

Lower Yakima River: Anadromous Fish Survival

WaterSMART Environmental Water Resources Projects for Fiscal Year 2023

Funding Opportunity No. R23AS00089

Prepared By
Yakama Nation

In Partnership
Benton County Conservation District



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1 TECHNICAL PROPOSAL AND EVALUATION CRITERIA

1.1 EXECUTIVE SUMMARY

Date: March 28, 2023
Applicant: Yakama Nation (Category A Applicant)
Applicant Partner: Benton County Conservation District (Category B Applicant)
City/Counties/State: Richland/Yakima and Benton/Washington
Reclamation Area: Yakima Project

The Yakama Nation (YN) in partnership with the Benton County Conservation District (BCD) will improve conditions for anadromous fish species in the lower Yakima River of Central Washington State by helping to address two key elements identified in the Yakima Basin Integrated Plan (YBIP); fish passage, and habitat protection and enhancement. These improvements will benefit the entire Yakima Major Population Group of federally-threatened Middle Columbia River (MCR) steelhead smolts and adults; smolts and adults from the entire Yakima populations of MCR spring and fall/summer run Chinook, Coho, and Sockeye salmon; and ammocoetes and adults from the entire Yakima population of Pacific lamprey. The proposed project would aim to improve fish passage for both smolts and adults by working to address poor water quality conditions by providing thermal refuge in the hottest portion of the river, and reducing predation pressures through intensive removal of piscivorous fish including several invasive species. All together this project will provide 2,000 square meters of critical cold water refuge for adult migrants, remove thousands of piscivorous fish, and limit the reintroduction of the McNary Pool subpopulation of smallmouth bass into the Yakima River during the critical smolt outmigration period.

1.2 PROJECT LOCATION

The Yakima River is a major tributary to the Columbia River located in central Washington (Figure 1). The Lower Yakima River: Anadromous Fish Survival project is located in Benton County Washington. The project area overlaps with both the City of Prosser, and the City of Richland. Project locations include: 1) Intensive predation management within the Prosser Reach within the vicinity of latitude 46.231081 N longitude -119.677422 W, 2) the Snively Reach within the vicinity of latitude 46.347698 N longitude -119.391810 W, and 3) predation management and the Amon Creek low flow deflector within the vicinity of latitude 46.248205 N longitude -119.261833 W. Project locations are displayed in Figure 1.

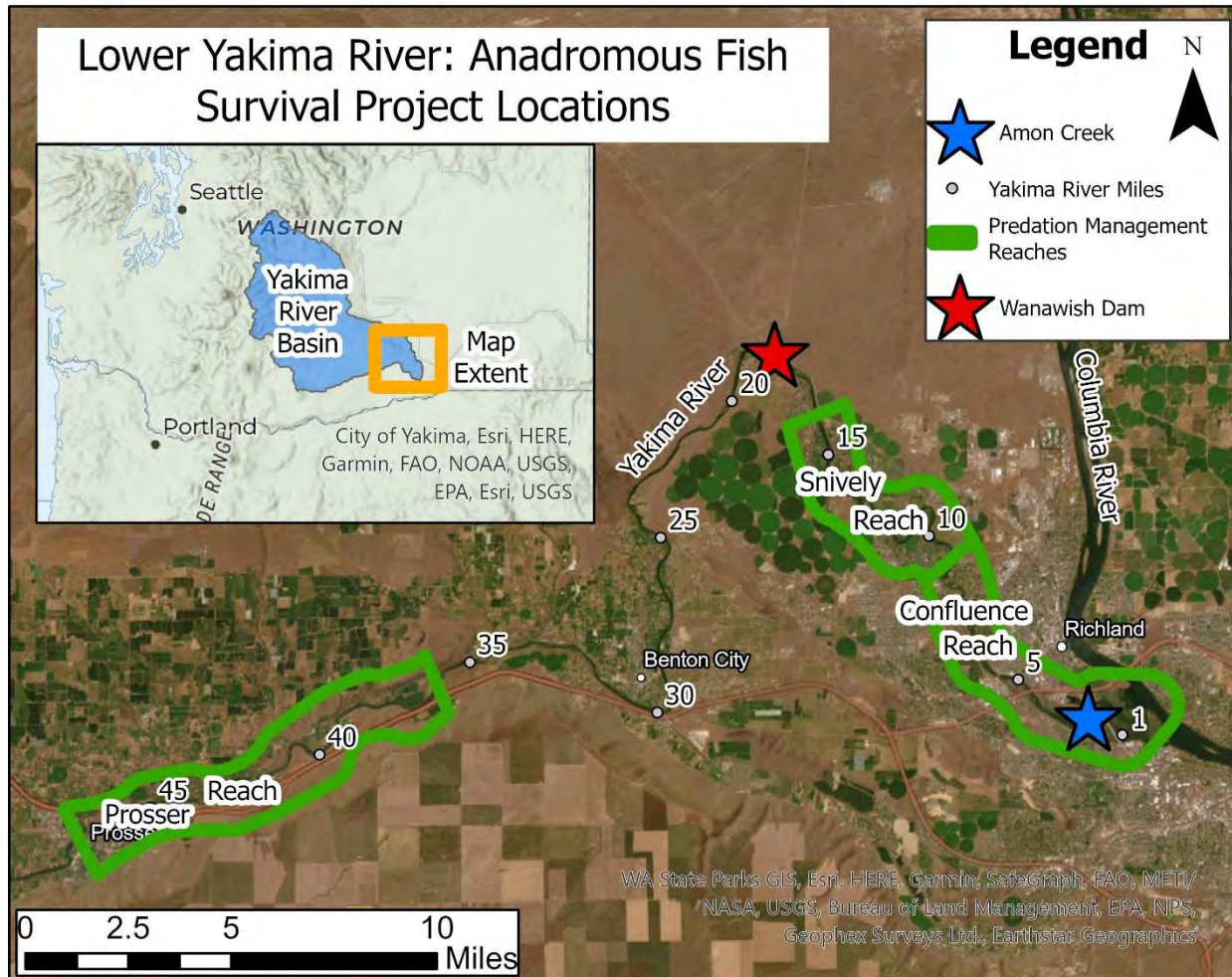


FIGURE 1. OVERVIEW MAP OF THE PROJECT AREA.

1.3 TECHNICAL PROJECT DESCRIPTION

The Yakima Basin Integrated Plan has resulted in a multitude of projects that address factors limiting anadromous fish populations within the basin such as habitat, streamflow, and fish passage. Yet these investments provide diminished returns due to lower river conditions that reduce survival for both adult and juvenile migrating anadromous fish. Existing and ongoing research have identified predation as a significant contributor to out-migrating smolt mortality and stream temperature as significantly limiting the success of adult summer chinook and sockeye migrants. This proposal seeks to address both of these issues affecting migrants by intensively managing predators and expanding the size of a cold water refuge within the Yakima River mainstem at the confluence of Amon Creek.

Improvements for Juvenile Anadromous Species:

The Yakama Nation has been conducting general fish abundance surveys within reaches of the Yakima River over the last two decades using raft and jet-boat electrofishing techniques. These surveys have elucidated the temporal and spatial distribution of invasive and native piscivorous

fish throughout the lower river. The Yakama Nation is particularly concerned with the presence of smallmouth bass, a non-native voracious predator of our out migrating smolts, which is thought to move up the Yakima River from the Yakima River Delta and Columbia River in early spring as stream temperatures begin to rise and out migrating smolts are beginning to make their way down the river (Figure 2).

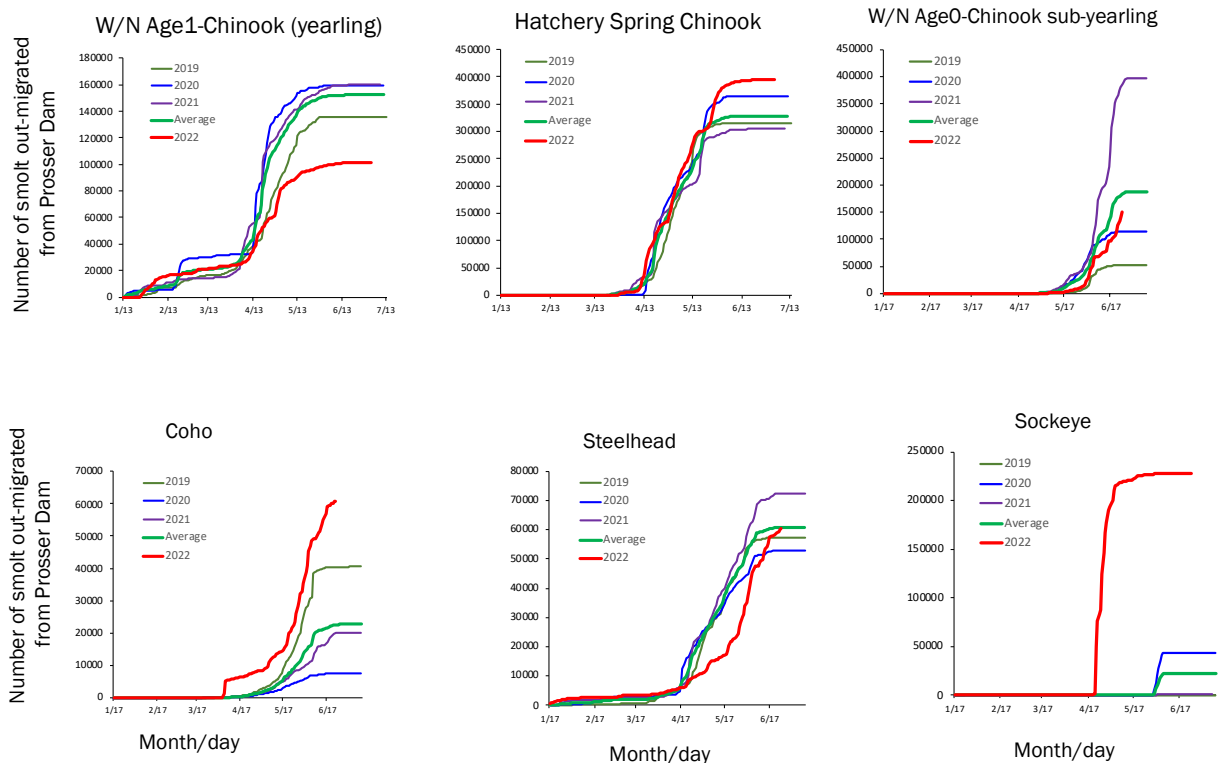


FIGURE 2. SUMMARY OF YAKIMA BASIN SMOLT-OUTMIGRATION PAST PROSSER DAM ON THE LOWER YAKIMA RIVER FROM 2019-2022 (W/N DENOTES WILD/NATURAL ORIGIN FISH)

The highest concentration of smallmouth bass has repeatedly been found year after year to be within the Yakima River Delta (confluence reach), especially of juvenile Smallmouth bass. Removal of a dike known as the Bateman Island Causeway in three years will significantly reduce the population of Smallmouth bass in the Yakima River by interrupting their lifecycle and significantly cooling the delta by allowing for greater mixing of Columbia River water. More broadly throughout the lower river, development of additional flexible storage for pulse flows is also expected to reduce predation during peak outmigration periods. However, there remains a significant need on an interim basis to reduce predation rates, especially for ESA listed MCR steelhead smolts, until these more permanent actions come into effect.

Intensive removal of invasive and native piscivorous fish using jet boat and raft electrofishing is found to be the most effective interim method of reducing predation rates of out migrating smolts. Other than the confluence reach, the other two reaches with the highest concentration of Smallmouth bass are the Prosser and Snively reaches.

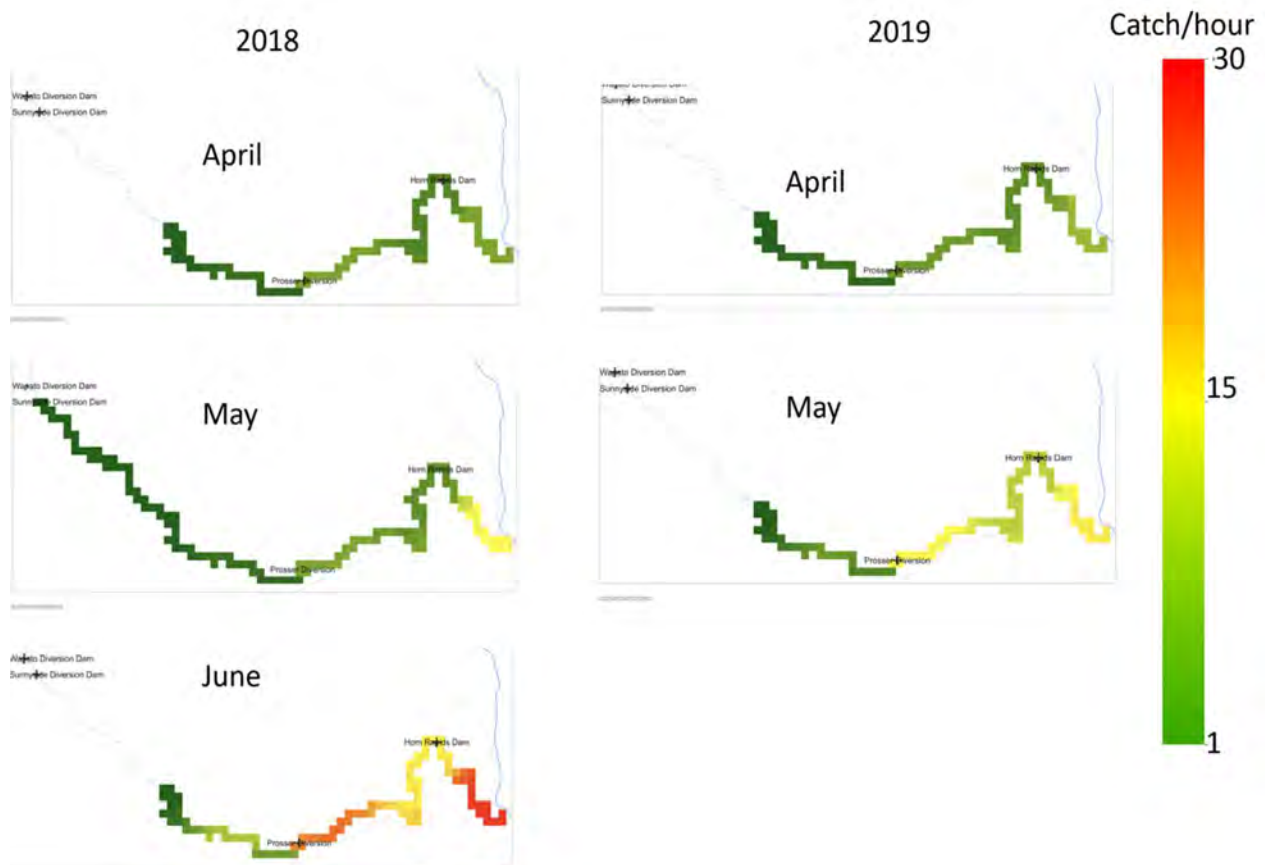


FIGURE 3. SPATIAL AND TEMPORAL VARIATION OF SMALLMOUTH BASS DURING 2018 AND 2019 SURVEY YEARS.

