 monitoring season Grant PUD will conduct another round of project wide aquatic vegetation surveys. In 2021 Grant PUD continued to monitor aquatic vegetation using established transects within the projects boat launches.

2.2.2.1 Boat-Based Surveys Methods

Survey dates were consistent with surveys from prior years (August/September). These survey efforts fulfilled the objective of revisiting transects at Project boat launches to collect sample data for species along the transects.

Transect methodology generally followed the same protocol in 2021 as was completed during previous monitoring events, which were modified slightly from the original protocol of 2011 (Keeler 2012-2020), but consistent with AISP requirements (Grant PUD 2010). The AISP states that boat launch surveys will:

“...be conducted by traveling three 50-meter transects out from the boat launch, or until visual contact with the macrophytes is lost. The first transect will be 30m upstream of the launch, the second will be even with the middle of the launch, and the third transect will be 30 meters downstream of the launch.”

In practice, transect configurations were adapted to local conditions based on the presence of adjacent shorelines, jetties and/or other structures.

In accordance with the AISP, three transects were surveyed at each boat launch; however, four transects were surveyed at the Desert Aire (PRRA) boat launch due to its reconfiguration. Other boat launches have been reconstructed since surveys began (Frenchman Coulee, Vantage, Wanapum State Park, Wanapum Forebay, and Huntzinger) but not substantially reconfigured; therefore, transect locations were not modified at these boat launches. During surveys, aquatic vegetation was sampled periodically along each transect, and dominance or occurrence of AIS species (e.g., Eurasian watermilfoil or curly leaf pondweed), native species, or no vegetation was recorded at each sample point. Boat launches surveyed within the Wanapum Reservoir included the following:

- Apricot Orchard
- Crescent Bar – Chinook (off-island)
- Crescent Bar – Riverbend (on-island)
- Sunland Estates
- Frenchman Coulee
- Kittitas County (Vantage)
- Wanapum State Park

- Upper Wanapum

Boat launches surveyed within the Priest Rapids Reservoir included the following:

- Lower Wanapum
- Huntzinger
- Buckshot and
- Desert Aire (PRRA)

Aquatic vegetation sampling was conducted either visually or using a sampling rake to collect from points along each transect, or within the aquatic vegetation areas. At each of the sampling locations, a GPS point with associated aquatic plant presence/absence and species composition data was recorded using the iPad. Rake samples were also examined for presence of potential macroinvertebrate AIS including quagga/zebra mussels and/or New Zealand mudsnails.

During the 2021 surveys, aquatic vegetation presence was recorded at each location as follows:

- Dominant species at each location was recorded as Eurasian milfoil, curly leaf pondweed, native species, or no vegetation.
- Secondary and/or tertiary sub-dominant species, if present, were also recorded (Eurasian milfoil, curly leaf pondweed, and/or native species).

Results for the 2021 aquatic vegetation surveys are discussed in detail in Section 3.2 and displayed in Figures C-1 through C-11 in Appendix C and Figures D-1 through D-10 in Appendix D.

2.2.3 Northern Pike Early Detection Monitoring

Grant PUD conducted activities for a northern pikeminnow removal program in 2021 that utilized set lines, beach seining, and angling. These efforts provided a potential avenue for early detection of northern pike within the Project. Additional activities conducted by Grant PUD which also served as a potential early detection method for northern pike include video fish count systems (Wanapum and Priest Rapids dams), dewatering of fish ladders and turbines (during maintenance), and a White Sturgeon Monitoring and Evaluation Program (i.e., set line fishery). The primary early detection technique that was first implemented during the 2019 season was the use of eDNA technology. This method was continued during the 2021 season. More details on these potential early monitoring techniques are provided in the following sections.

2.2.3.1 Setlines

Set lines are approximately 500 feet in length with hooks attached at equidistant intervals (approximately 5-ft. Each set line is composed of tarred Power Braided Twine No. 84. Both ends of the set line are equipped with an 8-lb cylindrical lead anchor, and 150-foot buoy lines which are attached upon deployment to mark the location and allow retrieval of the set line. Set line buoys are labeled with contact information and the current scientific collection permit number. The hook clips used on the set line consisted of a single-loop ground clip, a swivel, one foot of 10-lb test monofilament line, a size-10 winner day-glow float, and a No. 10 treble hook baited with a cricket. Light-weight monofilament is used to allow inadvertently caught larger non-target

fish such as white sturgeon (*Acipenser transmontanus*) to break away. Set lines are fished over a 24–48-hour period (typically) and recovered daily (depending on river/weather conditions).

2.2.3.2 Beach Seining

A beach seine fishery is conducted annually in the late summer and early fall. An 80-ft long, 6-ft deep beach seine with 1/8th in. mesh is used to remove age three and younger non-native piscivorous fish. Beach seining activities generally occur in the Wanapum reservoir where juvenile northern pikeminnow and non-native piscivorous fish have been collected in previous years.

2.2.3.3 Angling

Angling efforts are conducted in the tailrace directly below the transformer deck of Wanapum Dam using 8’6” spinning rods spooled with 30lb test and 10lb test leaders. Plastic fishing lures resembling juvenile salmonids are used.

2.2.3.4 Video Fish Counting

Annual adult fish-counting equipment at both Wanapum and Priest Rapids dams provides reliable fish counts to track trends for both resident and anadromous species and serves as an early detection or monitoring system for non-native species. The video fish-counting (VFC) system configuration at each dam has digital video cameras in each fishway streaming data to digital video recorders (DVRs). These DVRs are networked and accessed by fish counters via PCs from the fish-counting room at Wanapum Dam. Data from the DVRs are played back, and fish are identified and counted by the fish counters via a separate tallying program. Fish counting runs April 15 through November 15 of each year.

2.2.3.5 Fish Ladder and Turbine Dewatering

Dewatering of the fishways at Wanapum and Priest Rapids dams for inspection and maintenance is conducted annually during the periods of minimum fish migration (November 15 – March 31). Although infrequent, turbine dewatering for maintenance or rehabilitation occurs which allows Grant PUD staff to access and perform fish salvage activities within the dams. If northern pike were present within the fishways during salvage they would be observed and collected.

2.2.3.6 Environmental DNA

The use of eDNA was first implemented during the 2019 season within the Project and was continued during the 2021 season. The protocols followed for eDNA sample collection were established by the Rocky Mountain Research Station (Carmin et. al 2016). In 2021 Grant PUD added an additional eDNA site to the four sample stations that were established in 2019. Sites included are Crescent Bar Riverbend Park Boat Launch (on-island), the Rattlesnake Cove day-use area adjacent to Sunland Estates in the Wanapum Reservoir, the mouth of Crab Creek and Buckshot boat launch in the Priest Rapids Reservoir and the addition of the Wanapum State Park boat launch located in the Wanapum Reservoir. Results from these efforts are noted within Section 3.3 below and in Appendix B.

2.3 Local and Regional Coordination

Local and regional coordination activities in 2021 involved hosting Grant PUD’s Annual Aquatic Invasive Species meeting (virtually for 2021).

2.3.1 Annual Aquatic Invasive Species Meeting

On April 29, 2021, and in accordance with the AISP, Grant PUD hosted its annual AIS meeting that was conducted virtually in 2021 because of health and safety concerns stemming from the Covid-19 pandemic. Per the AISP, the purpose of this meeting is to discuss the upcoming monitoring and educational season, any needed/warranted changes to AIS education, monitoring, and/or control methods or other changes to the AISP based on results from the previous year, new technologies, new AIS threats and/or introductions, new AIS pathways, etc. Attendees included Carson Keeler and Nathan Dietrich (Grant PUD), Jesse Schultz (WDFW via WebEx/conference line), Marcie Clement (Chelan PUD via WebEx/conference line) and Jenifer Parsons/Breean Zimmerman (WDOE via WebEx/conference line). A PowerPoint was presented by Grant PUD on the results from the 2020 season along with a brief overview of the AISP activities to date. Comments were received from both WDFW and WDOE and incorporated into the final AIS report for 2021 (Dietrich 2021).

2.3.2 Flowering Rush Monitoring

Grant PUD was unable to participate in a Flowering Rush monitoring event within the Rocky Reach Reservoir. This event was held to conduct surveys to evaluate the potential spread of the Flowering Rush species and to mark areas for a removal team to visit and aid in the eradication effort. Grant PUD continues to maintain communication with Chelan PUD regarding these monitoring events. Grant PUD continues to monitor for Flowering Rush during aquatic vegetation survey within the project area.

3.0 Results

The following sections provide results from activities conducted as part of the AISP in 2021, which includes outcomes from the zebra/quagga mussel sampling (plankton tows and artificial substrate/shoreline surveys), aquatic vegetation boat launch transect surveys and northern pike monitoring.

