BUREAU OF RECLAMATION

Leavenworth National Fish Hatchery Surface Water Intake Fish Screens and Fish Passage Project Environmental Impact Statement

Biological Resources Report

U.S. Department of the Interior
Bureau of Reclamation
Columbia-Pacific Northwest Regional Office
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Mission Statements

The Department of the Interior conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Executive Summary

The U.S. Department of the Interior, Bureau of Reclamation (Reclamation) has prepared an Environmental Impact Statement (EIS) for the Leavenworth National Fish Hatchery (hereafter, LNFH or Hatchery) Surface Water Intake Fish Screens and Fish Passage (SWISP) Project (**Map A-1** in **Appendix A**). The purpose of this specialist report is to provide a comprehensive environmental baseline and analysis of the potential impacts of the SWISP Project under four separate alternatives, including Alternative A, No Action.

Vegetation, Including Special Status Plant Species

The Analysis Area for vegetation and special status plant species is those areas within the Project Area that would be directly disturbed by the proposed Project (**Map A-9** in **Appendix A**).

Affected Environment

Vegetation Types

Vegetation types in the Analysis Area were determined by querying Washington Gap Analysis Project (WA GAP) and NatureServe Ecological Systems Classifications (USGS 2020; NatureServe 2009) in the Analysis Area. These classifications were then refined using recent aerial imagery (Google Earth 2020), ground-truthing, and by observing numerous photographs of the Analysis Area. The resulting map of vegetation types in the Analysis Area is shown in **Map A-9** in **Appendix A**. Vegetation types in the Analysis Area are Disturbed Ponderosa Pine Woodland and Savanna, Developed and Landscaped, and Mixed Conifer Forest.

Vegetation at the intake construction area consists of Mixed Conifer Forest on the steeply-sloping hillsides above Icicle Creek. The Icicle Creek riparian zone is characterized primarily by ponderosa pine and upland shrub species, though few and scattered willow (*Salix* spp.) and alder shrubs are present at the immediate edge of Icicle Creek. In general, the riparian zone at this location lacks diversity in species composition and structure.

Other vegetation types in the vicinity but outside the Analysis Area that would not be subject to direct disturbance include Sparsely Vegetated Woodland and Shrubland, Montane Deciduous Foothill and Shrubland, Bedrock, Cliffs and Talus Slopes, Freshwater Wetland, Riparian Woodland and Shrubland, and Open Water (USGS 2020; NatureServe 2009).

Land use activities, such as logging, agriculture, and residential development have substantially altered the historical vegetation within the Analysis Area and vicinity, resulting in fragmented native vegetation communities with nonnative vegetation components. Climate change may also affect vegetation types in the Analysis Area. While models have shown variability in the predicted changes to dry coniferous forests (such as Disturbed Ponderosa Pine Woodland and Savanna, and Mixed Conifer Forest), these vegetation types are potentially vulnerable to the expected reduced winter snowpack accumulation and duration, as well as the associated earlier onset of summer drought.

Extended droughts could increase susceptibility to insects and disease and may increase the risk of large wildfires (Peterson et al. 2014).

Invasive, Nonnative, and Noxious Weeds

Invasive plants are nonnative species that have been introduced into an environment that they did not evolve in. They are capable of establishing free-living populations in areas beyond their natural range of dispersal. Noxious weeds, a subset of invasive plants, are designated and regulated by state and federal laws because they are known to be detrimental to agriculture, commerce, natural resources, and public health. The RCW section 17.10.010 defines noxious weeds as plants that, when established, are "highly destructive, competitive, or difficult to control by cultural or chemical practices."

Seven noxious weeds have been identified in the Analysis Area: diffuse knapweed (*Centaurea diffusa*), St. Johnswort (*Hypericum perforatum*), Dalmatian toadflax (*Linaria dalmatica* spp. *dalmatica*), Canada thistle (*Cirsium arvense*), kochia (*Kochia scoparia*), reed canarygrass (*Phalaris arundinacea*), and sulfur cinquefoil (*Potentilla recta*) (USFWS 2001; USFWS 2003). In addition, 10 nonnative plant species are also present in the Analysis Area (USFWS 2001).

Special Status Plant Species

In accordance with Section 7 of the Endangered Species Act of 1973, as amended (ESA; 16 USC 1531–1544), the Analysis Area was evaluated for the potential occurrences of ESA-listed threatened and endangered species. No ESA-listed plant species have the potential to be found in the Analysis Area because suitable habitat is not present. Wenatchee Mountains checkermallow has final designated critical habitat in Chelan County, although none is in the Analysis Area (Ecology 2019). Similarly, the vegetation types in the Analysis Area typically do not provide suitable habitat for most of the other special status plant species with potential to occur in the Analysis Area, such as Washington Natural Heritage Program (WNHP) listed plant species.

Environmental Consequences

The indicators for vegetation and special status plant species are as follows:

- Acres of native vegetation disturbed
- Changes in the extent of nonnative, invasive plants, or noxious weeds
- Changes in species diversity and structural diversity
- Potential for direct removal or injury of special status plant species.
- Acres of suitable habitat loss for special status plant species.