The Yakama Nation (YN) will collaborate and contract with the United States Geological Survey (USGS) to conduct predator reduction electrofishing within these reaches. This proposal will fund the acquisition of a new electrofishing raft for the USGS to utilize. During peak smolt outmigration for all stocks, typically from April-June, the YN and the USGS will conduct predator reduction electrofishing on a rotating basis four days a week over the course of the three year award period.

A component of the invasive introduced predator Smallmouth bass in the Yakima River overwinter in the McNary pool of the Columbia River during smolt-outmigration. This component of Smallmouth bass



FIGURE 4. YAKAMA NATION ELECTROFISHING RAFT

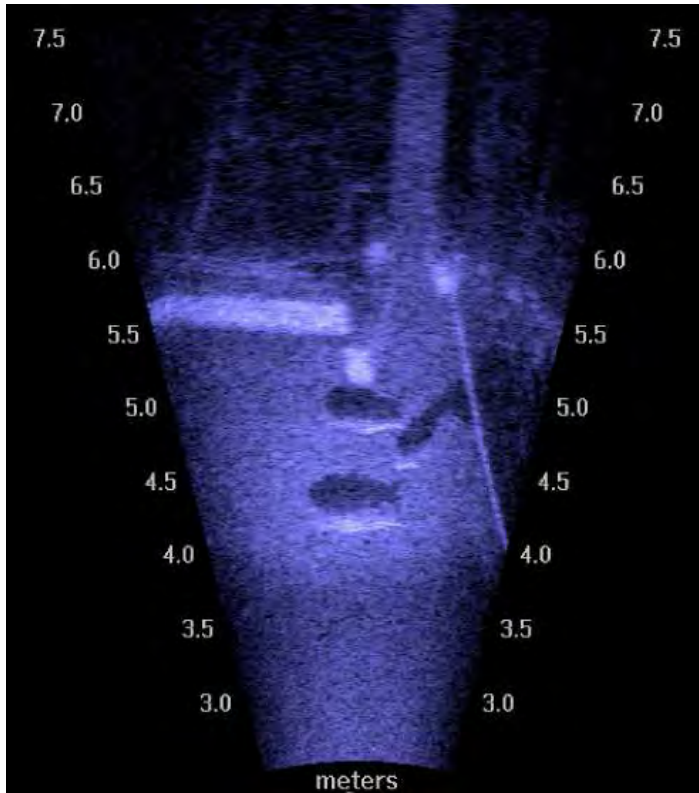


FIGURE 5. SMALLMOUTH BASS DIDSON CAMERA IMAGE AT WANAWISH DAM FISH LADDER.

will migrate up the Yakima River to spawn, rear, and feed. To traverse up the Yakima River the Smallmouth have been documented using the adult salmonid fish ladders at Wanawish Dam (see Figure 1). This work, conducted by the Roza-Sunnyside Board of Joint Control in 2022, shows clear DIDSON camera video of Smallmouth bass migrating upriver using the fish ladders. Trapping of Smallmouth bass at the Wanawish Dam fish ladders will occur during spring to manage this component of Columbia River Smallmouth bass that migrate up to and spawn in the lower Yakima River. Trapping will eliminate the presence of this subpopulation in the Yakima River and infrastructure changes at Wanawish dam will prevent Smallmouth bass from moving upstream past the site.

Improvements for Adult Anadromous Species:

To help adult migrants this proposal will improve cool water refuge habitat along the mainstem Yakima River by creating a deeper, cool water pool at the confluence of Amon Creek (River Mile 2.5). The Yakima River is highly regulated, and summer base flow below Prosser Dam depends on releases from upstream reservoirs by the Bureau of Reclamation in excess of total irrigation demand. During this "storage control" period, which begins on average in late June but can begin as early as April in drought years, target flows below Prosser Dam range from a minimum of 300 cfs up to 600 cfs depending on Bureau of Reclamation estimates of total water supply available.

TABLE 1. YAKIMA RIVER TARGET FLOWS SPECIFIED BY CONGRESS IN SECTION 1205 (A)(1), TITLE XII, PUB. L. 103-434.

Water Supply Estimate for Period (million acre-feet):					Target Flow From Date of Estimate Thru October Downstream of (cubic feet per	
April thru September	May thru September	June thru September	July thru September		Sunnyside Diversion Dam	Prosser Diversion Dam
3.2	2.9	2.4	1.9		600	600
2.9	2.65	2.2	1.7		500	500
2.65	2.4	2.0	1.5		400	400
Less than line 3 water supply					300	300

The lower Yakima River has chronic thermal issues that are detrimental to migratory adult salmonids in the late spring, summer and early fall (<https://pubs.er.usgs.gov/publication/ofr20201033>). Amon Creek is a known source of cool water on the mainstem Yakima River, with temperatures that are several degrees cooler than the mainstem temperatures during base flow conditions. The upper end of Amon Creek basin is used by Kennewick Irrigation from March - October as a wasteway for excess or “wastage” of Yakima River irrigation water. With its cooler confluence temperatures and added summertime water volume from irrigation excess, Amon Creek provides cool water refuge on the lower Yakima River. The current habitat conditions at the Amon confluence, however, are impaired and incoming cool water is quickly lost due to mixing with the warmer Yakima River water.

This project proposal will improve thermal refuge conditions by creating 2,000 square meters of new cool water habitat within the mainstem of the Yakima River. The project goal will be achieved by rerouting the channelized lower reach of Amon Creek downstream from its present confluence to a naturally deep hole on the Yakima mainstem (Figure 5). An additional 700 feet of new sinuous channel will be created within the riparian project area and replanted with native riparian species. In addition, a low flow deflector with apex log jams will be constructed within the Yakima mainstem channel to isolate the cool water pool during base flows. Enhancing cool water refuge habitats on the mainstem, such as the one provided by Amon Creek, will be a critical tool in aiding adult salmonid migration and survival in this arid basin by decreasing periods of thermal stress.

1.4 APPLICANT CATEGORY AND ELIGIBILITY OF APPLICANT

The Confederated Tribes and Bands of the Yakama Nation are a federally recognized tribe. The Yakama Nation Reservation and ceded lands are located within Washington State. Based on the requirements stipulated in section C.1.1. of the NOFO, the Yakama Nation meets the eligibility requirements as a Category A applicant.

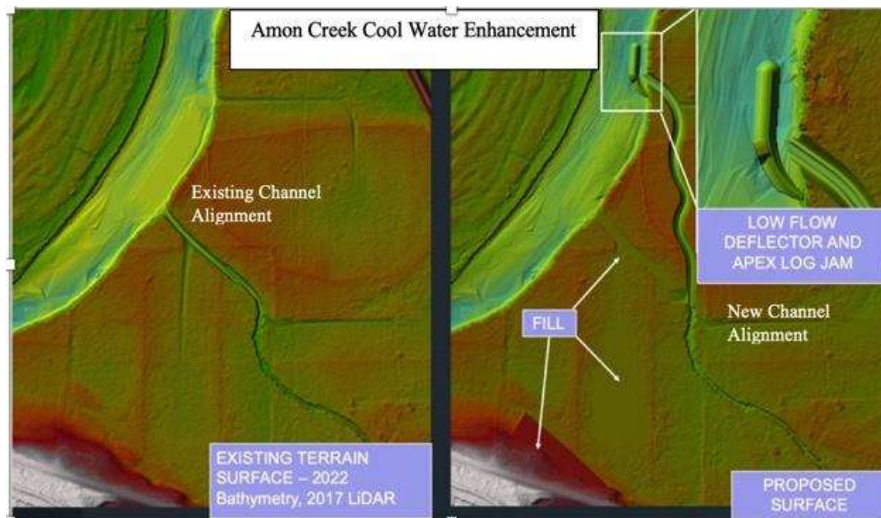


FIGURE 6. CURRENT AMON CREEK CONFIGURATION (LEFT); NEW AMON CHANNEL AND COOL POOL (RIGHT).

1.5 PERFORMANCE MEASURES

Performance measures were chosen to complement long term data that the Yakama Nation and Benton Conservation District have on lower Yakima River conditions, and fish passage through the lower river. The Yakama Nation has conducted periodic electrofishing surveys of the lower Yakima River over the past two decades, while Benton Conservation District has monitored water quality at various locations throughout the lower river including at the confluence of Amon Creek. Monitoring data from these efforts provides a strong basis from which to evaluate and quantify the magnitude of future changes in river conditions and Steelhead, Coho, Sockeye and summer Chinook migration success due to predation management and use of shapeable flows.

See Evaluation Criteria E for further information on project performance measures.

1.6 EVALUATION CRITERIA

E.1.1 EVALUATION CRITERION A: PROJECT BENEFITS

E.1.1.1.1 Sub Criterion - General Project Benefits

• Explain how the project will benefit ecological values that have a nexus to water resources or water resources management, including benefits to plant and animal species, fish and wildlife habitat, riparian areas, and ecosystems that are supported by rivers, streams, and/or other water sources, or that are directly influenced by water resources management.

The lower Yakima River, a critical part of the region's water supply and infrastructure, is also the primary migration corridor for native anadromous species. This proposed project benefits multiple ecological values within the lower Yakima River, utilizing infrastructure water to support Sockeye and Summer Chinook, species once extirpated from the basin, within the confines of current summer water supply allowances. Specifically, this project will help to improve in-stream temperatures and habitat for adult run Sockeye by installing a cool water refuge within the mainstem of the Yakima River. The constructed deeper holding pool on the mainstem Yakima River uses irrigation return flows captured within the Amon Creek tributary. Amon Creek flows are a mixture of groundwater recharge both natural and irrigation fed, wasteway operational water, and overland runoff. This proposal also addresses passage for juvenile Sockeye smolts by reducing warm water predators through the lower 40 miles of the Yakima River, aiding in native juvenile salmon passage success.

The typical low flow conditions experienced in the lower Yakima River during the summer months from abstraction of water for agriculture and municipal uses has altered the river's natural thermal regime and as such, daytime river temperatures often exceed 23 °C. These temperatures are prohibitive for adult salmon passage, and favor predator species over native populations, making passage difficult for juvenile smolts. While the project directly targets improvements for Sockeye, improvements will also benefit late spring/early fall migrants that include Chinook, Coho, Steelhead and lamprey.

The specific ecological benefits anticipated from this project are:

- **Improved Water quality and in-stream temperatures:**
 - Creation of 2000 square meters cold water refuge in the Yakima River Mainstem to support adult passage. The pool is anticipated to be at least 3°C - 4 °C cooler than mainstem river at base flow conditions. The pool will help offset warm temperatures in the mainstem created during peak irrigation water demand.
 - Replacement of the straightened Amon Creek Channel to new sinuous channel will reduce flow velocities allowing settling and reduction of sediments, toxins, and nutrients prior to the creek's confluence with the Yakima River. New sinuous channel will provide stabilization of the original man-made straightened channel that is eroding.
 - Utilization of natural river bathymetry at new Amon Creek outlet for scour and pool depth creation. Re-location will maximize river energy to mitigate sedimentation in the river at the mouth of Amon and help improve summer cool pool temperature dynamics

- **Fish and wildlife habitat Improvements:**
 - Additional 750 linear feet (1400 total) of cool water sinuous channel at the confluence of Amon and Yakima River. The lower end of Amon Creek supports fall Chinook, Coho, and Steelhead spawning.
 - New cool water holding pool will increase adult holding capacity and depth, providing both cover and space for adult migrants that use the cool water tributary for thermal regulation. Current Amon mouth confluence is less than 2 meters, with a degraded sediment bottom and minimal cover.

- **Riparian and wetland habitat Improvements:**
 - Removal of non-native Russian Olive monoculture and replacement with plantings of native shrub and riparian tree species including native Cottonwood
 - Periodically inundated vegetated benches within the new Amon Creek side channel to increase habitat diversity with tree, shrub and emergent plantings
 - Higher levels of habitat interspersions, with Sinuous Creek channel and wetland benches
 - Creation of 0.67 acres of new wetland will be created along the Amon Creek channel - benefiting upland wildlife species

- **Fish passage Improvements**
 - Cool water habitat alleviates daytime thermal stress during migratory periods, allowing summer adult native species (summer Chinook, Sockeye, and early and late fall/spring Chinook migrants) to hold and improve their chances of survival during lower river migration
 - The Yakima River is regulated to fulfill irrigation demand and generate power. These modifications favor high predator abundance. Increasing smolt survival rate by reducing predator density in the lower Yakima River.

Amon Basin is part of the Kennewick Irrigation District (KID) operations. The East Fork of Amon Creek is used as a wasteway to return excess (wastage) Yakima River water that is not utilized by their 68,000 district users back to the Yakima River. The irrigation water mixes with upper basin headwater flows, groundwater recharge, overland flows and returns to the Yakima River as a source of cooler water during the adult summer migration season. Summer salmon species are observed using the current degraded confluence as thermal refuge. The present alignment of Amon Creek was created by the US Army Corps of Engineers for flood and drainage control within the Yakima Delta Habitat Management Unit. This project will relocate the lowest part of the Amon channel to a deeper location on the Yakima River to create a cool water holding pool. A low flow deflector that is designed to prevent mixing of warmer and cooler waters in the summertime, and overtop and scour the cool water holding in the winter, will be installed on the mainstem Yakima. The placement of the low flow deflector makes use of the natural river geomorphology for enhanced flow and scour. The construction of the cool water refuge pool repurposes water from an irrigation wasteway that is considered operational “excess or wastage” for the direct benefit of adult salmonid habitat.