3.1 Zebra/Quagga Mussel Monitoring

As stated above in Section 2.2.1, zebra/quagga mussels were monitored by use of plankton tow nets, artificial substrates, and shoreline surveys throughout the Project. Results from each method are discussed in the following sections.

3.1.1 Plankton Tow Net Results

A total of 18 samples were collected from July – September, cataloged, and sent to Cameron Lange, a Senior Environmental Scientist located in the Great Lakes region of the United States who is familiar with the identification of zebra/quagga mussel veliger and is recognized as an expert by WDFW (Jesse Schultz, WDFW, pers. com), for analysis. The 18 samples were analyzed using standardized techniques that are accepted for zebra mussel analyses. These techniques included the use of a dissecting style microscope fitted with polarizing filters used to examine the samples under 40x-120x magnification. Since zebra mussels have not previously been found at the sample locations within the Project, the entire settled contents of each sample were examined. If samples contained a lot of phytoplankton or plankton, they were prescreened through a 425-micron mesh sieve (Lange 2020).

No zebra mussels were found in any of the samples analyzed. A copy of each analysis was sent via email to WDFW during the 2021 season. See Appendix A of this annual report for results from samples analyzed during 2021.

3.1.2 Artificial Substrate/Shoreline Survey Results

During the same timeframe that plankton tow samples were collected (July and September), artificial substrates and shoreline areas around the substrate locations were checked for presence/absence of zebra/quagga mussels or other AIS macroinvertebrates. A standard form was supplied by WDFW to check for presence/absence of mussels (WDFW 2016). No presence of zebra/quagga mussels, or any other macroinvertebrate AIS, were detected during the 2021 season. Results were documented, scanned, and sent via email to WDFW during 2021.

3.2 Aquatic Plant Survey Results

Results from the survey efforts put forth along transects at each boat launch are depicted in the following sections. Survey efforts during 2021 concentrated on boat launch transects that were recorded during previous survey efforts (Keeler 2012-2020).

3.2.1 Boat Launch Transect Results

Figures C-1 through C-12 illustrate results from aquatic vegetation mapping along transects established at each Project boat launch within Appendix C of this annual report. Each GPS point location along these transects represents a single sampling location where dominance, presence and/or absence of AIS and native aquatic vegetation were recorded based on visual observations and/or rake sampling within an approximate 4 meter by 2-meter plot located at the front of the boat. Where multiple species were present, the dominant species was recorded, and additional species were noted as sub-dominant. In some cases, transects were terminated early because of loss of contact with aquatic vegetation, which was often correlated with a water depth greater than 20 feet. This is consistent with the protocol for these surveys described in the AISP (Grant PUD 2010).

Results from the 2021 boat launch aquatic plant surveys within the Priest Rapids Reservoir were similar to the results from 2019 and 2020, with some minor differences. Results for the Wanapum Reservoir continued to differ from pre-drawdown surveys but were similar to post-drawdown surveys (i.e., areas more dominated by native vs AIS). In 2021, four of the eight Wanapum Reservoir boat launches had been recolonized with primarily native species, but also contained either Eurasian watermilfoil and/or curly leaf pondweed (Table 1) to a lesser extent. The boat launch at Crescent Bar was found to be dominated/sub-dominated by native species. Project-wide boat launch results indicated a slight change in dominant/sub-dominant species, with the presence of both Eurasian watermilfoil and curly leaf pondweed. Table 1 includes a summary of results for each boat launch. Figure 6 and Figure 7 display a visual representation of dominant and sub-dominant species found at each transect sample point for each boat launch.

Table 1 Summary Results for Boat Launch Transect Monitoring, Priest Rapids Hydroelectric Project, mid-Columbia River, WA

Year	Apricot Orchard			Crescent Bar			Sunland			Frenchman Coulee			Vantage			Wanapum State Park			Upper Wanapum			Lower Wanapum			Huntzinger			Buckshot			Desert Aire					
	EM	CP	NS	EM	CP	NS	EM	CP	NS	EM	CP	NS	EM	CP	NS	EM	CP	NS	EM	CP	NS	EM	CP	NS	EM	CP	NS	EM	CP	NS	EM	CP	NS			
2011				x	x		x			x	x		x	x		x	x		x	x								x			x					
2012				x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x							x	x	x	x	x	x			
2013				x	x	x	x	x	x	x	x	x	x	x	x	x	x	x										x	x	x	x	x	x			
2014																									x	x	x	x		x	x	x	x			
2015						x	x	x	x						x		x	x			x				x		x	x	x	x	x	x	x			
2016				x		x	x		x	x	x	x	x	x	x		x	x			x				x		x	x		x	x	x				x
2017	x		x	x		x	x		x	x		x	x		x			x			x				x		x	x	x	x	x	x	x			
2018	x		x	x		x	x		x	x		x	x		x	x	x	x			x				x		x	x	x	x	x	x	x			
2019	x		x	x		x	x		x	x		x	x		x	x	x	x			x				x		x	x	x	x	x	x	x			
2020	x		x	x		x	x		x	x		x	x		x	x	x	x			x				x		x	x	x	x	x	x	x			
2021		x	x	x		x	x		x	x		x	x		x	x	x	x			x	x			x	x	x	x		x	x	x	x			

Notes:

1. EM = Eurasian watermilfoil; CP = curly leaf pondweed; NS = native species.
2. Native species were not recorded in 2011.
3. The following boat launches were not surveyed in 2014 due to the Wanapum drawdown: Crescent Bar, Sunland, Frenchman Coulee, Vantage, Wanapum State Park and Upper Wanapum.
4. Huntzinger boat launch was formally established between the 2013 and 2014 survey seasons and therefore was not sampled prior to 2014.
5. Apricot Orchard boat launch was formally established between 2016 and 2017 survey seasons, and therefore was not sampled prior to 2017.
6. Crescent Bar Riverbend Park Boat Launch (on-island) was formally established in 2018 and 2019. Results in table include data from both on and off Island boat launches.

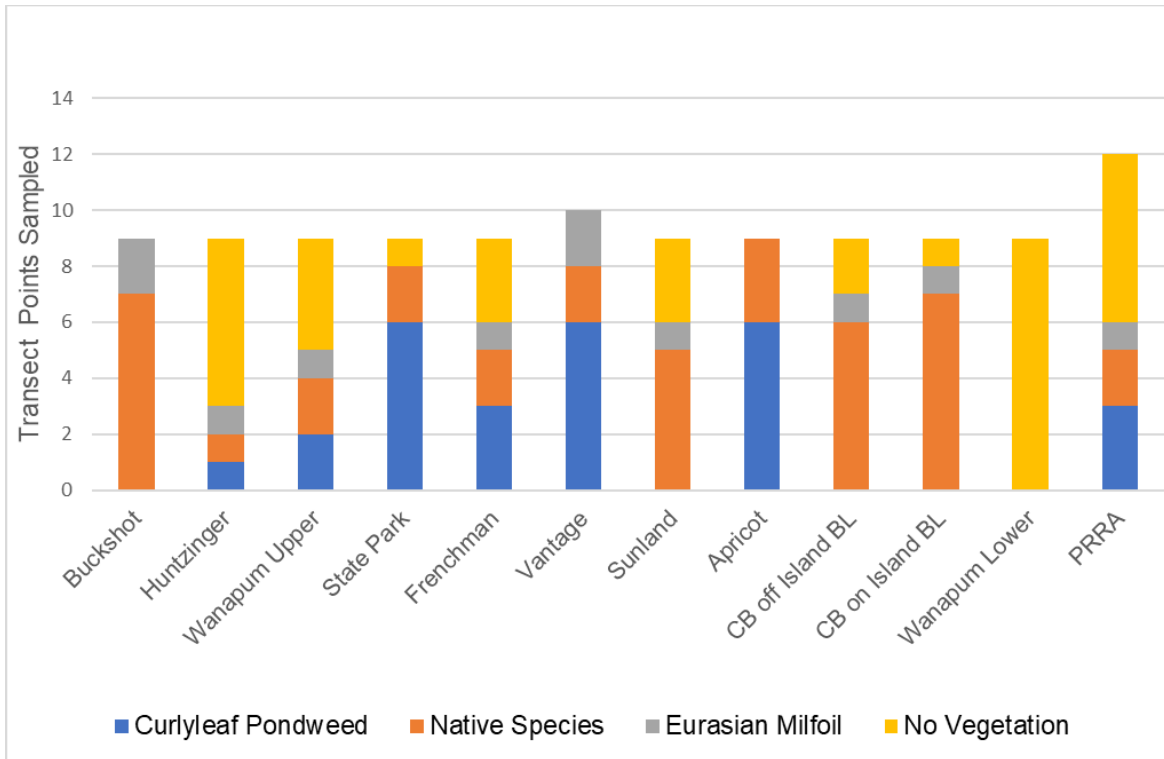


Figure 6 Dominant species noted along transect points at Priest Rapids Project boat launches in 2021.