Alternative A

There would be no additional surface disturbance in the Analysis Area because all existing features of the existing surface water intake and delivery system would remain in place and would not be removed, modified, or rehabilitated. As such, existing vegetation communities would not be affected. No surface disturbance would occur that would increase the potential for the introduction or spread of noxious weeds or nonnative, invasive plants, though these species would likely continue to spread on their own through natural (e.g., water flows, wind) and anthropogenic (e.g., recreational

activity, vehicle traffic) processes. Vegetation at the surface water intake site, which is dominated by Mixed Conifer Forest and a few scattered, seral riparian associated shrubs at the immediate edge of Icicle Creek, would not be disturbed. While existing conditions would remain, there would be no opportunities for reseeding or replanting to increase riparian species and structural diversity under this alternative.

Alternative B

Construction activities under Alternative B would result in short- and long-term surface disturbance of vegetation types in the Analysis Area. Since the vegetation types in the Analysis Area are departed from natural historical conditions, construction disturbance in these areas would have a relatively minor effect on species or structural diversity. Incorporating Best Management Practices (BMPs) to preserve existing vegetation to the extent possible, and minimize damage to trees and native vegetation (**Appendix B**, Best Management Practices) would serve to minimize the acres of native vegetation disturbed during construction. Phase I surface disturbing activities would have both short- and long-term impacts to vegetation in the intake construction area. Approximately 1.02 acres of short-term impacts to the Mixed Conifer Forest would occur due to site preparation. Long-term impacts, which would include replacing native vegetation with non-vegetated areas, would be approximately 0.18 acres. Phase I construction would require some large trees between Icicle Creek Road and Icicle Creek to be removed to allow for construction equipment and personnel to access the work area. A native upland seed mix would be applied at the end of Phase I construction, in early fall or spring, for erosion control and restoration, thereby stabilizing soils and maintaining or increasing species diversity in disturbed areas (approximately 0.84 acres). Structural diversity would likely be reduced, since trees may need to be removed, but only herbaceous species would be seeded. Other vegetation that is removed during Phase I construction would be reestablished to the extent practical, maintaining structural diversity (see *Phase III*).

Construction at the intake construction area would also remove several scattered riparian shrubs in the riparian zone of Icicle Creek. Vegetation disturbance would be limited to the extent practicable to facilitate the work. In general, the riparian zone at this location lacks diversity in species composition and structure, so this impact would be relatively minor. Additionally, riparian planting during Phase III would increase species and structural diversity in the riparian zone.

Phase II includes use of temporary access roads, staging areas, five contractor use areas (CUAs) to rehabilitate the conveyance pipeline, cut and cover corridors for pipeline replacement, and construction of the control valve vault. Phase II construction disturbance would occur on approximately 0.4 acres of Mixed Conifer Woodland, 2.6 acres of Developed and Landscaped, and 4.1 acres of Disturbed Ponderosa Pine Woodland and Savanna vegetation types. Most vegetation is departed from natural historical conditions and construction disturbance in these areas would have a relatively minor effect on species or structural diversity. Further, most Phase II construction would occur in areas that are already disturbed, developed, or unvegetated. Seeding of disturbed areas would occur at the end of Phase II to provide erosion control and restoration, minimizing changes in species or structural diversity.

Revegetation, Phase III, would restore native vegetation communities to pre-disturbance conditions or better and occur after construction Phases I and II. Revegetation would be done according to a

revegetation plan, (see **Appendix C**, Leavenworth National Fish Hatchery Intake Planting Plan) and planting would occur in early fall. Container plantings would be installed in disturbed upland areas at the intake construction area, while riparian tree and shrub cuttings would be installed in the riparian zone of Icicle Creek. The native species selected for planting include a diversity of upland and riparian trees and shrubs. In combination with the herbaceous seedings in Phases I and II, once the tree and shrub species are reestablished, the upland and riparian vegetation at the site would have greater species diversity and structural diversity. Replanting with native species would move the area closer to natural historic conditions

Ground disturbance and vegetation removal may increase the potential to introduce or spread nonnative, invasive plants or noxious weeds, resulting in additional infestations in the Analysis Area compared with current conditions. To reduce the potential for this effect, construction materials and equipment would be cleaned to remove dirt, vegetation, and other organic materials before arriving on site, in accordance with Reclamation's Cleaning Manual (Reclamation 2010) and would be subject to inspection before entering the site (**Appendix B**, Best Management Practices).

There is no potential for ESA-listed plant species to occur in the Analysis Area because suitable habitat is not present there; as a result, there would be no potential for direct removal or injury to these species, or loss of suitable habitat, under Alternative B. Construction activities would result in short- and long-term surface disturbance within the Developed and Landscaped, Disturbed Ponderosa Pine Woodland and Savanna, and Mixed Conifer Forest in the Analysis Area. These vegetation types typically provide low suitability for other special status plant species, so the potential for direct removal or injury of special status plant species would be minor, as would loss of suitable habitat for special status plant species. Incorporating BMPs to preserve existing vegetation to the extent possible (**Appendix B**, Best Management Practices) would serve to minimize the potential for weed introduction and spread, which would preserve existing habitat quality for special status plants to the extent possible.