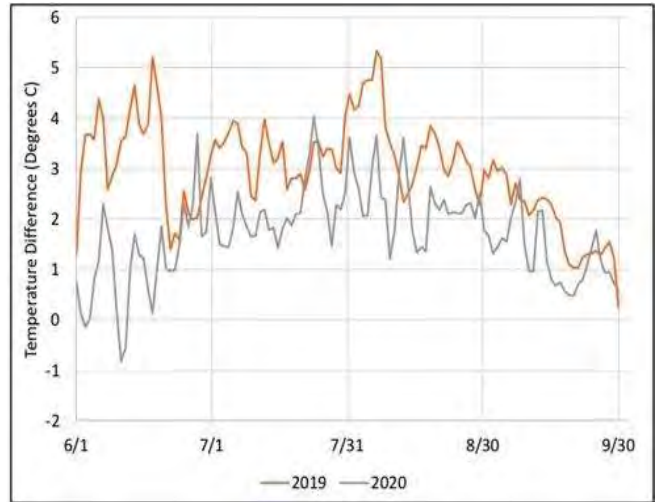


FIGURE 7. TEMPERATURE DIFFERENCE AT THE CURRENT CONFLUENCE OF AMON CREEK AND YAKIMA RIVER DURING BASE FLOW CONDITIONS IN 2019 AND 2020 (NHC, 2021). THE ANTICIPATED TEMPERATURE DIFFERENCES WILL BE GREATER THAN 5°C AT THE OUTLET DURING BASE FLOW CONDITIONS WITH 3 -4°C IN THE HOLDING POOL.

Fish surveys in the Yakima River have found that a major predator population of Smallmouth bass is present in large numbers in the lower Yakima River. Surveys also found that the density of Smallmouth increases in the lower Yakima River as flow decreases and water temperatures rise. As the populations of Smallmouth bass increase throughout the smolt migration season there is a significant survival decrease for smolts. Smallmouth bass numbers in the lower Yakima River are also highly correlated to river conditions. As water quality degrades by both flow and temperature populations of invasive piscivorous fish species that thrive in the degraded conditions begin to see marked increases. These increases of fish predators also coincide with the spring smolt out-migration

Predation management in the lower 40 river miles of the Yakima River will protect high priority anadromous fish runs from predation threats of invasive smallmouth bass. Predation management will reduce the threat of loss of anadromous fish within the: 1. Entire Yakima Major Population Group of federally-threatened Middle Columbia River (MCR) Steelhead smolts and adults, 2. Spring and fall/summer run Chinook, 3. Columbia River Coho, 4. Columbia River Sockeye salmon; and 5. Amocoetes and adults from the entire Yakima population of Pacific lamprey. Depression of invasive Smallmouth Bass in the Yakima River will also benefit entire Distinct

Population Segment (DPS) of Upper Columbia River fall/summer-run and federally-endangered spring-run Chinook salmon and federally-threatened (DPS) Steelhead, as Smallmouth bass from the Columbia River spawn and rear in the lower Yakima River exacerbating both Yakima and Columbia River predator populations.

Importance of removing predator fish species in the Yakima River basin

Hundreds of thousands of smolts of different species out-migrate annually past Prosser Dam on the Yakima River (Table 2), but more than 75% are lost downstream from Prosser (Blodgett et al., 2022). This mortality varies by year and species in association with factors such as water temperature, river flow and predation. After passing Prosser Dam, PIT-tagged smolts are first detected at McNary Dam on the Columbia River, so smolt survival rates are estimated for the Prosser-to-McNary reach, which includes a section of the Columbia River. Based on Columbia River smolt survival studies, mortality in the McNary Pool probably accounts for only a fraction of the smolt loss from Prosser to McNary. As the populations of SMB increase throughout the smolt migration season there is a significant survival decrease for smolts. Thus, smolt survival rate can be increased by reducing predator density in the lower Yakima River.

TABLE 2. NUMBER OF SMOLT OUT-MIGRATED FROM PROSSER DAM IN THE YAKIMA RIVER, WA.

Migratio n Year	Age0ChK (subyearling, Natural/Wild)	Age1Chk (yearling, Natural/wild)	Steelhead (Natural/wild)	Coho (Natural/wild)	Sockeye (Natural/wild)	Spring Chinook (Hatchery)
2019	52,512	135,802	57,389	40,534	129	314,235
2020	114,746	159,205	52,844	7,651	43,423	364,830
2021	396,443	159,806	72,321	20,125	1,413	304,111
2022	224,397	100,963	61,640	63,373	228,099	394,050

- ***Will the project improve watershed health in a river basin that is adversely impacted by a Reclamation water project?***

Yes, this project will improve watershed health in a river basin that is adversely impacted by a Reclamation Water project. Reclamation’s Yakima Project is regulated to fulfill irrigation demand and generate power which creates reduced flow in the lower Yakima River while shifting peak timing of the spring freshet. This negatively impacts water quality, in-stream temperatures and migration. The lower Yakima River is in a semi-arid basin that receives 7-9 inches of annual precipitation per year. The lower river relies on water quantity and timing from the upper

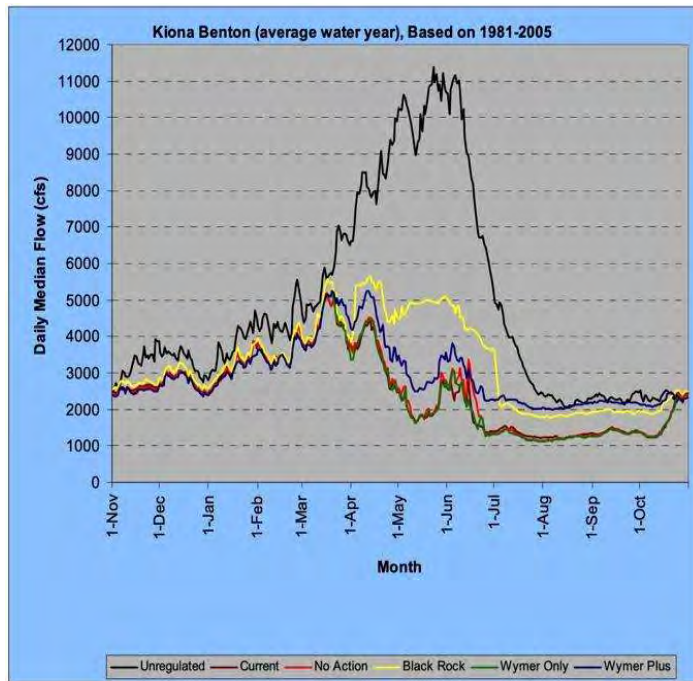


FIGURE 8. US BUREAU OF RECLAMATION (2008), MAGNITUDE AND TIMING OF REGULATED (BURGUNDY) VS. UNREGULATED FLOWS (BLACK) IN THE LOWER YAKIMA RIVER AT BENTON CITY (KIONA). GRAPH DEVELOPED BY US BUREAU OF RECLAMATION AS PART OF A STORAGE FEASIBILITY STUDY

watershed to help migrants successfully pass through the lower river. The spring freshet, which has been dramatically reduced in size by river regulation, typically occurs between April and May in the lower Yakima River, with low flows and high temperatures occurring June through August. The typical juvenile and adult migration timing window for the lower Yakima River is between March and October, which coincides with irrigation season timing. At base flow conditions, the lower river mainstem is wide and shallow with daytime temperatures exceeding 23°C. These degraded conditions have created favorable conditions for invasive piscivorous fish species and high predator abundance, while negatively impacting anadromous fish species that migrate through the lower Yakima River corridor.

Hundreds of thousands of smolts of different species out-migrate annually past Prosser Dam on the Yakima River (Table 2), but more than 75% are lost downstream from Prosser. Successful passage in the lower Yakima River, typically requires smolts and adults of anadromous species to navigate through the river corridor before or after base flow conditions, providing suboptimal conditions for late spring/early fall migrants and summer migrants whose life cycle does not coincide with the altered flow regimes. Watershed health improvements from the project include working within the altered flow regimes to improve migrant survival success and re-use of wasteway water for enhanced cool water refuge.

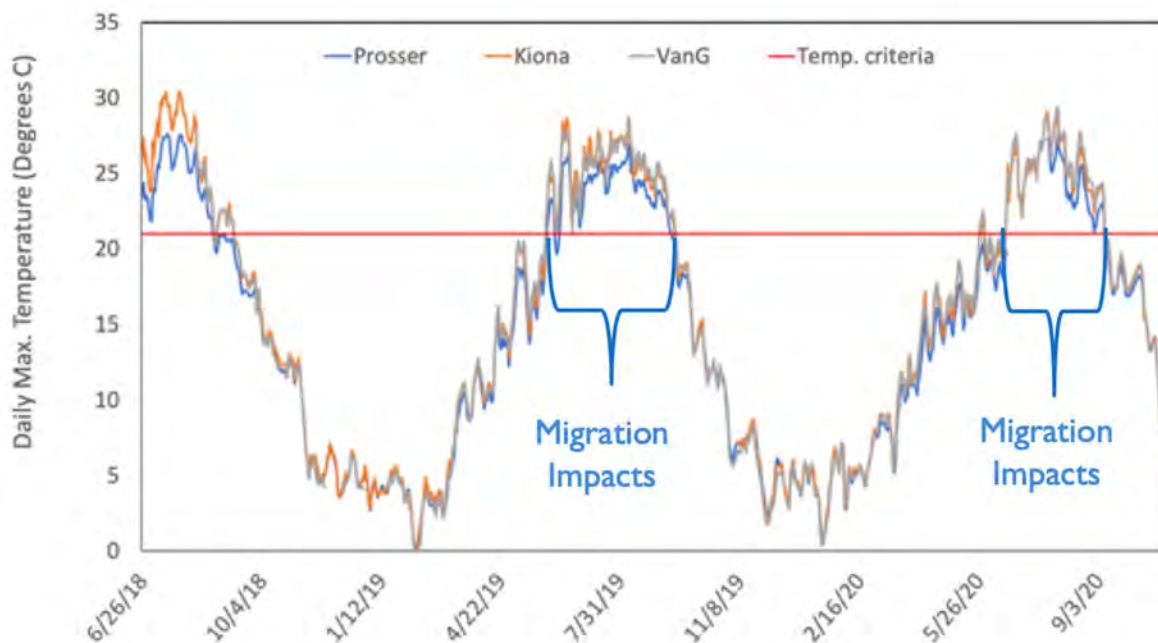


FIGURE 9. DAILY MAXIMUM TEMPERATURES AS MEASURED AT THREE USGS GAGING LOCATIONS ON THE LOWER YAKIMA RIVER IN 2018 - 2020 UNDER CURRENT FLOW CONDITIONS. RED LINE INDICATES THE TEMPERATURE THRESHOLD AT WHICH THE RIVER BECOMES IMPAIRED FOR ADULT SALMONID MIGRATION.

Specifically, the project will increase juvenile smolt survival through decreased predation pressure within the lower 40 river miles of the lower Yakima River corridor. Removal of predators in the lower Yakima River will help alleviate survival rates. We will increase adult migration success by lengthening the migration timing window through creation of a 2000 square meter cool water refuge pool that is at least 3 - 4°C cooler than mainstem river temperature at base flow. Additionally, 1100 sq. meters of the cool water holding pool will have temperatures that are greater than 5°C cooler at base flow. Adult salmonids utilize cool water refuges to hold until river temperatures drop either during summer storm events, nighttime cooling, or seasonal changes. These holding pools increase adult salmonid survival success by allowing for metabolic rest when thermally stressed.

• *Is the project for the purpose of meeting existing environmental mitigation or compliance obligations under Federal or State law?*

No, this project is not meeting existing environmental mitigation or part of compliance obligations under Federal or State law.

• *If the project will benefit aquatic or riparian ecosystems within the watershed, explain the extent of those benefits (i.e., magnitude and geographic extent).*

The “Lower Yakima River: Anadromous Fish Survival” proposal preserves native anadromous species in the lower Yakima River by increasing cool water refuge habitat and decreasing the dominance of non-native piscivorous species. This project expands upon basin-wide water

resource management goals, while working within the framework of the existing water supply, to build lower river resiliency for native aquatic species whose life cycle timing overlaps with peak basin water demands.

Enhancement of the cool water refuge uses excess water in the basin from Kennewick Irrigation District operations. Forty-five percent of water diverted for irrigation returns to the Yakima River and its tributaries as surface-water return flow and groundwater discharge (Gendaszek and others 2021; Bureau of Reclamation 1999). During low-flow periods these returns account for about 75 percent of streamflow in the lower Yakima River (Vaccaro, 2011; Gendaszek and others, 2021). Amon Creek Basin is the lowest tributary and irrigation return in the Yakima Basin. “Wastage” water is returned to the upper end of Amon Basin where it returns as cooler input through hydrogeological processes as it flows down the vegetated canyon to its confluence with the Yakima River.

As a functional wasteway, the flow regime of Amon Creek is opposite of the lower Yakima River with peak flows occurring in the summer and winter base flows sustained by groundwater. Average flows range from 20 cfs - 60 cfs during the summer months. The tributary’s cool water influence is quickly dissipated in the mainstem Yakima River. This project uses the higher flows of Amon during irrigation season, captured within a natural tributary drainage and uses them to increase the cool water influence within the Yakima mainstem. This project will help buffer mainstem warming by providing a cool water respite for migratory adult salmon species. The specific project metrics for improved aquatic and riparian function on the lower Yakima River are summarized in table 3.

Benton Conservation District contracted Northwest Hydraulic Consultants, Inc (NHC) for this project and they have worked closely with the Yakima Basin Technical Advisory Group (TAG) to develop a project design to meet basinwide goals for water resources and fish habitat. The final project metrics were determined by NHC, through their modeling and design work. NHC conducted hydrodynamic modeling with AdH and HEC-RAS (NHC Inc, 2021).