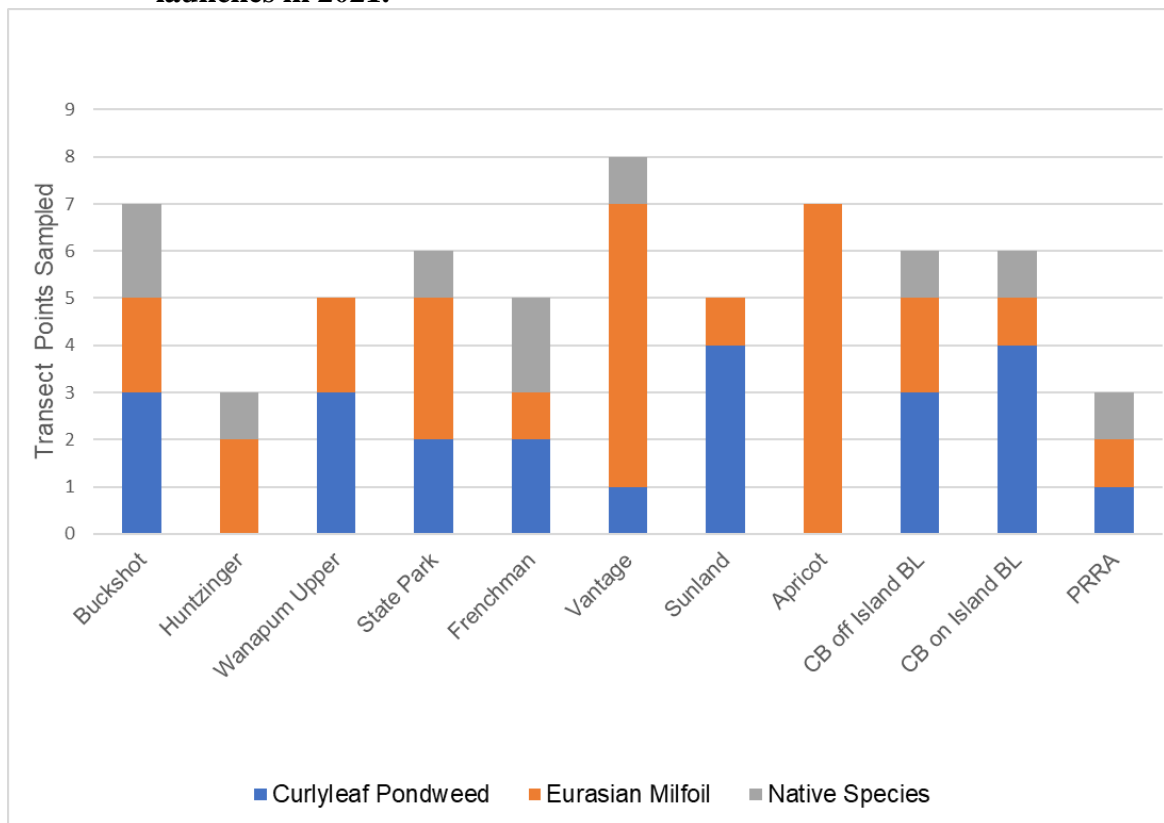


Figure 7 Sub-dominant species noted along transect points at Priest Rapids Project boat launches in 2021.

3.3 Northern Pike Monitoring Results

During 2021, various fish collection techniques (beach seining, setlines, and angling) were employed over differing habitat types within the Project, and no northern pike were collected. Additionally, no northern pike were detected during the fish ladder and/or turbine maintenance or were observed passing through the fishways via the video fish counting system in 2021.

Lastly, as noted above in section 2.2.3.7, eDNA was collected eight times at five locations during 2021. No northern pike eDNA were detected in any of the 40 samples analyzed. A copy of each analysis was sent via email to WDFW during the 2021 season. See Appendix B of this annual report for eDNA results from samples analyzed during 2021.

4.0 Conclusion/Summary

Educational activities for 2021 included providing signage updates at Project boat launches to match current WDFW AIS boat launch signage statewide. Monitoring activities during 2021 consisted of zebra/quagga mussel sampling, aquatic plant surveys at boat launches, and northern pike monitoring. Results from the monitoring efforts in 2021 reported no zebra/quagga mussel veliger identified in any samples, no presence of zebra/quagga mussels or other macroinvertebrate AIS, including New Zealand mudsnail (NZMS), on any artificial substrates within the Project. Results from the boat launch aquatic vegetation surveys within the Project were similar to prior years, with some minor deviations. Lastly, the efforts, which included the use of eDNA sampling, employed for early detection of northern pike within the Project did not detect the occurrence of the species within the Project.

Discussions about the future of the AISP Program will take place during Grant PUD's annual AIS meeting in early to mid-April 2022. Results from these discussions will be documented and included in the final AIS report, due to FERC by June 1, 2022.

Literature Cited

- CDFG (California Department of Fish and Game). 2008. Zebra and Quagga Mussel Artificial Substrate Monitoring Protocol. Adopted from the California Department of Water Resources Monitoring Instructions for Zebra/Quagga Mussel Plate Samplers, April 2, 2008.
- Carim, Kellie J., McKelvey, Kevin S., Young, Michael K., Wilcox, Taylor M., Schwartz, Michael K. 2016. A protocol for collecting environmental DNA samples from streams. Gen. Tech. Rep. RMRS-GTR-355. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 18 p.
- FERC (Federal Energy Regulatory Commission). 2008. Order Issuing New License for Public Utility District No. 2 of Grant County, 123 FERC ¶ 61,049, Washington D.C.
- Grant PUD (Public Utility District No. 2 of Grant County, Washington). 2010. Aquatic Invasive Species Control and Prevention Plan. Public Utility District No. 2 of Grant County, Ephrata, Washington. Accessed at <http://www.grantpud.org/environment/water-quality/aquatic-invasive-species>
- Keeler, C. 2012-20. Aquatic Invasive Species Control and Prevention Plan Annual Report. Priest Rapids Hydroelectric Project (P-2114), License Article 401(a)(22). Public Utility District No. 2 of Grant County, Washington. May 2012-20.
- Lange, C. 2020. Letter to Mr. Carson Keeler, Grant County PUD, Wanapum Dam, Beverly, Washington.
- Schultz, J. 2010-2020. Aquatic Nuisance Species Management Program Biologist. Washington Department of Fish and Wildlife. Personnel Communication.
- Washington Department of Ecology (WDOE). 2007. Water Quality Certification for the Priest Rapids Hydroelectric Project. Order No. 4219 dated April 2007 amended March 6, 2008 (Order 5419). <http://www.ecy.wa.gov/programs/wq/ferc/existingcerts.html#G>.
- WDFW. (Washington Department of Fish and Wildlife). 2016. Artificial Substrate Monitoring Data Collection Form. Olympia, Washington.