Alternative C

Impacts on native vegetation from Phase II construction would be reduced compared to Alternative B. This is because the entire conveyance pipeline on U.S. Fish and Wildlife Service (USFWS) property near the intake construction area would be rehabilitated by lining using cure-in-place pipe (CIPP), and no pipeline would be replaced. Thus, total ground disturbance and native vegetation removal would be reduced under this alternative, and large ponderosa pine, Douglas-fir, and cottonwood trees in the Icicle Creek riparian zone would remain. The reduction in total ground disturbance would also reduce the likelihood of direct effects on special status plant species and loss of special status plant species habitat. It would also reduce the likelihood of increasing the extent of nonnative, invasive, and noxious plant species. Less native reseeding would be required during Phase II under this alternative, which may slightly reduce opportunities to increase species diversity compared to Alternative B.

Alternative D

Impacts on vegetation would be the same as described under Alternative B.

Fisheries, Including Special Status Species and Aquatic Ecosystems

The Analysis Area for fisheries, including special status species, and aquatic ecosystems, includes the area below the ordinary high water mark (OHWM) of Icicle Creek, from 230 feet upstream of the intake construction area at RM 4.5, to the ecology compliance monitoring location at RM 2.3, downstream of the LNFH (**Map A-10** in **Appendix A**).

Affected Environment

Aquatic Habitat

Icicle Creek is a snowmelt-fed, 31.8-mile-long, fourth order tributary of the Wenatchee River (USFWS 2011). The measured flow in Icicle Creek ranges from a minimum of 44 cubic feet per second (cfs) to a maximum of 14,100 cfs, according to readings taken from the U.S. Geological Survey (USGS) gauging station (No. 12458000) at river mile (RM) 5.8, located above all major water diversions (Reclamation and USFWS 2018, pp. 43–49). The discharge of Icicle Creek is altered by water diversions, which can reduce the flow in the lower reaches to very low levels during summer and early fall. Near the LNFH, Icicle Creek splits to form the Hatchery Channel and the Historical Channel of Icicle Creek. The Hatchery and Historical Channels split at Structure 2 (RM 3.8) and rejoin one another at RM 2.9. The Hatchery Channel is a human-made, straight channelized section of this creek segment.

Icicle Creek is characterized by steep slopes on both banks. Vegetation on the banks of both the Historical and Hatchery Channels of Icicle Creek is primarily upland vegetation and shrub habitat (USFWS 2016). Thus, aquatic habitat within the channels essentially transitions to upland habitats with no intermediate riparian zone or floodplain. This combined with high water fluctuations throughout the year, limits establishment of mature riparian vegetation. Although freshwater wetlands have been documented in the vicinity and are associated with the Historical Channel, there are no wetlands associated with Icicle Creek and the Hatchery Channel in the Analysis Area (USFWS 2016).

There are approximately 4.0 miles of instream (aquatic) habitat in the Analysis Area. Instream habitat includes the combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources (WDFW 2008).

In its entirety, Icicle Creek provides important, high quality, and relatively undisturbed instream habitat for a variety of anadromous and resident fish. However, aquatic habitat quality in lower Icicle Creek (which includes the Analysis Area) is considered impaired due to previous land uses, such as forestry practices, private land development in the historical floodplain and riparian zone, roads, and agriculture. The installation of dams and diversions have created passage barriers, decreased flows, altered in-stream morphology and floodplain function, degraded water quality, and caused overall in-stream habitat degradation (Chelan County and Ecology 2019; NMFS 2017).

Current streamflow in Icicle Creek during low flow periods is too low for reliable fish passage at the low-head diversion dam or fish ladder/sediment sluice and reduces habitat availability (Reclamation 2020). The construction of LNFH and continued development in the Icicle Creek basin has

exacerbated aquatic habitat and fish passage issues (Chelan County and Ecology 2019; NMFS 2017). Two instream structures (Structure 2 [RM 3.8], and Structure 5 [RM 2.9]) are used during Hatchery operations and broodstock collection. Operation of these structures periodically limits fish passage on Icicle Creek. Currently, operation of Structures 2 and 5 may limit fish passage during spring and early summer when broodstock collection for LNFH is occurring (beginning as early as June 3). Structure 5 is closed once a 50-fish "trigger" has been hit or low Chinook returns warrant a closure. This also prohibits non-Hatchery fish from moving upstream of LNFH during this time. Until such time, Structure 5 remains open to fish passage (NMFS 2017). Structure 2 is reopened by June 24, and Structure 5 is reopened by July 7, restoring passage opportunities between RM 2.9 and 3.8 (USFWS 2011).