Action	Ecological Benefits	Impact Metric	Geographic Extent
Re-Routing of Amon Channel	Riparian and Fish Habitat	1400 feet of restored streamlength;	Support adult passage within 35 river miles of the lower Yakima River from the Yakima/Columbia Confluence to Corral Creek (next upstream cool water tributary).
		750 feet of newly created channel length	
	Riparian Habitat	0.67 Acres Wetland Creation - stream planting bench designed to inundate at higher flows	
Invasive Removal	Riparian/Upland Habitat	Restore 20 acres of floodplain and upland habitat with native vegetation; restoring plant diversity	
Cool Water Pool Installation	Fish Habitat	2000 sq. meters of newly created pool with at least 3 - 4°C cooler water; 1100 sq. meters with > 5°C cooling	
	Fish Habitat	> 2 meter increase in depth over current confluence configuration	
Predation Management	Fish Passage	Predator Prey Ratios and Prosser Dam to McNary Dam smolt survival estimates	Lower 40 miles of the Yakima River

Metrics for the size of cool water pool creation, anticipated depth and habitat/riparian/wetland restoration were computed as part of the permit ready design metrics by NHC. A physical flow model of the project is undergoing evaluation by NHC to confirm the function of pool scour under different flow scenarios. The physical model results will be available in June. The Hydrodynamic modeling results for both scour and temperature are provided below:

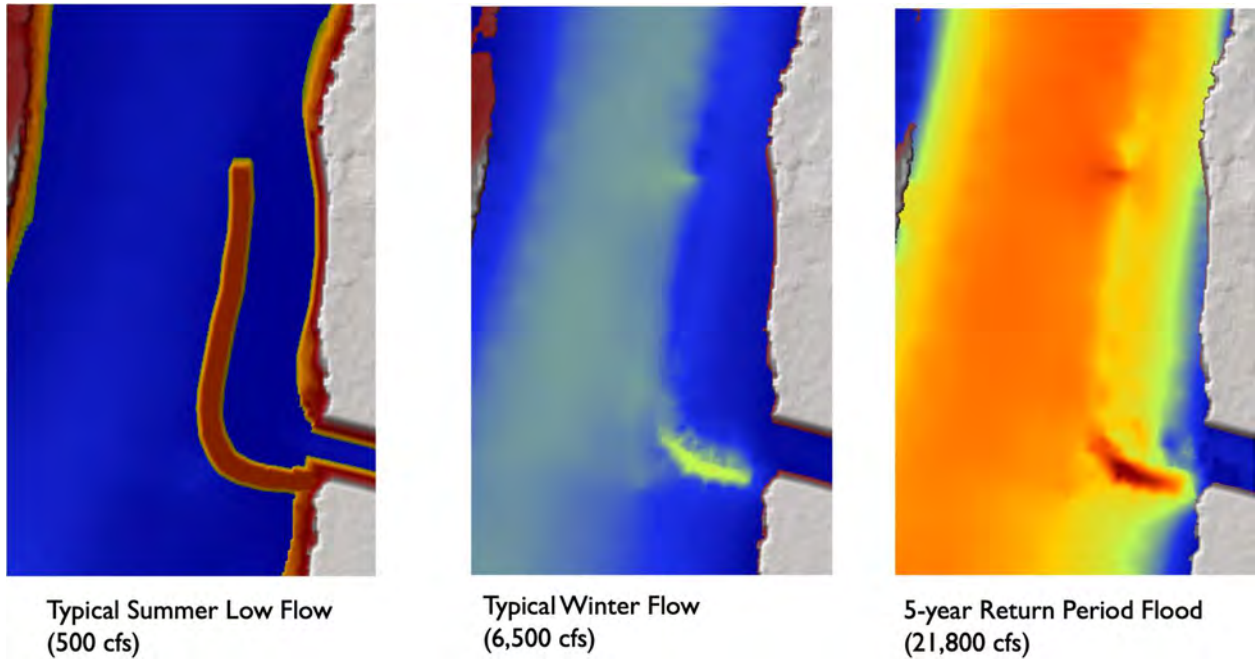


FIGURE 10. FLOW CONDITIONS AS MODELED BY NHC IN THE COOL WATER POOL UNDER A) TYPICAL SUMMER LOW FLOW CONDITIONS (LEFT) B) TYPICAL WINTER FLOW CONDITIONS (MIDDLE) AND C) 5 YEAR RETURN PERIOD FLOOD EVENTS (RIGHT).

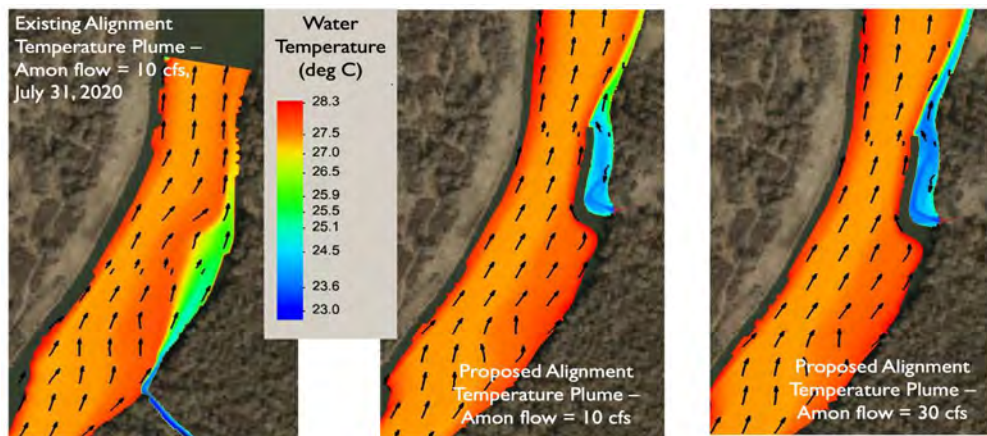
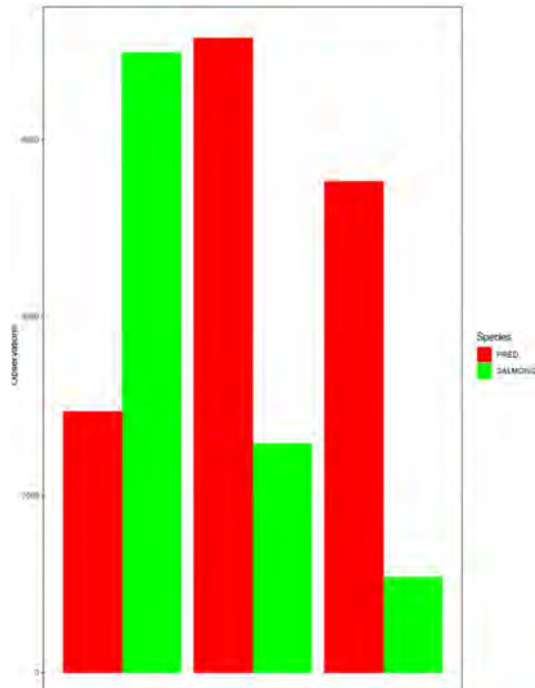


FIGURE 11. TEMPERATURE AND FLOW MODEL RESULTS FOR THE EXISTING (LEFT) VERSUS NEW COOL WATER POOL UNDER TWO DIFFERENT FLOW SCENARIOS (CENTER AND RIGHT). THE FLOWS WERE MODELED ON JULY 31, 2020 AT A CONSERVATIVE FLOW ESTIMATE OF 10 CFS, AS WELL AS ANTICIPATED AVERAGE FLOW OF 30CFS



Smolt survival rate is related to predator density, and smolt passage and survival can be directly linked to predator/prey ratios. Hundreds of thousands of smolts out-migrate annually past Prosser Dam on the Yakima River (Figure 15), but more than 75% are lost downstream from Prosser for some of the species (Blodgett et al., 2022).

Predator Prey ratios are developed by comparing smolt passage at Prosser Dam to river reach predator abundances. A metric of Predator/Prey ratios and smolt survival from Prosser Dam to McNary Dam will provide management information for effectiveness.

To enumerate smolt passage a portion of the wild and hatchery Chinook, Coho, Sockeye and steelhead smolts passing the Prosser Diversion Dam in the lower Yakima River are entrained into the Chandler irrigation and hydropower canal, screened from the canal, and bypassed through a sampling facility where they are enumerated before returning to the Yakima

River. The modeled relationship between the measured percentage of flow diverted and the percentage of each species entrained is applied to daily counts from the sampling facility to estimate total daily and annual passage of each species. The annual numbers of smolts of each species released from Prosser Hatchery immediately below Prosser Dam are added to the numbers passing Prosser Dam.

The survival rate of Prosser smolts to McNary Dam on the Columbia River is estimated from PIT-tagged smolts either detected at or released from Prosser Dam and Prosser Hatchery (see, Blodgett et al., 2022). Because only a fraction of these tagged smolts surviving and passing McNary Dam is detected in the smolt bypass system, the probability of tag detection at McNary Dam is derived from the percentage of tags detected at John Day or Bonneville dams downstream that were previously detected at McNary. McNary detections divided by their probability of detection yields McNary passage, which in turn is divided by Prosser passage to produce the survival rate estimate from Prosser Dam to McNary Dam for each species.

TABLE 4. DENSITY OF SMALLMOUTH BASS ELECTROFISHING CATCHES PER MILE IN THE LOWER YAKIMA RIVER AND COHO SURVIVAL RATE FROM PROSSER TO MCNARY DAM.

River section	2018	2019
	SMB density (electrofishing catches per mile)	SMB density (electrofishing catches per mile)
BELOW PROSSER	2.3	2.4
BENTON	1.9	6.1
GRANGER	0.3	0.2
LOWER YAKIMA	3.8	5.3
Pooled data (all sections)	2.4/mile	3.8/mile
Survival rate from Prosser McNary (Coho)	24.5%	14.3%

Predator abundances (Table.4) are found using the observed electrofishing catch per unit effort in 2018 and 2019. Yearly changes in Smallmouth bass populations will be assessed using relative abundance adjusted by logistic regression to account for yearly differences in catch-ability (i.e. boat type, experience, flow).

TABLE 5. DENSITY OF SMALLMOUTH BASS (SMB) CATCH PER UNIT EFFORT IN MINUTES (CPUE/MINUTE) IN LOWER YAKIMA RIVER. MIN, MEAN AND MAX ARE THE MINIMUM, MEAN, AND MAXIMUM NUMBER OF SMB ELECTROFISHING CATCHES PER MILE.

River section	Catch Per Unit Effort per minute (CPUE/minute)					
	2018			2019		
	Min	Mean	Max	Min	Mean	Max
BELOW PROSSER	0.010	0.190	2.720	0.014	0.077	0.197
BENTON	0.007	0.080	0.250	0.010	0.210	0.394
GRANGER	0.007	0.200	0.040	0.005	0.007	0.015
LOWER YAKIMA	0.006	0.155	0.700	0.010	0.205	0.562
Pooled data (all sections)	0.007	0.140	2.720	0.006	0.137	0.562

• If the project will benefit specific species and habitats, describe the species and/or type of habitat that will benefit and the status of the species or habitat (e.g., native species, game species, federally threatened or endangered, State listed, or designated critical habitat).

In salmon, warm water causes increased physiological stress, pre-spawn mortality, susceptibility to disease and likelihood of straying, while decreasing swimming performance and spawning success (Carter 2005). Berman and Quinn (1991) described that habitat restoration on spawning and rearing grounds may not be sufficient to ensure long-term survival of Yakima River salmonids without also protecting a series of cool water thermal refugia for migrating fish.

While the project proposal targets the life history of sockeye salmon it will also benefit multiple native anadromous species including spring and fall Chinook, summer Chinook, Coho, and lamprey. This project will also benefit Middle Columbia River Steelhead, listed as an ESA threatened species. Native fish habitat and function are severely degraded in the lower Yakima

River, impacting all anadromous species and life stages. Creation of a deeper cool water holding pool coupled with increased off-channel habitat on the lower Amon will support basin goals for increased native fish productivity. Specifically, Coho, fall Chinook and Steelhead use the lower end of Amon as spawning habitat. Summer Chinook, Sockeye and late spring/early fall Chinook species migrate through the river when temperatures are too warm for safe passage and will require a series of cool water refuges to support migration. Adult Pacific lamprey migration into the Yakima River is delayed by warm water.

• *If the proposed project will benefit federally listed threatened or endangered species, address the following:*

This project will have benefits for Middle Columbia River Steelhead, listed as threatened under the ESA. This species is subject to the Yakima Basin Steelhead Recovery Plan (Yakima Basin Fish and Wildlife Recovery Board, 2009) formally incorporated into the NOAA Middle Columbia River Steelhead Recovery Plan (2009). The plans are available at: <https://ybfwrp.org/recovery-planning/steelhead-recovery-plan/>.

Water temperatures in the lower Yakima River create a fish passage barrier, delaying migration of adult steelhead (Yakima Basin Steelhead Recovery Plan, 2009). As stated in the Recovery Plan, "... there appears to be a significant correlation between fish movements and periods when flows increase and temperatures drop below 70°F (Yakima Basin Steelhead Recovery Plan, 2009)". Steelhead tend to move in the lower Yakima in response to flow and temperature. Historically, it is thought that some portion of the Yakima River run would have occurred during the summer months, but changes in the summer flows and in-stream water temperatures altered the migration run timing (Yakima Basin Steelhead Recovery Plan, 2009).

Sustained flows in the Yakima River can impact species survival and run timing. According to the 2009 Steelhead Recovery Plan, "In the two years between 1999 and 2007 when spring high flows (>2000 cfs) and lower river temperatures (< 68 °F at Kiona) continued into July, a portion of the run passed Prosser in July (28 in 1999 and 10 in 2002)." Prior to regulation, spring flows would have extended longer into the summer allowing for increased passage of ESA listed steelhead.

Construction of storage dams prevented access of steelhead to watershed habitat above the Tieton, Bumping, Kachees, Cle Elum, and Keechelus Dams. These alterations to the basin flow and timing had a direct impact on steelhead populations. This project adds to the basin wide cumulative efforts to restore steelhead populations and the ultimate goal of their delisting as a threatened species through invasive predator management and increased lower river habitat to help in their migration and holding. Lower Amon Creek has historically supported steelhead spawning. Improvements in the lower off-channel habitat of Amon as well as the cool water pool will support the adult and juvenile life stages.

• *Will the project address drought conditions or drought-related impacts on water supplies, habitat, species, or the ecosystem as a whole?*

Climate change models for the Yakima Basin (Malek and others, 2020; UW Climate Impacts Group; Yakima River Basin Integrated WIRE Management Plan) show that irrigation unmet demand (a drought indicator) is sensitive to changes in basin water supply stemming from altered snowpack amounts and a shift to precipitation as rainfall. This shift results in greater water stress as the Yakima River is a snow dependent basin with much of its summer water supply met through storage in the upper watershed's five major reservoirs. Altered snowpack and a shift in precipitation to rain is predicted to negatively impact water supply storage in the upper basin leading to greater irrigation unmet demand in the lower basin. This water supply shift, coupled with a prediction of warmer air temperatures in the lower river (anticipated increase of +0.17 °F/decade) will lead to greater frequency of droughts from historical records, placing pressure on available water supply (<https://climate.washington.edu/climate-data/trendanalysisapp/>).