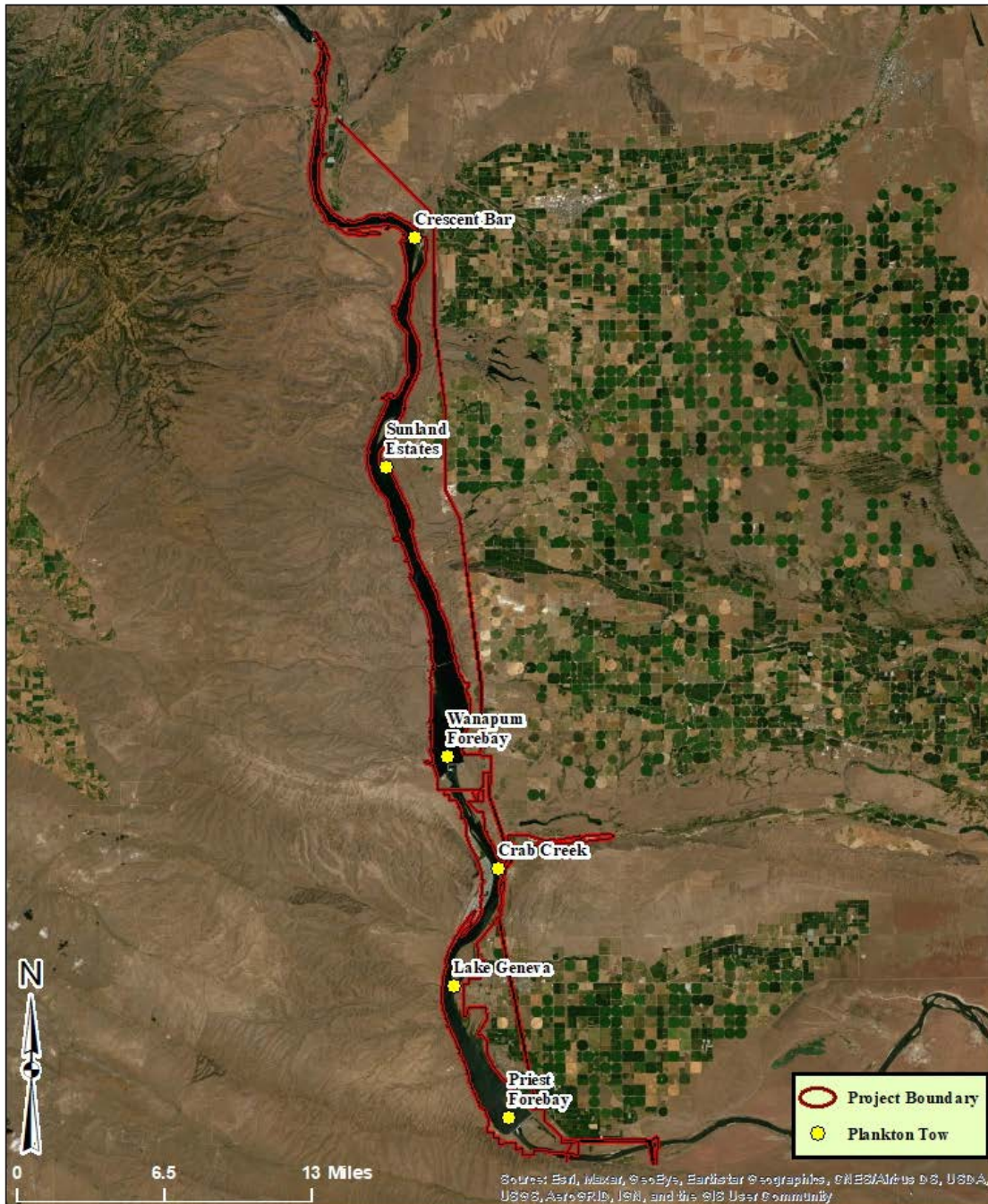
Appendix A
Zebra/Quagga Mussel veliger sample results during 2021
Priest Rapids Hydroelectric Project, mid-Columbia River, WA

Table A-1 Zebra/Quagga Mussel Veliger Sampling Results, Priest Rapids Project, mid-Columbia River, WA.

Date	Sample #	Reservoir	Location	Zebra Mussels	Corbicula	Prescreened	Comments
7/13/2021	1	Priest Rapids	Crab Creek	No	Some	No	
7/13/2021	2	Priest Rapids	Lake Geneva	No	No	No	
7/13/2021	3	Priest Rapids	Priest Rapids Forebay	No	Few	No	Many Cladocerans
7/13/2021	4	Wanapum	Crescent Bar	No	No	No	Many Cladocerans
7/13/2021	5	Wanapum	Sunland Estates	No	No	No	Many Cladocerans
7/13/2021	6	Wanapum	Wanapum Dam Forebay	No	No	No	

Date	Sample #	Reservoir	Location	Zebra Mussels	Corbicula	Prescreened	Comments
7/26/2021	3	Priest Rapids	Crab Creek	No	Yes	No	Heavy Phytoplankton
7/26/2021	2	Priest Rapids	Lake Geneva	No	No	No	
7/26/2021	1	Priest Rapids	Priest Rapids Forebay	No	No	No	
7/26/2021	5	Wanapum	Crescent Bar	No	No	No	
7/26/2021	4	Wanapum	Sunland Estates	No	No	No	Many Cladocerans
7/26/2021	6	Wanapum	Wanapum Dam Forebay/State Park	No	No	No	

Date	Sample #	Reservoir	Location	Zebra Mussels	Corbicula	Prescreened	Comments
9/9/2021	4	Priest Rapids	Crab Creek	No	Few	No	Heavy Phytoplankton
9/9/2021	5	Priest Rapids	Lake Geneva	No	No	No	
9/9/2021	6	Priest Rapids	Priest Rapids Forebay	No	Few	No	
9/7/2021	2	Wanapum	Crescent Bar	No	Few	No	
9/7/2021	3	Wanapum	Sunland Estates	No	No	No	
9/7/2021	1	Wanapum	Wanapum Dam Forebay/State Park	No	No	No	



**Quagga/Zebra Mussel Sample Locations,
Priest Rapids Project, mid-Columbia River, WA**

This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. NR GIS - 2022



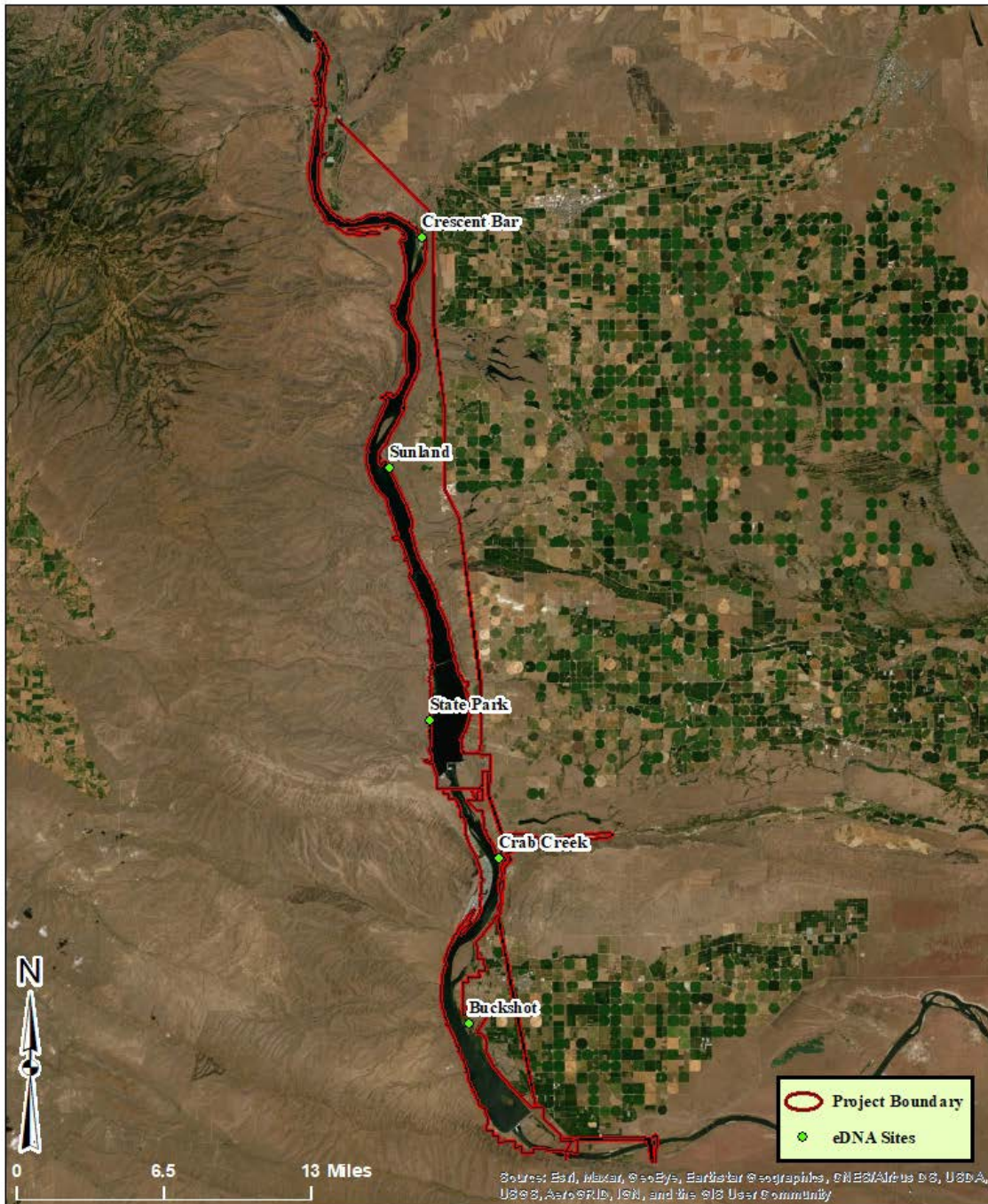
Figure A-1 Quagga/Zebra Mussel Sample Locations, Priest Rapids Project, mid-Columbia River, WA.