Operation of Structure 2 can also limit passage by decreasing flows in this reach when the gates are closed to divert water into the Hatchery Channel (Chelan County and Ecology 2019). The Icicle Creek Boulder Field at RM 5.6, upstream of the Analysis Area, also serves as a natural barrier under typical flow conditions, and, thus, limits fish passage above the Analysis Area reach. At the existing intake facilities, the low-head diversion dam diverts water from Icicle Creek to the intake channel, through an unscreened diversion. The diversion sediment sluice has been modified to function as a fish ladder, however, fish passage is impeded because current flows at the fish ladder/sediment sluice do not meet National Marine Fisheries Service (NMFS) guidelines for fish attraction. Fish passage is impeded during low flows in particular. Entrainment of anadromous and resident fish occurs at the existing unscreened intake facilities.

Icicle Creek within the Analysis Area has very steep banks, which limits riparian cover and does not provide much access to slow moving pools with overhanging banks, for fish to feed or rest. Stream velocities and substrate limit production of the macroinvertebrate community and do not offer significant foraging opportunity for fish species. Suitable spawning substrate is not common within the Analysis Area, and much of the substrate is embedded with fine sediment or armored making it unsuitable spawning habitat for ESA-listed species (USFWS 2005).

Climate change effects (e.g., elevated temperatures and changes in precipitation patterns) are expected to shift the hydrograph so peak flows occur earlier in the year, with low flow periods spanning more of the summer months. These changes in streamflow are expected to impact aquatic habitat conditions and fish passage (Chelan County and Ecology 2019). Also, water temperature may increase as water input from snowmelt decreases, and input from rain increases, due to climate change.

Hatchery Fish Production History

Over the years, the LNFH production program has included a variety of species, including Spring and Summer Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*Oncorhynchus kisutch*), Steelhead, Sockeye Salmon (*Oncorhynchus nerka*), and various resident salmonids. The LNFH currently rears only the "Carson lineage" stock of the Spring Chinook Salmon and targets a release of 1.2 million Spring Chinook Salmon smolts into Icicle Creek (at approximately RM 2.7) during mid-April. Production goals at LNFH are set by the Columbia River Fish Management Plan under *U.S. vs. Oregon*. The migration corridor for LNFH-produced smolts and returning adult fish is approximately 489 RMs (2.8 RM of Icicle Creek, 26 RM of the Wenatchee River, and 460 RM of the

Columbia River) and the Pacific Ocean. Adult salmon returning to the LNFH in excess of brood stock needs, support a Tribal fishery, at and just downstream of the spillway pool at RM 2.8, and a sport fishery, from approximately RM 0 to 2.7, in Icicle Creek. For more information regarding the Tribal fishery, see Section 3.10, Tribal Interests, of the SWISP Project EIS.

Fish and Aquatic Species

Salmonid species in the Analysis Area are Hatchery-reared Spring Chinook Salmon, Hatchery-reared Coho Salmon, Steelhead, Sockeye Salmon, Bull Trout (*Salvelinus confluentus*), non-native Brook Trout (*Salvelinus fontinalis*), Westslope Cutthroat Trout (*O. clarki lewisi*), Redband Trout (*O. mykiss gairdneri*), and Mountain Whitefish (*Prosopium williamsoni*). Native non-salmonids are also present in Icicle Creek, such as dace (*Rhinichthys* spp.), lamprey (*Lampetra* spp.), sculpin (*Cottus* spp.), and suckers (*Catostomus* spp.) (NMFS 2017).

Special Status Species

ESA-listed fish that may inhabit the Analysis Area are Bull Trout, Upper Columbia River Spring-run Chinook Salmon, and Upper Columbia River Steelhead. Additionally, designated foraging, migrating, and overwintering critical habitat for Bull Trout and designated critical habitat for Upper Columbia River Steelhead occur in the Analysis Area (USFWS 2010; NMFS 2016). These species are briefly described below. More detailed information on the status and trends of these listed resources, and their biology and ecology, can be found in the species' recovery plans (UCSRB 2007; USFWS 2015) and 5-year reviews published in the *Federal Register*.

The USFWS listed all U.S. populations of Bull Trout as a threatened species under the ESA in 1999 (64 *Federal Register* 58910, November 1, 1999). The Bull Trout's current range includes the Columbia River and Snake River basins in Washington, Oregon, Montana, Idaho, and Nevada; Puget Sound and Olympic Peninsula watersheds in Washington; the Saint Mary basin in Montana; and the Klamath River basin of south-central Oregon. At the time of the listing in 1999, Bull Trout were estimated to have been extirpated from approximately 60 percent of their historical range (USFWS 2015).

Bull Trout are native to the Wenatchee River watershed (including Icicle Creek and other tributaries). Upper Icicle Creek and other headwater areas of the basin offer some of the best habitat in the Mid-Columbia region. The Wenatchee River watershed has been designated as one of 24 Bull Trout core areas in the Mid-Columbia Recovery Unit. This is one of four core areas that contain the healthiest and most stable Bull Trout populations (USFWS 2015). Bull Trout have specific habitat requirements, preferring river environments with cold water temperatures (often less than 54 degrees Fahrenheit [12 degrees Celsius]); complex stream habitat with deep pools, overhanging banks and large woody debris; and connectivity between spawning and rearing areas and downstream foraging, migration, and overwintering habitats (USFWS 2015). Populations are isolated to headwater areas by downstream conditions that are too warm for incubation and early rearing (USFWS 2015).