Cold water species are predicted to decline in the coming decades as a result of altered temperatures and water availability with climate change. To combat this challenge, fishery scientists and agencies are recognizing the importance of cool water refuges as a mitigation strategy (<https://www.fs.usda.gov/rm/boise/AWAE/projects/ClimateShield.html>; <https://www.epa.gov/columbiariver/columbia-river-cold-water-refuges-plan>). Cold water habitats are going to be vital moving forward to buffer both warming temperatures and predation from warmer water species. The lower Yakima River has multiple cool water refuges on the lower Yakima River as identified by Gendaszek and others, 2021, however, the quality of these refuges is degraded, with limited fish holding capacity. This project will restore and enhance one of these cool water refuges on the lower Yakima River with plans currently underway to restore additional cool water refuges in the future. Restoring multiple cool water refuges will be a vital tool for saving cold water species in the Yakima River as climate change adds even greater pressures on an already stressed system. This project will add 2000 sq. meters of cold water habitat to the lower Yakima River working in parallel with other existing cold water refuges in the lower basin. Columbia Basin wide studies have shown that SMB populations are extending their range into upper watersheds as the climate warms. This project would eliminate a component of the Yakima River SMB and reduce the overall predation impact non-native species have on anadromous and resident native populations of steelhead, salmon, and lamprey.

• If the project will result in long-term improvements to water quality (e.g., decrease sediment or nutrient pollution, improve water temperature, or mitigate impacts from floods or drought), explain the extent of those benefits (i.e., magnitude and geographic extent).

This project will decrease mainstem Yakima River temperatures by 3 - 4°C within 2000 sq. meters of a cool water holding pool at base flow conditions, when mainstem river temperatures are at their warmest. Additionally, the project will create 1100 sq. meters of cool water within the pool that is greater than 5 °C cooler than mainstem river temperatures. These metrics were determined using AdH and HEC-RAS models by Northwest Hydraulic Consultants, (NHC Inc., 2021). The next prominent cool water refuge is Corral Creek, 35 miles upstream of Amon Creek. This project will provide summer run species a location to hold within the lowest 35 miles of the river until temperatures become more hospitable for them to move (e.g., night-time cooling,

summer storm events, or summer to fall season shifts. This is also the lowest documented spawning habitat for Coho, fall Chinook and Steelhead.

The project design is anticipated to have additional tangible benefits that have yet to be measured or quantitatively determined but are part of the overall project goals and will be evaluated after implementation through participating programs. Cool water refuge is anticipated to mitigate impacts from drought related events (see response to climate change impacts) and fish use and timing will be closely monitored so that impacts to basin-wide productivity can be calculated. Additionally, the new Amon channel is designed to dissipate energy, with planting benches designed to overtop during higher flows (summertime) allowing for sediment deposition and flood management. The current Amon Creek confluence is shallow (< 0.5 m deep) filled with fine sediment deposits from years of channel bank instability and wastewater loads. The enhanced channel design is anticipated to decrease sediment loading from Amon to the mouth of the Yakima River. The low flow deflector berm is designed to overtop at high flows and scour the cool water holding pool in the winter, maintaining the cool pool depth long term for summer use and minimize sediment accumulation in the Yakima River. Physical modeling is underway to optimize the low flow deflector design for high flow scour. Benton Conservation District is working closely with the Washington State Department of Agriculture and Washington State Department of Ecology to evaluate the current nutrient and sediment loading of Amon, with plans to continue monitoring the impact of the channel re-alignment on these metrics. This project is designed to be self-sustaining to mitigate sediment loading, with no required long term operation and maintenance.

• *Are there project benefits not addressed in the preceding questions? If so, what are these benefits?*

This project also addresses restoring first foods through enhanced tribal fisheries, fire reduction potential within the Yakima Delta Habitat Management Unit by removal of dense Russian olive trees and increasing recreational safety and enjoyment of the Yakima Delta Habitat Management located within the urban center of Richland, WA.

E.1.1.1.4 Restoration Project Benefits

**The project will benefit both habitat and fish species by addressing invasive species –
Vegetation: For projects that include removal of invasive vegetation, will the project include revegetation with native species at the removal site?**

The project will include revegetation of areas that are currently overgrown with Russian Olive. Removal of vegetation improves water resources and water resource management (<http://pubs.er.usgs.gov/publication/sir20095247>; <https://doi.org/10.1029/2010WR010317>; <https://doi.org/10.1139/b99-088>) by:

- Improving water uptake as the Russian olive uses more water than native vegetation
- Increased diversity of riparian habitat for native species

- Decreased soil erosion

The removal of the invasive Smallmouth Bass population will benefit survival of anadromous Salmon, Steelhead, and Lamprey. Predation impacts to survival of these highly important native species is essential to the Yakima Basin for both the Yakama Nation and basin Stakeholders. Water resources in the basin are limited and upper basin storage reservoirs are managed in a way that alters the natural hydrograph and creates lower Yakima River flow conditions that are detrimental to anadromous fish passage and beneficial for warm water species including Smallmouth bass (WDFW 2004, <https://doi.org/10.1577/T03-003.1>). Management of the Smallmouth bass through intensive removals via boat electrofishing will help alleviate survival issues for anadromous species (USGS 2020, <https://doi.org/10.1007/s10641-020-01016-0>). To prevent reintroduction of the major Smallmouth bass population of the McNary Pool Reservoir of the Columbia River trapping and removal of Smallmouth bass will occur at Wanawish Dam, the lowest Dam on the Yakima River. Projects planned under the YBIP (<https://yakimabasinintegratedplan.org/>) will address predator populations in the Yakima River. Infrastructure improvement goals under the plan will address anadromous fish passage at Wanawish Dam and prevent upstream migration of Smallmouth bass. Other future and current projects that will attempt to alleviate Smallmouth bass predation that are currently ongoing in the Yakima Basin are:

- Removal of the Bateman Island Causeway at the Confluence of the Yakima River, an area of Smallmouth Bass rearing and overwintering. This project would improve flow and reduce temperatures resulting in less water habitat that supports warmwater species (<https://www.nww.usace.army.mil/missions/projects/yakima-river-delta-ecological-restoration/>)
- Changes in timing of pulse flows that are currently ongoing that support anadromous fish passage. These pulses also alleviate predator interactions as Smallmouth bass abundance is correlated to river flow and flow pulses would reduce Smallmouth Numbers (ykfp 2014, <https://www.cbfish.org/Document.mvc/Viewer/P139180>)

Benefits for anadromous fish species and juvenile native fish species from the predation management actions will improve the likelihood of success and survival within the lower Yakima River. Studies have shown that smolt survival rate is related to predator density in the lower Yakima River

TABLE 6. DENSITY OF SMALLMOUTH BASS (SMB)

A. SMB Density (electrofishing catches/mile)

River section	2018			2019		
	Min	Mean	Max	Min	Mean	Max
BELOW PROSSER	0.3	2.3	10.5	0.2	2.4	7.8
BENTON	0.14	1.9	5.5	0.3	6.14	13.4
GRANGER	0.11	0.3	0.8	0.1	0.2	0.3
LOWER YAKIMA	0.12	3.8	18.8	0.2	5.3	17.0
Pooled data (all sections)	0.11	2.4	18.8	0.11	3.8	17.0

(https://www.researchgate.net/publication/275214042_Yakima_River_Species_Interactions_Studies_Annual_Report_1999). The proposed management plan for predator removal would be conducted over 8 weeks, using 2 boats per river reach. Total area of predator removal would in

include 10 miles river twice per week in individual reaches. Management would reduce the per mile density of Smallmouth bass (using Smallmouth bass densities in Table 6):

1. In the below Prosser Dam river reach approximately 376 adult Smallmouth bass and 3760 juvenile Smallmouth bass would be removed yearly.
2. In the lower Yakima River reaches approximately 732 adult Smallmouth bass and 7320 juvenile Smallmouth bass would be removed yearly.

Previous Yakama Nation surveys found several predatory fish species in 2018 and 2019 in different sections of the Yakima River; and a major predator was smallmouth Bass (SMB), which

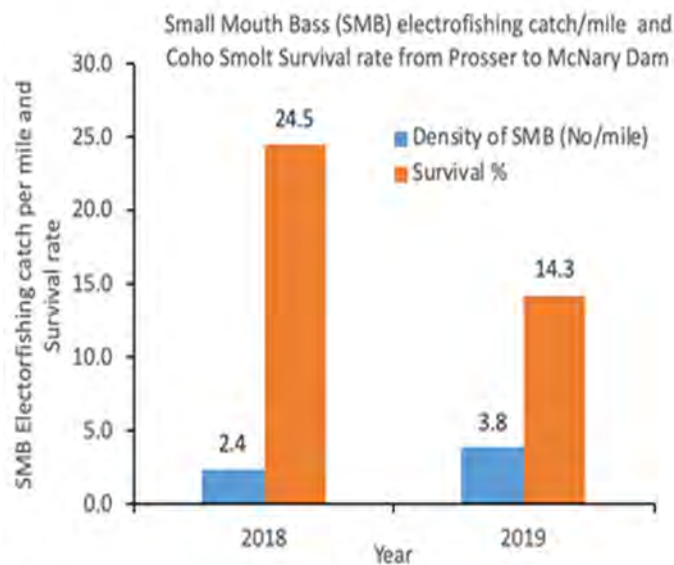


FIGURE 13. DENSITY OF SMALLMOUTH BASS (CATCHES PER MILE) AND COHO SMOLT SURVIVAL RATE FROM PROSSER DAM TO McNARY DAM IN 2018 AND 2019.

is present in large numbers in the lower Yakima River (YKFP ref). The density of SMB increases in the lower Yakima River as flow decreases and water temperatures rise. As the populations of SMB increased throughout the smolt migration season in study years a marked survival decrease was observed. The Coho survival rate from Prosser to McNary decreased as fish predators increased. For example, in 2018 the Coho smolt survival rate from Prosser to McNary dam was 24.5%; when the SMB density in the lower Yakima River was 2.4 electrofishing catches per mile; but in 2019 the Coho survival rate was lower (14.3%) but the SMB density was higher at 3.8 electrofishing catches per mile.

Based upon the previous work conducted on Smallmouth bass and Coho survival the expectation is that predator management of Smallmouth bass will have significant impacts on improving all smolt survival in the lower Yakima River. Using previous year’s observations of Smallmouth bass densities.

E.1.1.2 Sub Criterion A.2 – Multiple Benefits

- ***If the project will benefit multiple water uses explain how and to what extent the project will benefit multiple water uses.***

This project benefits tribal interests in resorting tribal fishing runs of native anadromous fish. This project will also benefit recreational users that hike the trails within the USACE Habitat Management Unit. Dense Russian olive overgrowth has led to safety issues on site for local hikers.

Removal of Russian olive and replacing it with native vegetation and restoring native grasses in upland areas will benefit both recreational users and the habitat diversity.

• *If the project will provide multiple restoration benefits (e.g., benefits to ecological values or watershed health; fish and wildlife habitat; protection against invasive species; enhancement to commercial, recreational, subsistence, or Tribal ceremonial fishing; enhancement of river-based recreation), explain how.*

This project will help in restoring summer tribal fishing runs on the mainstem of the lower Yakima River, provided added spawning habitat on the lower end of Amon Creek for ESA listed Steelhead, Coho, and fall Chinook; restore riparian native plants including plantings of Black Cottonwood trees, increase upland habitat diversity through removal of an invasive monoculture, decrease fire risk within the delta habitat management unit, and enhance recreational opportunities and safety within the Yakima Delta Habitat Management Unit.

• *Will the project reduce water conflicts within the watershed? If so, explain how.*

This project is designed to improve cool water refuge on the lower Yakima River by re-using wasteway water and predation management for enhanced fish habitat. Predation management actions are tied to basin management of water releases that are designed to balance water for irrigation and fish usage as well as improved flows through the Yakima Delta following the removal of the Bateman Island Causeway. As such the project is net-neutral for water resources utilizing water that is available in a more efficient manner. As such, this project will not contribute to water conflicts. Improving salmon productivity and passage success within the current confines of water resource allocation in the basin, and repurposing of wastage water to mitigate instream warming has a high likelihood of success for minimizing future lower basin water conflicts.

E.1.2 EVALUATION CRITERION B: COLLABORATIVE PLANNING

• *Strategy or Plan: Is your proposed project supported by a specific strategy or planning document?*

This project is supported by the Yakima Basin Integrated Plan (YBIP). The YBIP was created in 2009 when a diverse group of interests in the Yakima Basin came together with a desire to build a framework for resource management that would address the community's needs and put longstanding conflicts over water and fisheries behind them. The Integrated Plan identifies seven elements needed to achieve a balanced and comprehensive approach to water resource management and ecosystem restoration in the Yakima River Basin, including Reservoir Fish Passage, Structural and Operational Changes, Surface Water Storage, Groundwater Storage, Habitat/Watershed Protection, Enhanced Water Conservation, and Market Reallocation. This project is a critical component of the Habitat Protection and Enhancement and Fish Passage elements identified in the Integrated Plan. The plan also has several elements that work towards creating a 'bucket' of shapeable flows that is currently around 40,000 acre-ft, a portion of which

will be utilized by this project to reduce predator populations and predation rates on outmigrating smolts.

• ***Strategy or Plan Development: Was the strategy or plan developed through a collaborative process?***

The YBIP was developed as part of a collaboration coalition of 23 members, including conservation groups, agricultural interests, irrigators, and local, state, and federal agencies. The U.S. Bureau of Reclamation, Washington State Department of Ecology, and the Yakama Nation are leading plan implementation through partnership with these and other organizations. The YBIP is a grassroots workgroup built on collaboration and coordination. The leading entities typically receive input from other members through the executive committee at the highest level, and receive more technical level input from the various subcommittees of YBIP such as the Habitat and Lower Yakima River Subcommittees.