Appendix B
2021 Northern Pike eDNA Results

Table B-1 Results of eDNA analysis for detection of Northern Pike in samples collected by Grant PUD. All samples were processed at the National Genomics Center for Wildlife and Fish Conservation. Samples were analyzed in triplicate. PCR reactions using an eDNA assay developed by Carim et al. (2019). "#Filters" refers to the number of filters used to obtain the sample. "Filter volumes" refers to the volume of water in liters that was pumped through each filter. "Positive Wells" refers to the number positive reactions in each triplicate analysis. No samples in this dataset showed signs of PCR inhibition.

Waterbody	Site #	Site Description	Date	# Filters	Filter Volumes (L)	Northern Pike Detected DNA?	Positive Wells
Columbia River (Wanapum Reservoir)	CB-01	Crescent Bar on island Boat Launch	3/16/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SL-02	Sunland Estates/Rattlesnake Cove	3/16/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	CC-03	Crab Creek/Near the mouth	3/16/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	BK-04	Buckshot Boat Launch	3/16/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SP-05	Wanapum State Park Boat Launch	3/16/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	CB-01	Crescent Bar on island Boat Launch	4/12/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SL-02	Sunland Estates/Rattlesnake Cove	4/12/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	CC-03	Crab Creek/Near the mouth	4/12/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	BK-04	Buckshot Boat Launch	4/12/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SP-05	Wanapum State Park Boat Launch	4/12/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	CB-01	Crescent Bar on island Boat Launch	5/10/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SL-02	Sunland Estates/Rattlesnake Cove	5/10/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	CC-03	Crab Creek/Near the mouth	5/10/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	BK-04	Buckshot Boat Launch	5/10/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SP-05	Wanapum State Park Boat Launch	5/10/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	CB-01	Crescent Bar on island Boat Launch	6/2/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SL-02	Sunland Estates/Rattlesnake Cove	6/2/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	CC-03	Crab Creek/Near the mouth	6/2/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	BK-04	Buckshot Boat Launch	6/2/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SP-05	Wanapum State Park Boat Launch	6/2/2021	1	a: 5	N	0/3

Waterbody	Site #	Site Description	Date	# Filters	Filter Volumes (L)	Northern Pike Detected DNA?	Positive Wells
Columbia River (Wanapum Reservoir)	CB-01	Crescent Bar on island Boat Launch	7/12/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SL-02	Sunland Estates/Rattlesnake Cove	7/12/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	CC-03	Crab Creek/Near the mouth	7/12/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	BK-04	Buckshot Boat Launch	7/12/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SP-05	Wanapum State Park Boat Launch	7/12/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	CB-01	Crescent Bar on island Boat Launch	8/9/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SL-02	Sunland Estates/Rattlesnake Cove	8/9/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	CC-03	Crab Creek/Near the mouth	8/9/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	BK-04	Buckshot Boat Launch	8/9/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SP-05	Wanapum State Park Boat Launch	8/9/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	CB-01	Crescent Bar on island Boat Launch	9/14/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SL-02	Sunland Estates/Rattlesnake Cove	9/14/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	CC-03	Crab Creek/Near the mouth	9/14/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	BK-04	Buckshot Boat Launch	9/14/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SP-05	Wanapum State Park Boat Launch	9/14/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	CB-01	Crescent Bar on island Boat Launch	10/12/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SL-02	Sunland Estates/Rattlesnake Cove	10/12/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	CC-03	Crab Creek/Near the mouth	10/12/2021	1	a: 5	N	0/3
Columbia River (Priest Rapids)	BK-04	Buckshot Boat Launch	10/12/2021	1	a: 5	N	0/3
Columbia River (Wanapum Reservoir)	SP-05	Wanapum State Park Boat Launch	10/12/2021	1	a: 5	N	0/3



Northern Pike Environmental DNA (eDNA) Sample Locations, Priest Rapids Project, mid Columbia River, WA.

This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. NR GIS - 2021



Figure B-1 Northern Pike Environmental DNA (eDNA) Sample Locations, Priest Rapids Project, mid-Columbia River, WA.

Appendix C
Boat Launch Survey Maps Series for 2021



Transect Data:

Occurrence of Aquatic Vegetation Species

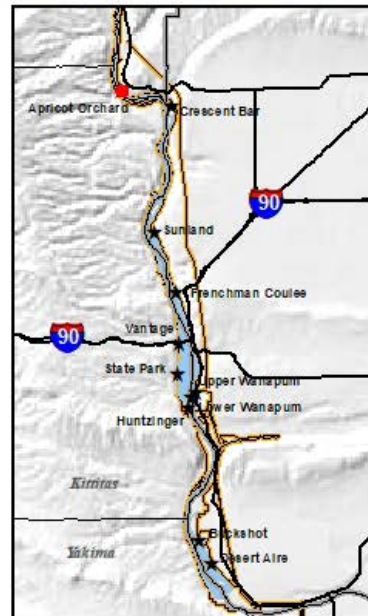
NS*	EM*	CP*
NS*, CP	EM*, CP	CP*, EM
NS*, EM	EM*, NS	CP*, NS
NS*, CP, EM	EM*, NS, CP	CP*, EM, NS
		No Vegetation

NS = native species

EM = Eurasian watermilfoil

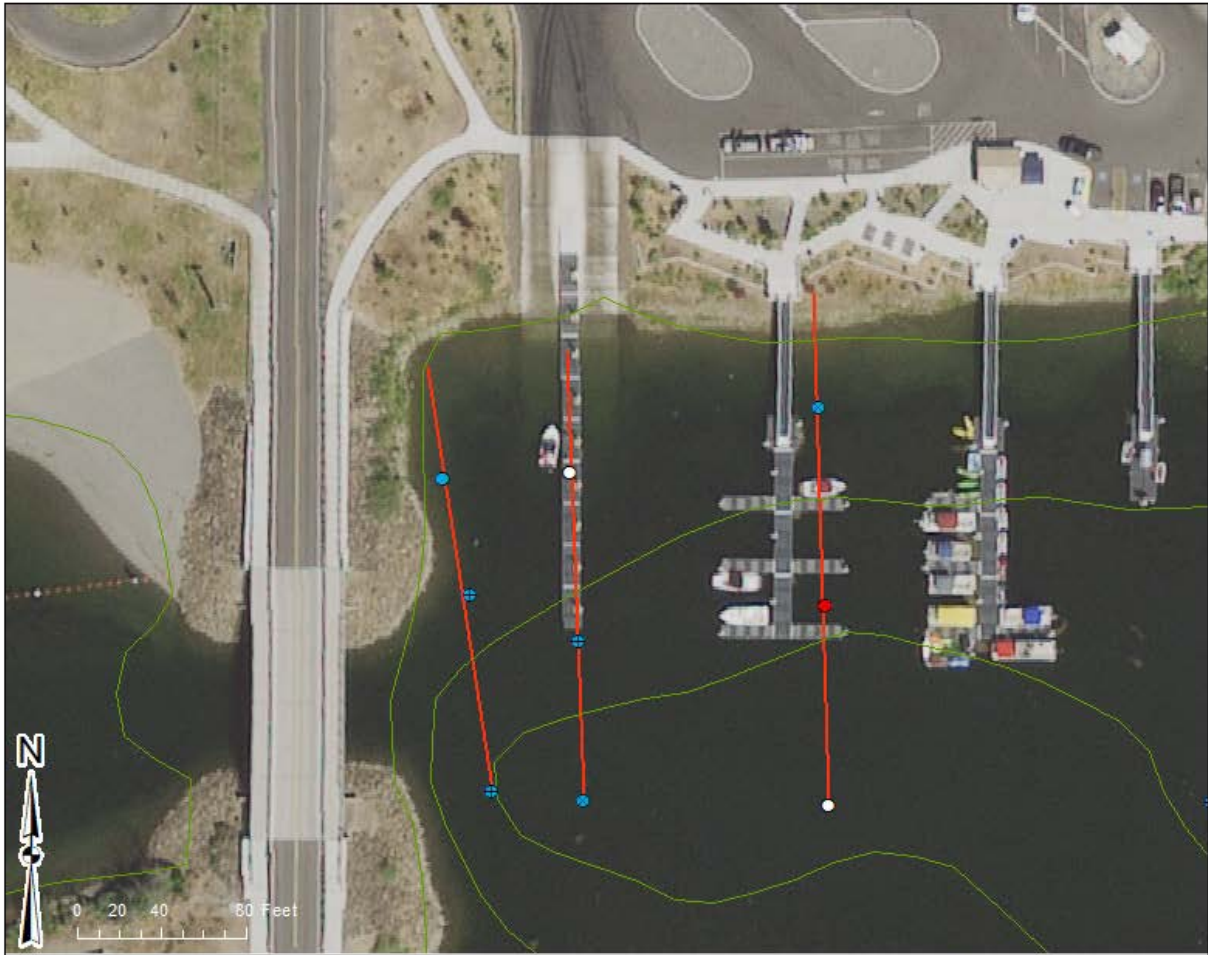
CP = curlyleaf pondweed

* indicates dominant species



2021 Boat Launch Transects
Apricot Orchard Boat Launch
This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-1 Apricot Orchard Boat Launch Transects, Wanapum Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.