Most of the Icicle Creek population of Bull Trout are resident; they spawn and rear in tributaries upstream of the Analysis Area and mature and forage throughout Icicle Creek, including in the Analysis Area. They could be present in the Analysis Area year-round. A small percentage of the

population (15 to 20 percent) may migrate long distances to other subbasins of the Columbia River for foraging or overwintering, returning to spawning areas annually every few years. Bull Trout from other core areas also migrate to Icicle Creek for foraging and refuge habitat in and upstream of the Analysis Area. Most populations in the Wenatchee River Watershed spawn from mid-September to mid-October (USFWS 2015). However, there is no spawning or rearing habitat for Bull Trout in the Analysis Area, nor are there records of Bull Trout redds[1] in the Analysis Area (unpublished data on file with the USFWS Mid-Columbia Fish and Wildlife Conservation Office).

The main threats to Bull Trout are habitat destruction, modification, fragmentation, or curtailment (e.g., dewatering, sedimentation, thermal modification, water quality degradation) due to land and water management activities and isolation and habitat fragmentation due to fish passage issues and impaired connectivity. In the Analysis Area, Bull Trout spawning and rearing habitat is limited in late summer and early fall because of low instream flows in some years (see **Table ES-1**, Current Listed Fish Habitat Limitations on Lower Icicle Creek). Entrainment is also an issue; in the 2017 Biological Opinion (NFMS 2017), the NMFS required LNFH to provide entrainment protection (fish screens) and fish passage for anadromous fish, which would also benefit Bull Trout.

Designated Bull Trout foraging, migrating, and overwintering critical habitat includes all areas of Icicle Creek in the Analysis Area that are accessible to Bull Trout (75 *Federal Register* 63897). The critical habitat designation for Bull Trout applies only to the stream channel, as defined by its OHWM by the U.S. Army Corps of Engineers (USACE) at 33 CFR 329.11. The critical habitat designation does not extend to the floodplain or the adjacent land (USFWS 2010).

Table ES-1
Current Listed Fish Habitat Limitations on Lower Icicle Creek

River Mile[1]	Affected Species/Life Stage	Months When Target WUA[2] Not Achieved (Average Year)	Months When Target WUA Not Achieved (Low-Flow Year)
0.2–2.4	• Steelhead rearing • Bull Trout rearing/foraging	• Late July–October • None	• Mid-June through October • September through October
2.7–3.9 (Historical Channel)	• Steelhead rearing/Bull Trout rearing	• None	• Mid-June through October
3.9–4.5	• Steelhead rearing/Bull Trout rearing	• Early August to late October	• Early to mid-April and mid-June through October
6.0-9.1	• Steelhead rearing/Cutthroat Trout rearing/Bull Trout rearing	• September	• No Data

[1]Analysis Area includes RM 2.3–4.5
[2]Weighted Usable Area (WUA): A quantity that can be used to describe the spatial habitat area of a specific fish species for a particular life stage
Source: Chelan County and Ecology 2019

[1] Riverbed hollows made and used by fish for spawning.

Upper Columbia River Steelhead was listed as an Endangered species under the ESA in 1997 (62 *Federal Register* 43937, August 18, 1997) and reclassified to Threatened in 2006 (71 *Federal Register* 833, January 5, 2006). Upper Columbia River Steelhead exhibit complex life histories. Adults return to the Columbia River in the late summer and early fall. A portion of the returning run overwinters in the mainstem reservoirs, passing over the Upper Columbia River dams in April and May of the following year. Spawning occurs in the late spring following entry into the river. Steelhead currently spawn and rear in the Wenatchee River between Tumwater Canyon and Nason Creek, the Chiwawa River, and in Nason, Icicle, Peshastin, Chumstick, and Mission creeks (UCSRB 2007). Most Steelhead spawning in the wild are hatchery fish. Juvenile Steelhead generally spend one to three years rearing in freshwater before migrating to the ocean, and most adults return to the Upper Columbia River after one or two years at sea (UCSRB 2007). Redds for Upper Columbia River Steelhead have been identified in the Analysis Area within the Historical Channel and Lower Icicle Creek (unpublished data on file with the USFWS Mid-Columbia Fish and Wildlife Conservation Office).

Upper Columbia River Steelhead critical habitat occurs in the Analysis Area. It is designated in the upper Wenatchee River and lower mainstem areas, as well as the tributaries above and below Tumwater Dam, including Icicle Creek. These waterbodies serve as major migration, spawning, and rearing areas for adults and juveniles (NMFS 2005).