• ***Strategy or Plan Support for Project: Describe how the plan or strategy provides support for your proposed project.***

This project addresses two of the seven elements in the YBIP, habitat protection, and fish passage. In recent years YBIP members have recognized the importance of successful fish passage through the lower Yakima River. Without improved passage through the lower Yakima River the significant investments (>200 million over the last 5 years) in the upper basin on habitat and fish passages improvements will have limited return on their investment in terms of increasing anadromous fish populations within the basin. YBIP members recognize that further improvement in fish populations are imperiled unless passage for smolts and adults is improved through the lower river and have called out fish passage as a priority in the YBIP. A letter of support from YBIP is included in the supplemental materials.

E.1.3 EVALUATION CRITERION C: STAKEHOLDER SUPPORT FOR PROPOSED PROJECT

- Describe the level of stakeholder support for the proposed project. Are letters of support from stakeholders provided? Are any stakeholders providing support for the project through cost-share contributions or through other types of contributions to the project?

Letters of Support from stakeholders are provided in the Supplemental Materials. There is a high level of involvement and stakeholder support for this project including:

- Yakima Basin Integrated Plan partners
- US Army Corps of Engineers
- Mid-Columbia Fisheries
- Department of Natural Resources
- Washington State Department of Fish and Wildlife
- Yakama Nation
- Sunnyside Valley Irrigation District
- NOAA Fisheries

- Kennewick Irrigation District
- Tapteal Greenway Association
- Yakima Basin Fish and Wildlife Recovery Board
- US Bureau of Reclamation - Yakima Field Office

The stakeholders represent a diverse group of interests. Agricultural and water supply interests are represented by irrigation districts, the Yakima Basin Integrated Plan Work Group, and the local US Bureau of Reclamation office (Yakima Field Office). Tribal interests are represented by Yakama Nation Fisheries, and environmental interests are represented by Mid-Columbia Fisheries, Washington State Department of Fish and Wildlife, NOAA fisheries, and the Yakima Fish and Wildlife Recovery Board. Landowner interests are represented by US Army Corps of Engineers and Department of Natural Resources. Tapteal Greenway Association is an active local organization in the tri-cities committed to outdoor recreation, education and conservation. They are working closely with local stakeholders for the improvement of Amon Creek from the headwaters to the confluence. Tapteal Greenway secured the headwaters of Amon as a Nature Preserve and is working with Benton Conservation District for Amon Creek preservation and enhancement. Tapteal Greenway is aware of the project and a willing partner as we develop future urban outdoor recreational opportunities near the reconstructed channel.

- ***Is the project supported by entities responsible for the management of land, water, fish and wildlife, recreation, or forestry within the project area?***

US Army Corps of Engineers (USACE) and Department of Natural Resources (DNR) are the landowners for this project and responsible for the management of the land on which the project activities will occur. Both entities are supportive of the overall project goals (see attached letters of support). This proposal is consistent with the policies of USACE and DNR and their management goals for improved fishery habitat.

- ***Is there opposition to the proposed project? If so, describe the opposition and explain how it will be addressed. Opposition will not necessarily result in fewer points.***

There is no known opposition to the project at this time.

E.1.4 EVALUATION CRITERION D: READINESS TO PROCEED

- ***Describe the implementation plan for the proposed project.***

Project Timeline: *The Timeline for Project Implementation is outlined in Table 7.*

TABLE 7. PROJECT TASK, OBJECTIVES AND MILESTONES

Major Task	Milestones	Start Date	End Date
Electrofishing Predator Removal	Decreased CPUE Compared to Historical Record	4/1/2024	6/30/2026
Shapeable Flow Releases	Decreased CPUE During Flow Releases	4/1/2024	6/30/2026
Wanawish Dam Fish Trap	No Tagged Smallmouth Bass from Snively Reach Above Wanawish	4/1/2024	6/30/2026
Environmental Compliance	Complete All Outstanding Environmental Compliance Requirements	See Permit Timeline in Table 7	See Permit Timeline in Table 7
Amon Refuge Construction	20 Acres cleared of invasive trees	2/15/2024	2/15/2025
	1400 linear feet of channel habitat	5/1/2025	8/30/2025
	Cold Water Refuge Decreases Temp 3 - 5 °C and is 2000 m2	7/1/2025	8/15/2025
	Restore 20 acres of with native trees, shrubs and grasses	12/15/2026	5/30/2026
Amon Refuge Monitoring	Document fish usage after construction	6/1/2026	9/30/2026
5 Year Monitoring Plan	Use of Refuge and Decreased CPUE are Maintained	4/1/2027	9/30/2031

- ***Proposals with a budget and budget narrative that provide a reasonable explanation of project costs will be prioritized under this criterion.***

See attached budget and budget narrative.

- ***Describe any permits and agency approvals that will be required along with the process and timeframe for obtaining such permits or approvals.***

The Predation Management actions are ready for implementation immediately. The Yakama Nation has acquired the permits needed for the management of fish predators for recovery of anadromous and resident fish species in the Yakima Basin. The following permits are already acquired:

1. U.S. Fish and Wildlife Service recovery permit issued under section 10(a)(1)(A) of the Endangered Species Act (ESA) (#PER0011813-0), 16 U.S.C. 1531 et seq., and its implementing regulations and
2. National Oceanic Atmospheric Administration Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation (# NWR-2011-06509) permit.

US Army Corps of Engineers (USACE) is the lead for Section 106, NEPA, and ESA on the cool water refuge enhancement. The Seattle District Regulatory Division is working on the Nationwide Permit 27 (NWP #27), and Limit 8 programmatic covers the habitat improvement project. The consultation with the National Marine Fisheries Service (NMFS) is complete. US Fish & Wildlife Service Letter of Concurrence (LOC) review of project for bull trout compliance with 2008 restoration programmatic is underway and is anticipated this spring. On 11/22/2022 the Department of Ecology determined that an Individual Section 401 Permit is not required for this project as it meets Ecology’s programmatic decision for NWP #27. Benton Conservation District is working with USACE on Section 106. Cultural Resource Review is initiated and conducted at the government to government level for this project. The following table provides the timeline for the remaining permits.

TABLE 8. PROJECT PERMITTING AND TIMELINE

Remaining Permits	Anticipated Completion Date	Comments
SEPA/NEPA	Oct-23	USACE is lead for NEPA
		SEPA submitted to City of Richland
ARPA Permit	May-23	USACE is lead for Section 106 and NHPA
Cultural Resources Complete	Sep-23	NA
Hydraulic Project Approval	August 31 2023	NA
No-Rise Analysis	1-Jun-23	No-Rise Analysis complete; USACE H&H division reviewing and coordinating with City of Richland to issue final determination

- ***Identify and describe any engineering or design work performed specifically in support of the proposed project.***

The cool water refuge enhancement is in the final design phase and is at 60% final design. This project has had an extensive design and planning process with multiple basin stakeholders involved in water resource management and fisheries (USBR, USACE, DNR, WDFW, NMFS, Yakama Nation Fisheries, KID, Mid-Columbia Fisheries, and Yakima Basin Fish and Wildlife Recovery Board). Northwest Hydraulic Consultants, Inc. were selected through a bid process in 2019 for development of the conceptual and final designs, with GeoEngineers selected to oversee project permitting. Project design was initiated in 2019, with four conceptual design alternatives presented to the basinwide Technical Advisory Group. The selected concept was moved into preliminary design in 2020 and the final design will be complete by August 30, 2022. The developed project design incorporated extensive modeling of the temperature and flow dynamics within Amon Creek and the Yakima River using HEC-RAS and AdH models. Physical modeling is currently underway to refine the project design and placement of the apex log jams in the river and move the design from 60% to final.

Implementation for the project is anticipated to begin in the winter/early spring of 2024 with site preparation including the clearing and removal of Russian olive. The cleared sites will be treated and managed for Russian Olive for one year in collaboration with USACE to prevent re-growth. Excavation of the new 1400-foot Amon Creek channel will begin in the spring and summer of 2025. Plugs will be installed at the ends of the new channel, and it will remain dry until other project components are complete. This project will take advantage of the different in-water work windows for Amon Creek and the Yakima River Mainstem. The low flow deflector will be installed in the summer of 2025 during the in-water summer work window for the Yakima River. The old Amon Channel will be dewatered in the winter of 2026 and backfilled with re-filling of the new channel in the winter of 2026. Complete revegetation of the site with natives will be completed by 5/1/2026. Monitoring of the new channel will take place in the summer of 2026. A detailed project sequencing plan with mitigation and specific construction elements has been developed and submitted to USACE as part of the Joint Aquatic Resources Permit Application.

- **Does the applicant have access to the land or water source where the project is located?**

Yes, the project has permission and access to the land and water sources where the project actions are located. Permission for project access and landowner acknowledgement for the cool water refuge enhancement work were obtained by Benton CD for both DNR and USACE in 2020 as part of the project design funding process. Permissions for predation management actions are covered through the project permits and coordination with USBR at the Wanawish Dam Fish Ladders.

- ***Identify whether the applicant has contacted the local Reclamation office to discuss the potential environmental and cultural resource compliance requirements for the project and the associated costs.***

Yes, the applicants have talked with Dan Church, the US Bureau of Reclamation Project Management Specialist (CCAO Project Management Group) within the Pacific Northwest Interior Region 9 about the project. Staff within the US Bureau of Reclamation Yakima Field Office have been involved with development of the project and also contacted about proposal development and submission. No external costs are needed for compliance through the US Bureau of Reclamation as the US Army Corps of Engineers will be the Federal Lead for this project. The fees and costs associated with USACE as the lead are provided in an attached estimate provided by the USACE real estate division.

- ***Is the project completely or partially located on Federal land or at a Federal facility?***

This project is completely on property owned and managed by the US Army Corps of Engineers (USACE). It was purchased for flood control as part of the McNary Dam installation in the mid-1950s. The property was farmland prior to the purchase by USACE. The Amon Creek channel was created by USACE to drain Amon Basin and help with property flood control after the natural outlet was cut off by the installation of HWY-240. USACE does not have funds for the site beyond basic management for public safety. This project does align with USACE long term goals for Russian olive tree removal and fire management at the site. USACE began Russian Olive management in 2015 but funding ran out 2018, and no further work planned at this time. USACE, however, will take over management of the newly established native plantings post installation as part of their basic site management. While the re-routing of the creek for cool water creation does not directly benefit USACE or their management of the site, they are supportive of the efforts, but do not have budget or funding for this work.

E.1.5 EVALUATION CRITERION E: PERFORMANCE MEASURES

- ***All applicants are required to include information about plans to monitor improved streamflows, aquatic habit, or other expected project benefits.***

Multiple performance measures that leverage YN's and BCD's long term datasets on lower river conditions will be used to measure the effectiveness of the project at improving migration through the lower river for smolt and adult sockeye, summer chinook, and steelhead.

Performance measures that quantify the benefit of the project for smolts will include:

- Number of piscivorous predators removed.
- Change in general abundance of piscivorous predators.
- Change in reach level populations of small mouth bass.
- Change in the overall survival of smolts between Prosser and McNary Dams

Performance measures that quantify the benefit of the project for adults will include:

- Change in temperature at the confluence of Amon Creek between historic and enhanced conditions after construction of the refuge.
- Change in the size of the cold water pool at the confluence of Amon Creek between historic and enhanced conditions after construction of the refuge.
- Average time adults spent in the cold water refuge.
- Number of adults that are recorded as entering the refuge.

The effectiveness measures that will evaluate the success of the project for out-migrating smolts can be categorized into two parts; those that quantify the magnitude of our actions, and those that quantify the magnitude of the response. To measure the magnitude of these actions several performance metrics relating to the relative overall size of the piscivorous fish populations in the lower Yakima River, and that of smallmouth bass will be monitored and quantified. Using catch per unit effort (CPUE), which provides a standardized metric derived from our electrofishing surveys for the general abundance of fish, we can compare changes in the general abundance of piscivorous fish populations within the target reaches over time as well as the Before-After Control-Impact (BACI) analysis will be used to evaluate the project performances. During the three year award period the USGS will calculate a CPUE for each day they are performing predator reduction electrofishing. Combined with the Yakama Nations two decades of periodic general abundance surveys of the lower river, we can evaluate the project's effectiveness at reducing piscivorous fish populations in the lower river. The USGS will also perform mark-recapture surveys of invasive smallmouth bass to give us a more robust estimate of changes in their population during the three year project period. In the five years following project completion the YN will continue to conduct periodic electrofishing surveys of the lower river to evaluate the effectiveness of the permanent measures (shapeable flow releases, trap at Wanawish Dam, and removal of the Bateman Island Causeway) to prevent or restrict the reintroduction of the McNary Pool subpopulation of smallmouth bass during the critical smolt outmigration period when this subpopulation begins to migrate up the lower Yakima River. These additional surveys conducted by the YN in the 5 years following project implementation will not be conducted using federal funds associated with any award agreement received through this EWRP proposal. These effectiveness measures will allow for a thorough quantification of the magnitude of this proposal's actions to reduce piscivorous fish populations, including the invasive smallmouth bass.

To evaluate the magnitude of the response from our predation management actions on smolt survival, specifically for sockeye, summer chinook, and Steelhead, the overall smolt survival between Prosser and McNary Dams will be calculated. A portion of the wild and hatchery Chinook, Coho, Sockeye and steelhead smolts passing the Prosser Diversion Dam in the lower Yakima River are entrained into the Chandler irrigation and hydropower canal, screened from the

canal, and bypassed through a sampling facility where they are enumerated before returning to the Yakima River. The modeled relationship between the measured percentage of flow diverted and the percentage of each species entrained is applied to daily counts from the sampling facility to estimate total daily and annual passage of each species. The annual numbers of smolts of each species released from Prosser Hatchery immediately below Prosser Dam are added to the numbers passing Prosser Dam.

The survival rate of Prosser smolts to McNary Dam on the Columbia River is estimated from PIT-tagged smolts either detected at or released from Prosser Dam and Prosser Hatchery. Because only a fraction of these tagged smolts surviving and passing McNary Dam is detected in the smolt bypass system, the probability of tag detection at McNary Dam is derived from the percentage of tags detected at John Day or Bonneville dams downstream that were previously detected at McNary. McNary detections divided by their probability of detection yields McNary passage, which in turn is divided by Prosser passage to produce the survival rate estimate from Prosser Dam to McNary Dam for each species.