Transect Data:

Occurrence of Aquatic Vegetation Species

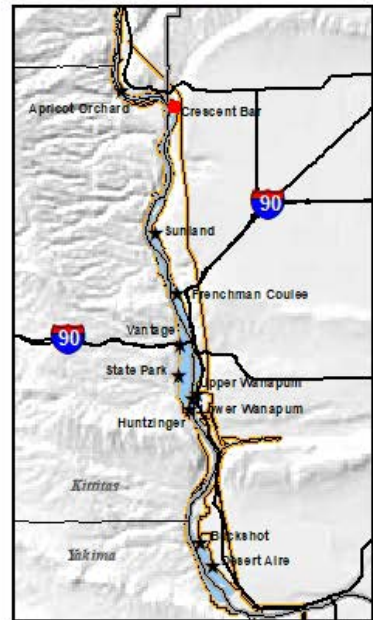
- | | | |
|---------------|---------------|-----------------|
| ● NS* | ● EM* | ● CP* |
| ⊕ NS*, CP | ⊕ EM*, CP | ⊗ CP*, EM |
| ⊗ NS*, EM | ⊕ EM*, NS | ⊕ CP*, NS |
| ⊕ NS*, CP, EM | ⊕ EM*, NS, CP | ⊕ CP*, EM, NS |
| | | ○ No Vegetation |

NS = native species

EM = Eurasian watermilfoil

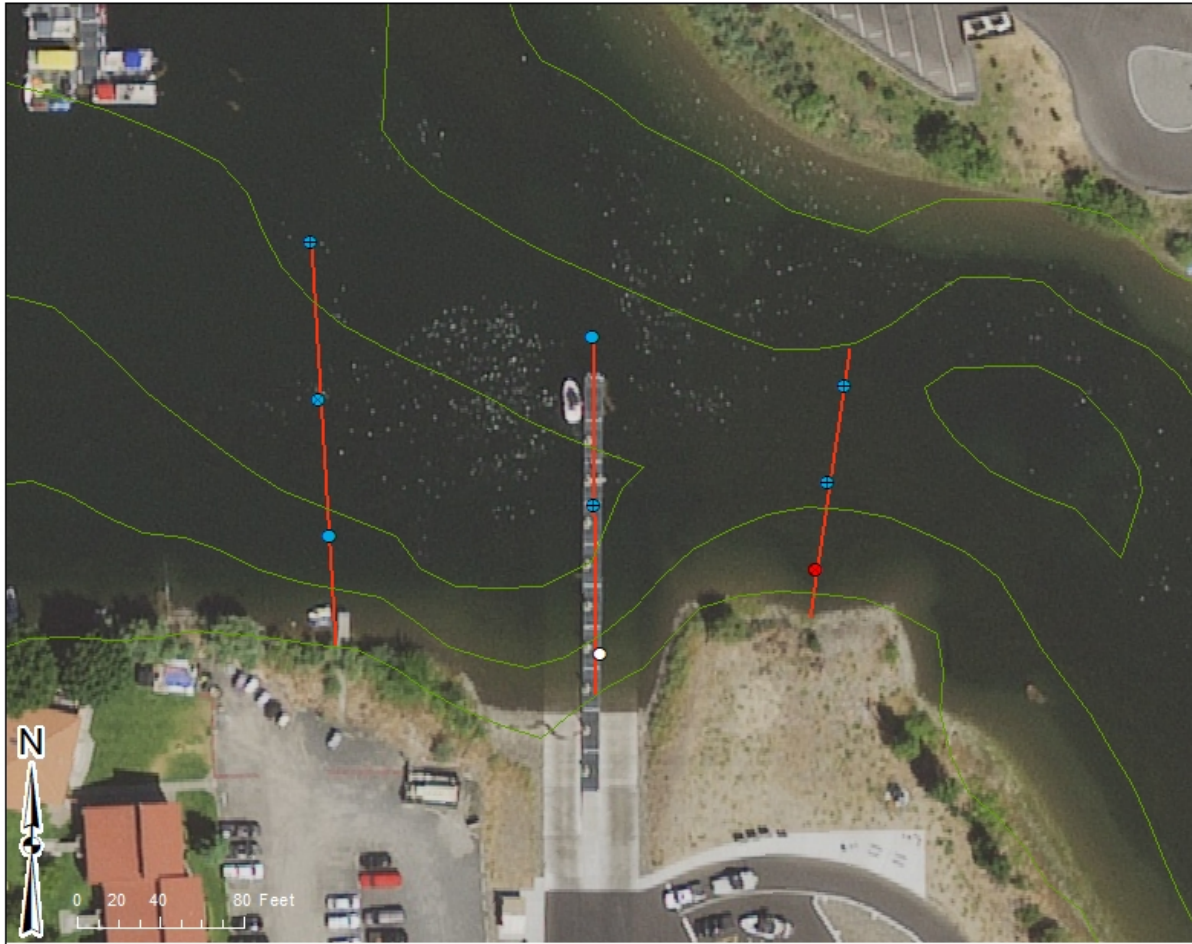
CP = curlyleaf pondweed

* indicates dominant species



2021 Boat Launch Transects
Crescent Bar off Island Boat Launch
This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-2 Crescent Bar Boat Launch Transects, Wanapum Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.



Transect Data:

Occurrence of Aquatic Vegetation Species

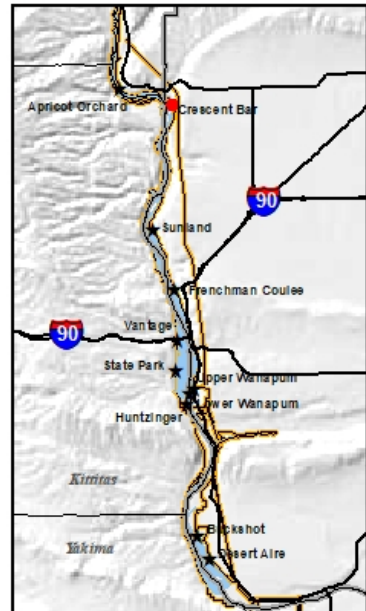
- | | | |
|---------------|---------------|-----------------|
| ● NS* | ● EM* | ● CP* |
| ⊕ NS*, CP | ⊕ EM*, CP | ⊗ CP*, EM |
| ⊗ NS*, EM | ⊙ EM*, NS | ⊙ CP*, NS |
| ⊕ NS*, CP, EM | ⊕ EM*, NS, CP | ⊕ CP*, EM, NS |
| | | ○ No Vegetation |

NS = native species

EM = Eurasian watermilfoil

CP = curlyleaf pondweed

* indicates dominant species



2021 Boat Launch Transects
Crescent Bar on Island Boat Launch

This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-3 Crescent Bar on Island Boat Launch Transects, Wanapum Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.



Transect Data:

Occurrence of Aquatic Vegetation Species

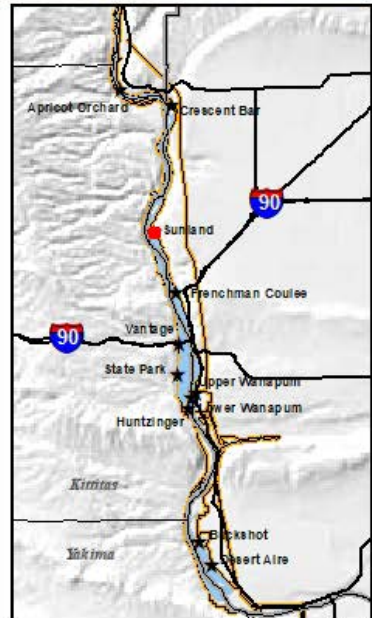
- | | | |
|---------------|---------------|-----------------|
| ● NS* | ● EM* | ● CP* |
| ⊕ NS*, CP | ⊕ EM*, CP | ⊗ CP*, EM |
| ⊗ NS*, EM | ⊕ EM*, NS | ⊕ CP*, NS |
| ⊕ NS*, CP, EM | ⊕ EM*, NS, CP | ⊕ CP*, EM, NS |
| | | ○ No Vegetation |

NS = native species

EM = Eurasian watermilfoil

CP = curlyleaf pondweed

* indicates dominant species



2021 Boat Launch Transects
Sunland Boat Launch
This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-4 Sunland Boat Launch Transects, Wanapum Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.