The Upper Columbia River Spring-run Chinook Salmon evolutionarily significant unit (ESU) was listed as Endangered in 1999 (64 *Federal Register* 14308, March 24, 1999). Spring Chinook Salmon broodstock used in the LNFH program are not included in an ESA-listed ESU. Little natural production from the native Spring Chinook population is thought to occur in Icicle Creek (NMFS 2017; UCSRB 2007). Although Spring-run Chinook Salmon critical habitat is designated in the upper and lower mainstem Wenatchee River, including tributaries above Tumwater Dam that serve as major migration, spawning, and rearing areas for adults and juveniles, none occurs in the Analysis Area. The Analysis Area is designated as essential fish habitat (EFH) for both Chinook and Coho Salmon (NMFS 2017).

Spring-run Chinook Salmon enter the Upper Columbia tributaries from April through July; spawning occurs in the late summer, peaking in mid to late August. Juvenile Spring-run Chinook Salmon spend a year in freshwater before migrating to salt water in the spring of their second year of life, and most return as adults after two or three years in the ocean (UCSRB 2007). Primary spawning areas of Spring-run Chinook Salmon in the Wenatchee subbasin include Nason Creek and the Chiwawa, Little Wenatchee, and White rivers (UCSRB 2007). Spawning also occurs in Icicle Creek, and these spawners are believed to be primarily returns from LNFH. Between 2014 and 2019, Spring-run Chinook redds were observed and counted. Redds were observed in the Historical Channel and near the existing intake facilities (unpublished data on file with the USFWS Mid-Columbia Fish and Wildlife Conservation Office).

Natural spawning of native anadromous fish in Icicle Creek has been reduced from historical conditions as a result of habitat degradation, including flow diversions, and overfishing. Historical barriers to upstream passage, including historical LNFH infrastructure, also have limited natural anadromous fish spawning to the lower 2 RMs of Icicle Creek until improvements to fish passage

were made in recent years (Chelan County and Ecology 2019). Current streamflow in Icicle Creek during low flow periods (late summer and early fall) is too low for reliable fish passage at the low-head diversion dam or fish ladder/sediment sluice and reduces habitat availability (Reclamation 2020; Chelan County and Ecology 2019).

Habitat degradation and loss is a major threat to the listed fish species described above. These are a lack of habitat diversity (e.g., pools and spawning areas, riparian vegetation) and quantity, excessive sediment load, anthropogenic barriers, a lack of channel stability, low flows, and high summer temperatures (NMFS 2016). Specific areas of concern regarding habitat conditions in the Analysis Area are passage conditions and upstream passage barriers in Icicle Creek at LNFH and the boulder field (NMFS 2016).

Several Washington State Priority Species are found in the Analysis Area. These are the described ESA-listed salmon and trout species, Pacific Lamprey, Mountain Sucker, Leopard Dace, and Umatilla Dace (WDFW 2008).

Environmental Consequences

The indicators for fisheries, including special status species, and aquatic ecosystems are as follows:

- Changes to habitat quantity, including spawning habitat (count of redds), EFH (miles), and critical habitat (miles)
- Changes to habitat quality (connectivity/fish passage, water quality (temperature, dissolved oxygen, potential of hydrogen [pH], and turbidity, total phosphorus), and geomorphology)
- Potential for disturbance, injury, or mortality of aquatic wildlife

The following analysis assumptions were used in the analysis:

- Impacts on fish and aquatic resources are directly related to changes within aquatic habitats.
- BMPs will limit impacts on fish and aquatic resources.
- Conservation measures for ESA-listed fish species will be developed under Section 7 consultation and would reduce impacts to most fish and aquatic species.
- Successful installation and utilization of screening will reduce take of ESA-listed fish species.
- Successful completion of the roughened channel and low-flow boulder weir fishway will facilitate and improve fish passage for all aquatic species over a greater range of flows.
- Mobile special status fish species would move away from direct, short-term disturbances to nearby higher quality habitat during Project activities.

Alternative A

The No Action Alternative represents the continuation of the current operations of the LNFH surface water intake and delivery system as well as ongoing operations and maintenance (O&M) activities. Continuing O&M under the No Action Alternative would not fulfill the requirements of the 2017 Biological Opinion (NMFS 2017). This is because continued operation of the LNFH under the baseline condition would leave the existing fish ladder/sediment sluice and low-head diversion dam in place. The fish ladder would not be modified to alter flow or enhance fish passage and

current regulatory criteria would not be met. Current flows at the fish ladder/sediment sluice would continue to not meet NMFS guidelines for fish attraction. Therefore, these pieces of infrastructure would continue to limit habitat quality (connectivity) by inhibiting ESA-listed species passage within the Icicle Creek aquatic ecosystem during low flows (see **Table ES-1**).

The No Action Alternative would also leave the existing unscreened diversion and conveyance pipeline in place. This continued operation of infrastructure would maintain the current potential for take of ESA-listed species due to entrainment and need for removal from the existing intake facilities. For example, between 30 and 63 Steelhead were removed from the existing intake facilities each year between 2009 and 2013 (Hall et al. 2014). Under existing conditions, between 2008 and 2018, 34 Bull Trout have been entrained in the surface water intake and delivery system (Potter 2019).