The effectiveness measures that will evaluate the success of the project for immigrating adult Sockeye, summer Chinook, and Steelhead can similarly be split into two categories; those that measure the effect of the refuge on creating conditions beneficial to migrating adults, and those that measure the change of adult behavior in response to the improved conditions at the confluence of Amon Creek. To measure the water quality benefit that the Amon Creek refuge will provide for migrating adults, ambient Yakima River stream temperature and dissolved oxygen will be measured above the refuge and within the refuge. The difference between these two measurements as well as the overall size of the cold water pool created by the refuge is the benefit that the refuge provides to migrating adults. These two parameters will be monitored in year three, after Amon Creek refuge construction, and will continue to be measured in the 5 years following project implementation. These effectiveness measures will be compared to historical data collected on the size and temperature of the cold water pool that was present at the Amon Creek confluence prior to project implementation. The larger the increase in the size of the pool and the greater the difference in stream temperature and dissolved oxygen between ambient river conditions and conditions within the refuge, the more likely sockeye, summer chinook, and steelhead are to use and benefit from the refuge.

To evaluate the degree to which adult sockeye, summer chinook, and steelhead utilize the Amon Creek refuge several monitoring methods will be implemented. These methods include the use of a submerged PIT tag array, acoustic camera, snorkel surveys, and seine net surveys. The use of the PIT tag array and acoustic camera both provide continuous monitoring of fish presence, and the period of time that the fish have spent in the refuge. While these two methods are redundant, it is necessary to use these methods in concert due to the low number of PIT tagged adult Sockeye that return to the Yakama Nation. Snorkel surveys and seine net surveys are needed in order to calibrate the observations of the acoustic camera based on the actual fish populations present in the river. The use of the acoustic camera, and the completion of snorkel, and seine net surveys will only occur within 6 months of construction completion. The YN and BCD will continue to maintain and monitor the refuge using the PIT tag array for 5 years after

project implementation. It is hoped that within four years the number of pit tagged adult Sockeye are such that monitoring using the submerged array will be sufficient to assess anadromous fish use of the refuge. This fish use monitoring data will provide a clear picture of how effective the project has been at providing a refuge for migrating adult sockeye, summer chinook, and steelhead when conditions in the mainstem Yakima River are near or exceeding lethal levels.

E.1.6 EVALUATION CRITERION F: PRESIDENTIAL AND DOI PRIORITIES

E.1.6.1 Subcriterion No. E1: Climate Change

- *How will the project build long-term resilience to drought? How many years will the project continue to provide benefits? Estimate the extent to which the project will build resilience to drought and provide support for your estimate.*

Climate change models for the Yakima Basin (Malek and others, 2020; UW Climate Impacts Group; Yakima River Basin Integrated WIRE Management Plan) show that Yakima River basin is highly sensitive to changes in basin water supply stemming from altered snowpack amounts and a shift to precipitation as rainfall. This shift results in greater water stress as the Yakima River is a snow dependent basin with much of its summer water supply met through storage in the upper watershed's five major reservoirs. Drought years typically lead to warmer and hotter waters. Creation of cool water refuge will help alleviate the impacts of climate change driven drought by providing cool water habitat for thermoregulation and lessening stress on the system in drought years, aiding to drought resiliency in low flow water years.

The benefits of the cool water refuge enhancement project are anticipated to last decades as the project does not require long term operation and maintenance and is self-sustaining.

- The proposed project reduces urban fire risk which increases in drought years, through removal of dense, overgrown Russian Olive trees and re-opening the site with native grasses and riparian plantings along the creek. This project also lends to drought resiliency through water savings within the project site as 10 acres of the 20 cleared acres will be reseeded with native grasses that have a lower water requirement than mature Russian Olive Trees. Conversion of Russian Olive trees per acre to native grasses results in about 5 million gallons of groundwater conserved per year within the riparian area. This will be a long term conservation benefit as USACE will manage the property to prevent Russian Olive re-growth. This water savings estimate using Consumptive Use Calculations that are utilized by the Conservation District regularly as part of water savings and land management. This calculation assumes that for native grasses the water use is: 18 in. x 10 acres x 27,154 gal/acre in = 4,877,720 gallons/year for native grasses. The required water usage for Russian olive estimates is: 36.76 in. x 10 acres x 27,154 gal/acre in = 9,981,810 gallons/year. The difference in these is the presumed water savings at the site. A full grown Russian Olive tree is estimated to consume 50 – 75 gal/day of water during the summer months depending on the daytime temperature. Returning some of the property

back to native grasses and brush and reducing mature Russian Olive trees will contribute to groundwater savings within the Delta HMU.

Will the proposed project establish and use a renewable energy source?

Yes, this project will make use of the transfer of heat between the ground and infiltrated irrigation return flows that discharge as groundwater to Amon Creek, which constitutes the majority of the creek's streamflow. In order to decrease the temperature of a thermal refuge on the Yakima River with a through flow of 50 cfs (flow rate of Amon Creek) by 2.7 degrees Celsius for an hour it would take -57,834 megajoules (MJ) of energy. If this were to be done with a thermal heat exchanger with 100% efficiency this would require 16,065 KW/hr of power. Over the course of cooling the refuge from June through the end of September this would equate to about 46,909,800 KW of power which assuming a wholesale price of 6 cents/KW would cost about \$2,814,588/year. By taking advantage of geothermal cooling in the summer, a renewable energy source, this project will save approximately \$2.8 million dollars in power costs per year, over a thermal refuge project that used non-renewable energy by cooling water using a thermal heat exchanger. Calculation:

$$Q = mc\Delta T$$

Where Q is heat in Joules, m is mass in kilograms, c is specific heat in J/kgC and ΔT is the change in temperature. The total volume of water with the creek flowing at a rate of 50 cfs after an hour is 5,100 cubic meters or a total mass of 5,100,000 kg. The specific heat of water is 4,200 J/kgC.

$$Q = 5,100,000 \text{ kg} * 4,200 \text{ J/kgC} * -2.7 \text{ C}$$

$$Q = -57,834,000,000 \text{ J or } 57,834 \text{ MJ}$$

If we assume that a constructed thermal heat exchanger would have 100% efficiency then this would translate into 16,065 kilowatt hours.

- ***Does the proposed project include green or sustainable infrastructure to improve community climate resilience, such as reducing the urban heat island effect, lowering building energy demands, or reducing the energy needed to manage water?***

This project also increases upland biodiversity through removal of the Russian Olive monoculture within Yakima Delta. Russian Olives will be replaced with a diversity of species including native Black Cottonwoods, willows, aspens, as well as understory bushes and native grasses. This project directly conserves our nation's urban resources by enhancing fish habitat and upland habitat while repurposing water resources in the lower Amon Creek Basin for improved temperatures on the mainstem of the Yakima River.

This proposed project will also reduce greenhouse gas emissions by sequestering carbon in native grasses, trees, and understory/brush species. Sediment excavated from the new channel will remain on site, limiting carbon emissions for offsite removal. Excavated soils will be used to backfill the current channel and other low lying areas within the Delta Habitat Management Unit, and remain onsite. The Russian Olives will be ground and mulched on site, and repurposed for groundcover, mulch, and suppression material. This will re-use the carbon bound within the

Russian olive trees for onsite mulch. It will also reduce the carbon emissions for hauling the removed trees offsite, or bringing in external materials.

- ***Does the proposed project seek to reduce or mitigate climate pollutions such as air or water pollution?***

This project will mitigate sediment loading to Yakima River as the new channel at the cool water refuge will provide reduced flows, and deposition opportunities within the wetland planting bench. The change in flows within the lower end of Amon Creek will also mitigate the effects of nutrient loading to the river from upstream urban runoff activities. This project compliments efforts by Benton Conservation District within the upper part of Amon Basin funded through the Department of Ecology's Centennial Clean Water Act - that work is improving upstream basin water quality through monitoring, education, and conservation activities on private, urban properties. Removal of predator species from the river, benefits public health and a source of recycling of harmful chemical toxins from the river supply. The Yakima River has a public health consumption warning and limit for warm water species due to bioaccumulation of toxins. Removal of these species decreases the overall burden of toxins as contained within the large predator populations.

- ***Does the proposed project have a conservation or management component that will promote healthy lands and soils or serve to protect water supplies and its associated uses?***

The USACE adaptively manages the Yakima River delta including the Amon Creek refuge project to promote healthy lands and soils as well as protect water supplies by working to address the proliferation of invasive species in the area. YN and BCD will work with the USACE to adaptively manage the Amon Creek project area to promote the establishment of native plant communities, and reduce erosion and sediment runoff to protect water supplies and downstream users.

E.1.6.2 Subcriterion No. E2: Disadvantaged or Underserved Communities

- ***Will the proposed project serve or benefit a disadvantaged or historically underserved community?***

The Yakama Nation itself is an underserved community and a federally recognized tribe. The Yakama Nation has been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. This project will not only provide increased economic opportunity for those tribal members whose livelihoods depend on harvestable populations of salmon, but it will also enhance significant cultural sites within the project area by increasing the amount of anadromous fish that transit through those sites. The greater area surrounding the Yakima River Delta and Prosser is part of an extremely diverse Traditional Cultural Landscape associated with the Yakama Nation. The Yakima delta has several important cultural sites located in the vicinity. Prosser Dam at the start of the Chandler Reach is located in an ancestral area known as *top-tut*, which is vital to the continued survival of Yakama culture and traditional

practice. This project will improve overall access to tribal treaty resources by increasing anadromous fish populations within the Yakima River Basin.

There are several neighborhoods surrounding the Yakima delta and the Chandler Reach (within a 10 min drive) that have poor socioeconomic indicators relative to the rest of the nation (EPA, 2023). For the Confluence Reach and the Amon Creek Confluence these indicators include nearby neighborhoods in the 90-95th percentile of unemployment, 80-90th percentile of low income, 80-90th percentile of less than high school education, 95-100% over the age of 65, and 95-100th percentile of low life expectancy. For the Chandler Reach these indicators include 80-90th percentile of the EPA demographic index, 80-90th percentile of low income, 80-90th percentile of unemployment rate, 80-90th percentile of being linguistically isolated, 95-100th percentile of less than high school education, and 95-100th percentile over the age of 65. Given these findings, it can reasonably be concluded that these nearby neighborhoods meet the definition of being underserved communities. These nearby underserved communities will benefit from this project's water quality benefits, and may benefit from jobs created during the construction of the Amon refuge.

E.1.6.3 Subcriterion No. E.3: Tribal Benefits

- ***Does the proposed project directly serve and/or benefit a Tribe? Will the project improve water management for an Indian Tribe?***

The 1855 treaty between the U.S. government and the Yakama reserved the tribe's rights to hunt, gather foods and medicines and take fish in all usual and accustomed places. The project area is within the usual and accustomed fishing places for the Yakamas, as well as the Umatilla and Nez Perce tribes. The project is also at the mouth of the Yakima River, serving as the gateway for salmon to the bulk of the tribe's reservation. Court cases beginning in the 1970s affirmed the Yakamas right not only to harvest salmon, but established the treaty tribes as co-equal partners in managing fish resources with the state of Washington. More recent cases have affirmed that the treaty right to fish also requires sufficient habitat restoration to sustain the fishery. The USBOR as a federal agency shares in these treaty trust responsibilities. The Yakama Nation strives to protect Yakima and Columbia River resources through responsible management with partners, and upholding our unique treaty rights and sovereign status within the United States.

The greater area surrounding the Yakima River delta is part of an extremely diverse Traditional Cultural Landscape associated with the Yakama Nation. These locations have many associated legendary and monumental sites which are told through the oral history and way of teaching in ichishkinsinwit (the language that belongs to the land). Archaeological sites including burials/cemeteries, fishing sites, villages, and ceremonial sites, and many other resource types are interconnected and associated elements of the delta area. The Yakama Nation retains the traditional responsibility, as a people, to respect the laws of this land understood as Nami-taman-wit (The Creator's Law). In this way, Yakamas have a responsibility to the resources that sustain our lives. Without these resources we would not live every day, and we know every breath that we take is as a deeply spiritual gift. If we understand this and do not take the steps necessary to

protect our resources, we will bring harm to ourselves, others, and future generations yet unborn. Climate change threatens these resources by increasing stream temperatures creating favorable conditions for invasive piscivorous fish to feed on outmigrating smolts, and increasing the period of time that the thermal block halts adult fish passage up the lower Yakima River during the late summer months. This project will help mitigate these negative impacts of climate change by reducing invasive piscivorous fish populations and providing thermal refuge for migrating adults.

Multiple indigenous communities within the project area (e.g. Yakama, Umatilla and Nez Perce tribes) have depended on salmon as their primary First Food¹, with the Columbia and Yakima Rivers as primary sources for salmon production and harvest. Applying traditional knowledge of salmon production, run timing, and habitat conditions will optimize the rehabilitation potential of restoration efforts. Traditional knowledge of historic environmental conditions is necessary for assessing climate change projections and resource impacts at expanded scales of temporal analysis. This project will incorporate traditional knowledge into project implementation in order to help mitigate climate change impacts related to invasive species predation and increased stream temperatures. Data sharing agreements with non-indigenous partners, such as with BCD, will also help facilitate the preservation of ecological and traditional knowledge about species, harvesting locations, and traditional uses (Climate and Traditional Knowledge Workgroup 2014).

Disclosure Statement:

No conflict of interest is declared.

¹ **The relationship between indigenous peoples and first foods is reciprocal.** First foods serve the people by providing cultural and physical health, and the indigenous communities reciprocate by maintaining the health of first foods. In this way, both people and food provide and are provided for.
https://www7.nau.edu/itep/main/tcc/Basic/TDK_FirstFoods#:~:text=The%20relationship%20between%20indigenous%20peoples,provide%20and%20are%20provided%20for.

WaterSMART
Environmental Water Resources
Projects for Fiscal Year 2023

Funding Opportunity No. R23AS00089

Lower Yakima River:
Anadromous Fish Survival

**Letters of Support and Land Owner
Acknowledgments:**



This River Runs Forever Yakima Basin Integrated Plan

Urban Eberhart
Kittitas Reclamation District

March 23, 2023

Commissioner Cory Wright
Kittitas County

To: U.S. Bureau of Reclamation WaterSMART Environmental Water Resources Projects Program FY23 (R23AS00089) Reviewers

Commissioner Amanda McKinney
Yakima County

Re: Support for the Lower Yakima River: Anadromous Fish Survival Proposal

Brandon Parsons
American Rivers

Lisa Pelly
Trout Unlimited

Dear Review Committee,

Scott Revell
Roza Irrigation District

As members of the Implementation Committee of the Yakima Basin Integrated Plan (Integrated Plan), we are writing to express support for the Yakama Nation and Benton County Conservation District's application under the U.S. Bureau of Reclamation WaterSMART Environmental Water Resources Projects Program for the *Lower Yakima River: Anadromous Fish Survival Proposal*.