Transect Data:

Occurrence of Aquatic Vegetation Species

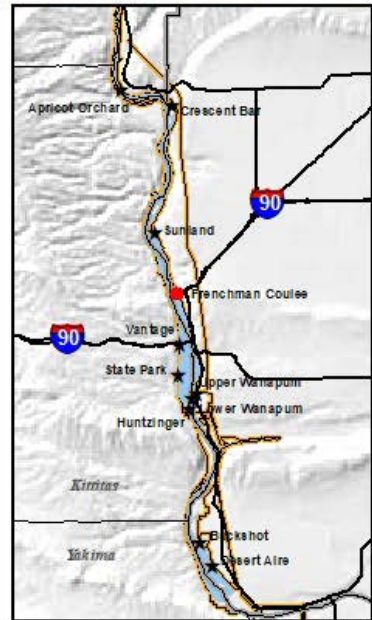
● NS*	● EM*	● CP*
⊕ NS*, CP	⊕ EM*, CP	⊗ CP*, EM
⊗ NS*, EM	⊙ EM*, NS	⊙ CP*, NS
⊕ NS*, CP, EM	⊕ EM*, NS, CP	⊕ CP*, EM, NS
		○ No Vegetation

NS = native species

EM = Eurasian watermilfoil

CP = curlyleaf pondweed

* indicates dominant species



2021 Boat Launch Transects
Frenchman Coulee Boat Launch
This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-5 Frenchman Coulee Boat Launch Transects, Wanapum Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.



Transect Data:

Occurrence of Aquatic Vegetation Species

● NS*	● EM*	● CP*
⊕ NS*, CP	⊕ EM*, CP	⊗ CP*, EM
⊗ NS*, EM	⊙ EM*, NS	⊙ CP*, NS
⊕ NS*, CP, EM	⊕ EM*, NS, CP	⊕ CP*, EM, NS
		○ No Vegetation

NS = native species

EM = Eurasian watermilfoil

CP = curlyleaf pondweed

* indicates dominant species



2021 Boat Launch Transects
Kittitas (Vantage) Boat Launch
This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-6 Kittitas County (Vantage) Boat Launch Transects, Wanapum Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.



Transect Data:

Occurrence of Aquatic Vegetation Species

	NS*		EM*		CP*
	NS*, CP		EM*, CP		CP*, EM
	NS*, EM		EM*, NS		CP*, NS
	NS*, CP, EM		EM*, NS, CP		CP*, EM, NS
					No Vegetation

NS = native species

EM = Eurasian watermilfoil

CP = curlyleaf pondweed

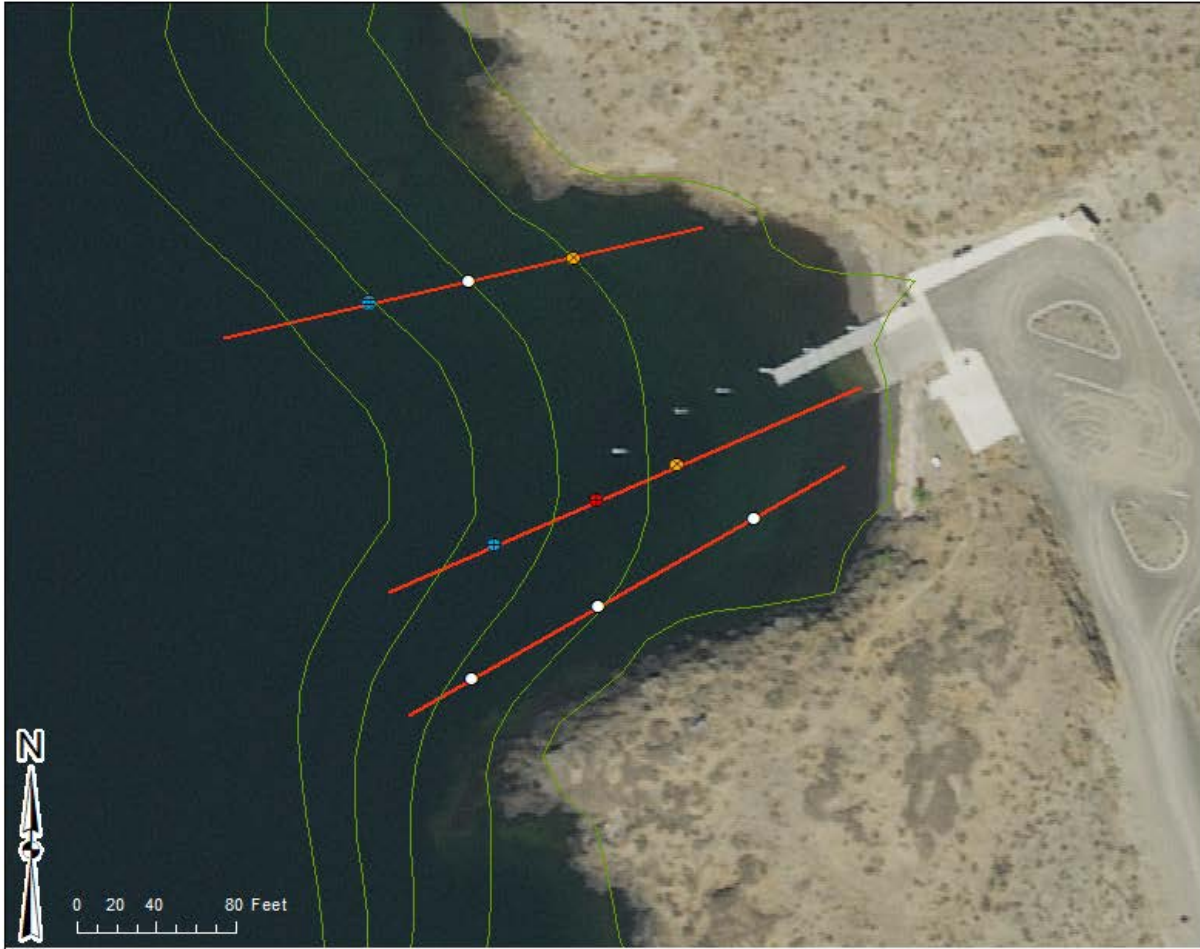
* indicates dominant species



**2021 Boat Launch Transects
Wanapum State Park Boat Launch**

This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-7 Wanapum State Park Boat Launch Transects, Wanapum Reservoir, Priest Rapids Project, mid-Columbia River, WA.



Transect Data:

Occurrence of Aquatic Vegetation Species

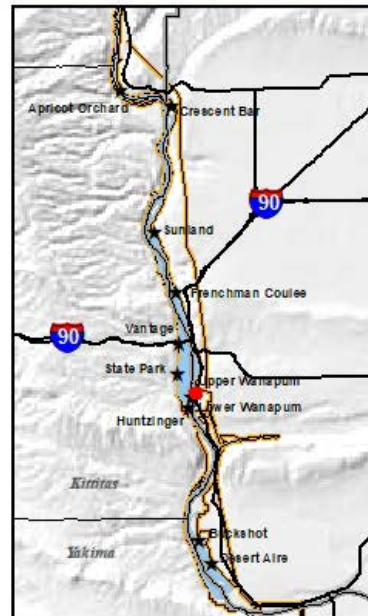
	NS*		EM*		CP*
	NS*, CP		EM*, CP		CP*, EM
	NS*, EM		EM*, NS		CP*, NS
	NS*, CP, EM		EM*, NS, CP		CP*, EM, NS
					No Vegetation

NS = native species

EM = Eurasian watermilfoil

CP = curlyleaf pondweed

* indicates dominant species



2021 Boat Launch Transects
Upper Wanapum Boat Launch
This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-8 Upper Wanapum Boat Launch Transects, Wanapum Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.



Transect Data:

Occurrence of Aquatic Vegetation Species

	NS*		EM*		CP*
	NS*, CP		EM*, CP		CP*, EM
	NS*, EM		EM*, NS		CP*, NS
	NS*, CP, EM		EM*, NS, CP		CP*, EM, NS
			No Vegetation		

NS = native species

EM = Eurasian watermilfoil

CP = curlyleaf pondweed

* indicates dominant species



2021 Boat Launch Transects
Lower Wanapum Boat Launch
This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-9 Lower Wanapum Boat Launch Transects, Priest Rapids Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.