NMFS relied on the Hatchery and Genetics Management Plan's description of the proposed action to complete the formal consultation with the release of the September 2017 Biological Opinion (NMFS 2017). For this consultation to remain valid, the USFWS and Reclamation must implement the conservation actions included as part of the proposed action evaluated in the consultation. Without completing the fish screening and fish passage improvements by May 2023, the USFWS and Reclamation may be required to reinitiate consultation with NMFS.

Several assessments of LNFH facilities have noted that much of the infrastructure is nearing the end of its expected working lifetime. Repair and improvements are needed to ensure that infrastructure failure does not result in a catastrophic loss of Hatchery facilities or fish production resources. O&M activities would continue, including daily visual inspections of existing intake facilities. Extraordinary maintenance would occur every couple of years and would be expected to continue into the future. This includes the removal of sediment from the intake channel. Failure of the diversion or water delivery system would be an emergency situation. The timing and extent of potential impacts from extraordinary maintenance or emergency repairs would depend on the nature, extent, and timing of the necessary repairs.

As a result of the existing infrastructure within the Analysis Area, the impacts it has on fish passage and aquatic habitat conditions would continue. These include the limitations on fish passage, habitat quantity and connectivity, and habitat quality as described in **Section 3.3.2**, Aquatic Habitat.

Under the No Action Alternative, the existing intake facilities and delivery infrastructure would remain in place and continue to degrade, causing infrastructure problems for the Hatchery and causing it to become even more unreliable. For example, the conveyance pipeline would continue to degrade resulting from the sediments transported through it. This unreliability would jeopardize the Hatchery's ability to meet the *U.S. v. Oregon* agreement annual objectives for the LNFH to release 1.625 million Spring Chinook Salmon smolt to Icicle Creek.

Catastrophic failure of any part of the water delivery system could result in the loss of one to two years of Chinook Salmon broodstock at the Hatchery. This could result in a failure to meet *U.S. v. Oregon* mitigation requirements and would impact the amount of fish returning annually in the out-years. Effects of catastrophic failure could last five to eight years, depending on how long Hatchery production is down to complete necessary repairs.

Alternative B

Under Alternative B, the existing intake facilities and delivery infrastructure would be replaced and rehabilitated, improving the reliability of water delivery and the Hatchery's ability to meet the *U.S. v. Oregon* agreement annual objectives for the LNFH to release 1.625 million Spring Chinook Salmon smolts to Icicle Creek.

Alternative B would have long-term beneficial effects to fisheries, including special status fish, and aquatic ecosystems in the Analysis Area. Alternative B would provide NMFS-compliant fish screening, reducing potential for injury or mortality to fish species, including ESA-listed species, due to entrainment in the existing intake facilities. The low-flow boulder weir fishway would provide NMFS-compliant fish passage for anadromous salmonids during typical low flows, and the portion of the roughened channel extended upstream of the existing low-head diversion dam would facilitate fish passage overall and at higher flows in particular. This would increase connectivity of aquatic habitat in Icicle Creek, and access to high-quality aquatic habitat upstream of the Analysis Area. Improving habitat connectivity and fish passage, which is currently limited in the Analysis Area, would allow for a more complete expression of essential life history characteristics related to reproduction, feeding, rearing, and migration.

Despite localized and temporary habitat losses for expansion of the intake structure and intake operations and maintenance area (IO&MA) and for constructing the roughened channel and low flow fishway (described in further detail below), habitat quantity in the Analysis Area would increase overall because the roughened channel would facilitate natural sediment movement past the existing intake facilities. This would ultimately improve habitat quality downstream of the intake facilities by decreasing the amount of spawning gravels that are currently entrained in the intake facilities and lost from the Icicle Creek system, and instead retaining these gravels in Icicle Creek. This could result in increased availability of spawning habitat and number of redds of Spring Chinook Salmon, which have been observed in the Analysis Area. Corresponding beneficial effects on critical habitat for Bull Trout and Upper Columbia River Steelhead and EFH would be expected since these habitats occur in the Analysis Area.

After Phase I and Phase II construction, the woody vegetation that would be removed in the intake construction area would be reestablished by planting of native upland and riparian trees and shrubs to restore vegetation communities to pre-disturbance conditions or better. Container plantings would be installed in disturbed upland areas at the intake construction area, while riparian cuttings would be installed in the Icicle Creek riparian zone. Revegetation of riparian shrubs and trees would increase shading of Icicle Creek, improving aquatic habitat quality by buffering stream temperatures, and maintaining dissolved oxygen levels in the creek, especially during summer months. It would also stabilize streambanks, helping to decrease erosion and sediment transport into Icicle Creek. However, there would be a delay of several years between the time trees were removed and the time planted trees became large enough to provide these benefits.