Mike Livingston
Washington Department of Fish and Wildlife

Tom Tebb
Washington State Department of Ecology

This project is a critical component of the Habitat Protection and Enhancement and Fish Passage elements identified in the Integrated Plan. The Integrated Plan is a unique integrated water resource management effort supported by a coalition of 23 members, including conservation groups, agricultural interests, irrigators, and local, state, and federal agencies. The U.S. Bureau of Reclamation, Washington State Department of Ecology, and the Yakama Nation are leading plan implementation through partnership with these and other organizations.

The Integrated Plan's Salmon and Steelhead 10-Year Restoration Strategy seeks to increase Yakima River Basin fish population recovery levels through the collaboration of Integrated Plan partners implementing fish and habitat restoration work. The Strategy focuses on three themes: (1) safe fish passage, (2) flow restoration, and (3) habitat restoration, and identifies key actions over the next 10 years to rebuild salmon and steelhead populations while improving their resilience to withstand climate change. The Strategy emphasizes safe passage projects in the Lower Yakima River, including water quality improvement and predation reduction, as critical to the entire Integrated Plan salmon and steelhead restoration effort. The Lower Yakima River: Anadromous Fish Survival proposal is part of a suite of Integrated Plan projects designed to improve the safety and reliability of fish passage that have been completed, are in process, or are in planning for the next 10 years.

"Restoring the natural health and economy in the Yakima Basin."

The Yakima Nation, in partnership with the Benton County Conservation District, seek funding for the Lower Yakima River: Anadromous Fish Survival proposal to improve fish passage impaired by poor water quality conditions by providing 2,500 square meters of critical cold-water refuge in the hottest portion of the Lower Yakima River and to reduce predation pressures through removal of piscivorous fish, including several invasive species. The proposal aims to improve conditions in the Lower Yakima River for anadromous fish species, including the Yakima Major Population Group of federally threatened Middle Columbia River (MCR) steelhead smolts and adults; smolts and adults from the Yakima populations of MCR spring and fall/summer run Chinook, Coho, and Sockeye salmon; and ammocoetes and adults from the Yakima population of Pacific lamprey.

Thank you for considering this proposal for funding under the WaterSMART Environmental Water Resources Projects Program.

Sincerely,

Sincerely,



Urban Eberhart
Kittitas Reclamation District



Cory Wright
Kittitas County



Amanda McKinney
Yakima County



Brandon Parsons
American Rivers



Lisa Pelly
Trout Unlimited



Tom Tebb
WA State Dept. of Ecology



Scott Revell
Roza Irrigation District



Mike Livingston
WDFW

“Restoring the natural health and economy in the Yakima Basin.”

March 26, 2023

Review Committee

U.S. Bureau of Reclamation WaterSMART Environmental Water Resources Projects Program
FY23

Grant Call: R23AS00089

Dear Review Committee,

Please consider this a letter of landowner acknowledgement and letter of support for the Yakama Nation and Benton Conservation District's application to the US Bureau of Reclamation's WaterSMART Environmental Water Resources Projects Program Proposal titled "Lower Yakima River: Anadromous Fish Survival".

As the landowner of the Yakima Delta Habitat Management Unit, the Corps supports Benton Conservation District's efforts to improve cool water habitat on the Yakima Mainstem River by re-routing the existing channel of Amon Creek to a new location on the mainstem further downstream that provides greater habitat value. This project will improve off-channel cool water refuge habitat to help alleviate thermal stress on native fish, stabilize the eroding Amon Creek channel and improve upland riparian habitat. The Corps is committed to work with project partners on implementation of this project which capitalizes on the availability of a documented cool water source within Corps owned lands and will provide support for the project as the federal lead for NEPA, ESA and Section 106.

The Walla Walla District recognizes the importance of the lower Yakima River within the McNary Pool influence and the persistent thermal and predation challenges that are present. The Corps is working with local stakeholders to improve water quality and temperature conditions within the delta, along with managing predator habitat. This project aligns with ongoing efforts by the Corps to support native fish and improve water quality in this area. The project's riparian restoration actions are in alignment with our agencies goals to control invasives species (Russian Olive, etc.) and establish sustainable native upland habitat for all wildlife.

The Corps supports the efforts of Yakama Nation and Benton Conservation District's proposal to improve lower Yakima river function by making use of the available cool water resources present in the system.

Sincerely,

Damian Walter

Damian Walter
Dist. Wildlife Biologist
Walla Walla District



State of Washington
DEPARTMENT OF FISH AND WILDLIFE
South Central Region • Region 3 • 1701 South 24th Avenue, Yakima, WA 98902-5720
Telephone: (509) 575-2740 • Fax: (509) 575-2474

March 24, 2023

**U.S. Bureau of Reclamation
WaterSMART Environmental Water Resources Projects Program
FY23 (R23AS00089) Reviewers**

RE: Letter of Support for the Yakama Nation and Benton Conservation District's WaterSMART grant proposal titled, "*Lower Yakima River: Anadromous Fish Survival*".

WaterSMART Grant Reviewers,

I am writing to express the Washington Department of Fish and Wildlife's (WDFW) support for the Yakama Nation and Benton Conservation District's (BCD) joint WaterSMART application for fish passage and habitat improvement efforts that should help improve the survival of anadromous fish in the lower Yakima River by addressing some of the limiting factors identified in the Yakima Basin Integrated Plan (YBIP).

The Yakima River has long been one of the most popular fisheries for smallmouth bass within the state, but the WDFW began liberalizing regulations in this popular fishery in the early 2000's due to internal studies detailing predation hotspots. Predation is known to account for part of the mortality of out-migrating fish and as such, the WDFW operates a bounty program for Northern Pikeminnow, a native predator in the Columbia River system. In 2019, the Governor's Southern Resident Orca Task Force published its final report outlining 49 recommendations intended to improve Chinook populations and provide more prey for Southern Resident orca. These recommendations were followed by legislation requiring the WDFW to reduce size and daily limits of certain warmwater species in all anadromous waters across the state to reduce the risk of predation, and by the development of an internal policy that helps guide our management of non-native game fish.

This project is consistent with the direction provided by the legislature for anadromous waters and should improve survival of both juvenile and adult life histories of federally threatened Middle Columbia River (MCR) steelhead, as well as smolts and adults of spring and fall/summer run Chinook, Coho, and Sockeye salmon; and ammocetes and adults of Pacific lamprey in the Yakima River Basin. This project, if undertaken correctly, can possibly contribute to improved out-migrating fish survival and passage conditions by addressing poor water quality conditions and providing thermal refugia in the warmest reaches of the lower Yakima River, while reducing predation pressures through the removal of piscivorous fish species.

The Yakama Nation and WDFW have worked collaboratively over many decades, including the Yakima Basin Integrated Plan (YBIP), to implement a multitude of salmon and steelhead restoration projects

within headwater areas that address factors limiting habitat, streamflow, irrigation diversion entrainment, and fish passage. However, despite our successes with supplementation and habitat restoration, smolt survival to the Columbia River, ocean, and adult returns to spawning areas, remains significantly diminished. This proposal seeks to address some of the issues affecting migrants by managing predators and expanding cold-water refugia.

The Yakama Nation has been conducting research regarding the temporal and spatial distribution of piscivorous fish throughout the lower river and will collaborate and contract with the United States Geological Survey (USGS) to obtain all necessary permits and approvals, and conduct predator reduction in the Yakima River.

To help adult migrants, this proposal will provide cool water refugia at the confluence of Amon Creek (River Mile 2.5). The lower Yakima River has chronic thermal issues that are detrimental to migratory adult salmonids, and this project will create 2,500 square meters of new cool water, resting habitat for adult salmonids. The project will also provide an additional 700 feet of new sinuous channel replanted with native riparian species along Amon Creek and will improve rearing conditions and fish passage into the Creek.

This project compliments, and provides an interim solution to, longer term efforts by the Yakama Nation and WDFW efforts to remove the Bateman Island Causeway that could significantly reduce the population of smallmouth bass and other warm water species in the Yakima River by interrupting their lifecycle by significantly cooling the delta by allowing for greater mixing of Columbia River water.

The Yakama Nation and WDFW are also working with other YIP stakeholders in developing additional shapeable stored water to provide pulse flows in the lower Yakima River to reduce predation during peak outmigration periods. However, there remains an interim need to reduce predation rates, especially for ESA listed MCR steelhead smolts, until these more permanent actions are realized.

WDFW supports the Yakama Nation's and BCD's efforts to improve salmonid migration efficiency and survival in the Yakima River in our collaborative effort to recover salmon and steelhead stocks. This project will likely help advance salmonid recovery efforts in the Yakima River Basin.

Thank you for the opportunity to support this funding request. If you have any questions, please do not hesitate to contact me.

Sincerely,

A handwritten signature in blue ink, appearing to read "Mike Livingston".

Mike Livingston
WDFW - Region 3, South-Central Washington, Director



SERVING AGRICULTURE SINCE 1906

March 20, 2023

To U.S. Bureau of Reclamation WaterSMART Environmental Water Resources Projects Program FY23 (R23AS00089) Reviewers

Re: Support for the Yakama Nation and Benton Conservation District Grant Application: Lower Yakima River Anadromous Fish Survival Proposal

Dear Review Committee,

Sunnyside Valley Irrigation District (SVID) supports the Yakama Nation's (YN) and Benton Conservation Board's (BCD) partnership WaterSMART grant application for the Environmental Water Resources Projects notice of federal funding opportunity (NOFO). The proposal titled, "*Lower Yakima River: Anadromous Fish Survival*" helps address two key elements of the Yakima Basin Integrated Plan (YBIP), fish passage and habitat protection and enhancement. The Integrated Plan is a unique integrated water resource management effort supported by a coalition of 23 members including conservation groups, agricultural interests, irrigators, and local, state, and federal agencies. SVID, as a member of YBIP, has worked diligently to improve lower river function through implementation of critical projects such as the 2022 installation of a fish passage boom at the Sunnyside Dam, and improving water quality through sediment reduction and runoff. We support partner initiatives that align with YBIP and further the basin wide efforts for fish passage and habitat protection.

This proposal helps address poor river conditions in the lower Yakima River that have been recently identified as key to increasing fish production in the basin. Hundreds of millions of dollars in investments for anadromous fish have been made in the upper Yakima River basin, but the returns on these investments cannot be realized until lower river conditions are improved. Smolt predation and the thermal barrier created by high lower Yakima River stream temperatures are two large contributors to the overall poor river conditions on the Yakima River which recent research has proven to be the single biggest factor limiting anadromous fish recovery in the Yakima Basin.

To help alleviate the effects of the thermal barrier on adult migrants, this proposal will provide cool water refugia at the confluence of Amon Wasteway (River Mile 2.5). This will be accomplished by constructing a flow deflector that will create 2,500 square meters of new cool water, resting habitat for adult salmonids.

While longer term efforts are being implemented to reduce predation rates on out migrating smolts, there remains an acute need in the short term to decrease these high rates. Removal of the Bateman Island Causeway, projected to occur in 2025, is expected to significantly reduce the presence and metabolism of warm water predators in the Yakima River during the critical outmigration window. Notably, this project is also expected to remove a substantial area of favorable rearing habitat for invasive smallmouth and largemouth bass. Over the coming years, conservation and construction of additional storage in the basin are also expected to contribute to the amount of water available for shaping river flows to the benefit of migrating anadromous fish species. Interim results from the USGS have shown the potential for these flows to substantially improve outmigrating smolt survival, with much of this benefit accruing from reduced predation rates through the lower river. Although these efforts are expected to markedly reduce

predation pressures in the coming years, smolt survival through the lower river will remain low without an interim intensive predation management program.

We strongly urge Reclamation to fund the Yakama Nation and Benton Conservation District's proposal to improve lower Yakima River conditions. These actions are a critical part of Yakima Basin Integrated Plans efforts to restore healthy, harvestable populations of salmon, steelhead and bull trout to the Yakima Basin.

Sincerely,

A handwritten signature in black ink that reads "Lori Brady". The signature is written in a cursive, flowing style.

Lori Brady
SVID Manager



**DEPARTMENT OF
NATURAL RESOURCES**

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March 20, 2023

US Department of Interior
Bureau of Reclamation
WaterSMART Grants

Dear Grant Proposal Reviewer:

The Washington State Department of Natural Resources (DNR) is pleased to provide this letter in support of the FY23 WaterSMART Environmental Water Resources Projects grant proposal submitted by the Yakama Nation in partnership with the Benton Conservation District, titled "Lower Yakima River: Anadromous Fish Survival."

DNR Aquatic Resources Division oversees the stewardship over 2.6 million acres of state-owned aquatic lands, responsible for ensuring protection of habitat, encouraging direct public use and access and fostering water-dependent activities for future generations. DNR manages these lands to ensure the environmental protection and restoration of these aquatic lands in the effort to ensure healthy waterways by supporting ecological quality and function of native aquatic habitats for the benefit of the people, plants, and animals that live there. Rivers District, in the Aquatic Resources Division, manages the state-owned aquatic lands throughout the Yakima Basin, including the portion that runs through the proposed project areas from the City of Prosser to the mouth of the Yakima River.

We strongly support the Yakama Nation and Benton Conservation District's WaterSMART proposal to improve the habitat for Yakima River Basin fish populations by improving habitat vital for aquatic species and to address the effects of climate change by creating access to critical cold-water refugia in portions of the Lower Yakima River that are impaired by poor water quality and high temperatures. Species that would benefit from these improvements include federally threatened Middle Columbia River steelhead smolts and adults; smolts and adults from the Yakima populations of Middle Columbia River spring and fall/summer run Chinook, Coho, and Sockeye salmon; and juvenile and adults from the Yakima population of Pacific lamprey. By also removing introduced plant species and replanting with native species, as well as removing both invasive and native predatory fish, this proposed project will help decrease the survival pressures on the native anadromous fishes already imperiled by habitat degradation and high temperatures. We believe that the work proposed through the WaterSMART program is essential to ensuring the survival and enhancement of healthy Yakima River fish populations.

Thank you for considering the Lower Yakima River: Anadromous Fish Survival proposal. Feel free to contact me if you have any questions.

Sincerely,

Renelle Smith, Assistant Division Manager, Rivers District
Department of Natural Resources, Aquatic Resources Division
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