Transect Data:

Occurrence of Aquatic Vegetation Species

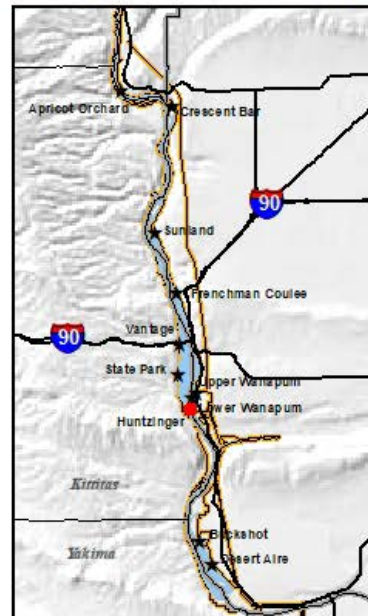
● NS*	● EM*	● CP*
⊕ NS*, CP	⊕ EM*, CP	⊗ CP*, EM
⊗ NS*, EM	⊙ EM*, NS	⊙ CP*, NS
⊕ NS*, CP, EM	⊕ EM*, NS, CP	⊕ CP*, EM, NS
		○ No Vegetation

NS = native species

EM = Eurasian watermilfoil

CP = curlyleaf pondweed

* indicates dominant species



2021 Boat Launch Transects
Huntzinger Boat Launch
This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-10 Huntzinger Boat Launch Transects, Priest Rapids Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.



Transect Data:

Occurrence of Aquatic Vegetation Species

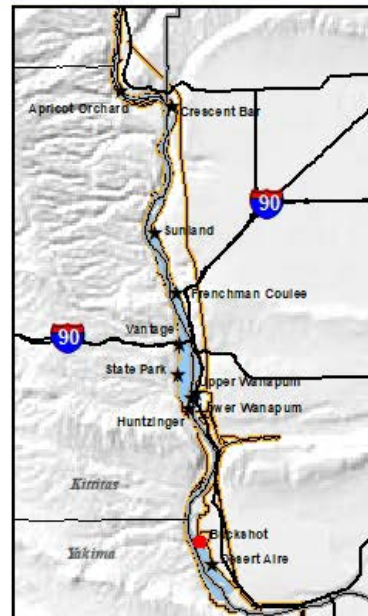
NS*	EM*	CP*
NS*, CP	EM*, CP	CP*, EM
NS*, EM	EM*, NS	CP*, NS
NS*, CP, EM	EM*, NS, CP	CP*, EM, NS
		No Vegetation

NS = native species

EM = Eurasian watermilfoil

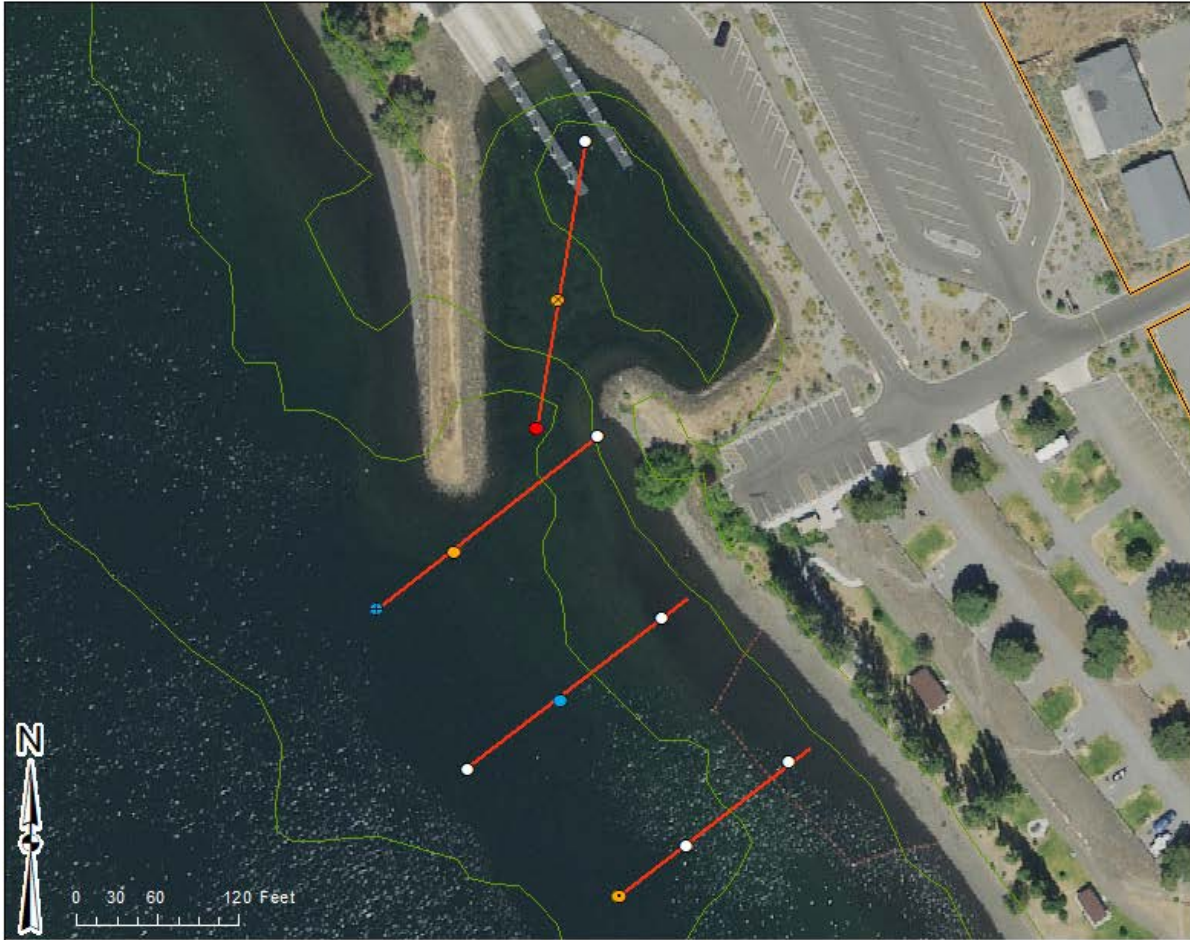
CP = curlyleaf pondweed

* indicates dominant species



2021 Boat Launch Transects
Buckshot Boat Launch
This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-11 Buckshot Boat Launch Transects, Priest Rapids Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, WA.



Transect Data:

Occurrence of Aquatic Vegetation Species

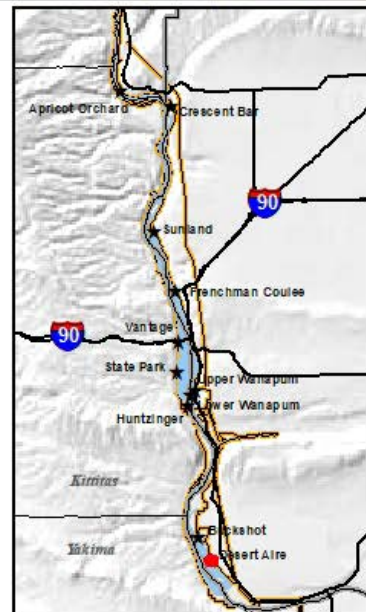
- | | | |
|-------------|-------------|---------------|
| NS* | EM* | CP* |
| NS*, CP | EM*, CP | CP*, EM |
| NS*, EM | EM*, NS | CP*, NS |
| NS*, CP, EM | EM*, NS, CP | CP*, EM, NS |
| | | No Vegetation |

NS = native species

EM = Eurasian watermilfoil

CP = curlyleaf pondweed

* indicates dominant species



2021 Boat Launch Transects
Desert Aire (PRRA) Boat Launch
This map/data was created for informational, planning, reference and guidance purposes only. Grant PUD makes no warranty, expressed or implied related to the accuracy or content of these materials. EA GIS - 2022

Figure C-12 Desert Aire (PRRA) Boat Launch Transects, Priest Rapids Reservoir, Priest Rapids Hydroelectric Project, mid-Columbia River, Washington.

Appendix D
Washington Department of Fish and Wildlife Comments and Grant PUD Responses

Submitting Entity	Date Received	Comment #	Agency Comment	Grant PUD Response
Washington Department of Fish and Wildlife (WDFW)	3/28/2022 (email from Jesse Schultz)	1	WDFW has converted all of their zebra and quagga mussel monitoring field collection datasheets electronically (iForms Builder) and an app/portal to house the data. WDFW, IT has approved the use of non-WDFW staff and wanted to know if we would be interested switching to this platform.	Grant PUD is open and receptive to iForms but will need to get clearance from Grant PUD's IT Dept. Grant PUD will reach out to WDFW when/if we get the ok for iForms.
Washington Department of Fish and Wildlife (WDFW)	3/31/2022 (email from Patrick Verhey/Comment from Jesse Schultz)	2	Additional activities also early detection method of zebra and quagga mussels I assume?	Grant PUD continues to conduct early detection monitoring for zebra and quagga mussels using plankton tow nets.