Increased fish passage and access to upstream habitat, and minimization of injury, mortality, and take of ESA-listed fish species from installing NMFS-compliant screening, would work in conjunction with other plans and projects in or near the Analysis Area to benefit fisheries, including special status fish species and aquatic ecosystems in the Analysis Area in the long term. These

include the Trout Unlimited Icicle Creek Boulder Field Fish Habitat Improvement Project, continued implementation of the Recovery Plan for Upper Columbia River Spring Chinook Salmon and Steelhead and the USFWS Bull Trout Recovery Plan, relocating and replacing the City of Leavenworth water supply pipeline and fish screen, replacing and relocating the Icicle and Peshastin Irrigation District's (IPID's) fish screens, and improving fish passage at the IPID and City of Leavenworth diversion dam. These projects would increase fish passage, improve stream geomorphology and water quality parameters, and lower the potential for injury or mortality of aquatic species (e.g., by reducing entrainment in water diversions). For example, the Trout Unlimited Icicle Creek Boulder Field Fish Habitat Improvement Project would create accessibility to more than 26 mainstem miles of high-quality fish habitat in Icicle Creek available above the boulder field. The habitat above the boulder field includes more than 20 miles of virtually undisturbed National Forest System lands and wilderness (Trout Unlimited 2020a, 2020b).

Temporary impacts from Phase I construction would occur during the in-water work window of July 1 to November 15; two construction seasons would be needed to complete Phase I construction. The proposed in-water work window extends beyond the approved in-water work window for Icicle Creek of July 1 to August 15 (USACE 2018). Although the proposed extended window would have to be approved by regulatory agencies prior to construction, working outside the approved window would increase the duration of impacts to aquatic habitat by extending the length of time that in-water work would occur. This may result in changes to the number and types of species and life stages of fish species that are present in the Analysis Area relative to the shorter, approved work window. For example, Upper Columbia River Steelhead adults return to the Columbia River in the late summer and early fall, so conducting in-water work within this window may affect more individuals than if work was restricted to the approved window of July 1 to August 15.

The proposed extended in-water work window would also increase the potential for injury or mortality of special status fish species. Salmon are particularly vulnerable to these effects during the fall and winter, when adults are migrating and spawning, and the extended in-water work window would overlap this sensitive period. It would also increase the potential for interference with spawning Spring Chinook Salmon or Bull Trout (which spawn in late summer and late fall, respectively). This may come about because potential spawning habitat may be unavailable to fish species, either because it was isolated behind a cofferdam, or because it was removed during construction of the intake structure and IO&MA, roughened channel, or another in-stream Project component.

Species that are present in the Analysis Area in late summer through fall (in addition to those present in early summer) would be subject to impacts including changes in habitat quantity, quality, and potential for injury or mortality. Specific impacts are described in more detail below.

Potential temporary effects to habitat quality during in-water construction activities include effects to habitat connectivity and fish passage. Fish passage would be temporarily reduced because cofferdams would be installed to isolate the in-water work area. At no point would the entire width of Icicle Creek be blocked, but cofferdams would temporarily reduce the effective width of Icicle Creek while installed, potentially limiting, but not completely blocking, passage opportunities. For

Bull Trout, this could result in migration delays to spawning habitat upstream of the Analysis Area, and post-spawn migrations from spawning and rearing habitat to foraging, migrating, and overwintering habitat in and downstream of the Analysis Area. Effects would be minimized through BMPs (**Appendix B**) that require cofferdam installation maintain a minimum water depth of 0.8 feet within the greatest amount of natural streambed width as possible to facilitate fish passage while cofferdams are in place. Fish passage criteria in *Icicle Creek Fish Passage Evaluation for the Leavenworth National Fish Hatchery* (Anglin et al. 2013, pages 26-28) would be consulted for minimum depth and maximum velocity criteria, and attempts would be made to provide fish passage to the greatest extent practical across the natural stream channel width and hydrograph.

Because cofferdams would be in Icicle Creek beyond the low flow timeframe (lowest flows typically occur from July through September), this creates risk of cofferdam failure during high flows. High flows generally occur in May and June, but winter months can have high flows or extensive snow and ice conditions. Occasionally peak annual floods have occurred in July and October, which may require adjustment to the start and completion date for a given construction year (Reclamation 2020). Floods would be a concern for inundating areas and overtopping a cofferdam. Geo-bag cofferdams would not be suitable for use in Icicle Creek during heavy or prolonged precipitation or rain-on-snow events that typically occur between November and April, or during typical flows resulting from spring runoff in May and June.

Cofferdam failure during high flows could release tons of sediment or rock into Icicle Creek. Depending on the volume and type of material released, there could be long term changes to the Icicle Creek streambed, primarily by increasing the proportion of sands, gravels, and fine sediments. Released materials could reduce ESA-listed fish habitat quantity or quality by burying or degrading suitable spawning substrate in Icicle Creek. Depending on the timing of cofferdam failure, released materials could bury ESA-listed fish species redds or eggs, which could be considered take under the ESA.

During low summer flows, constricting the stream and providing a minimum water depth of 0.8 feet would likely be an improvement over baseline water depth conditions, as the water across the width of the stream under the No Action Alternative could be less than 0.8 feet deep during previous low-flow conditions.

During Phase I, the temporary Hatchery water supply of 40 cfs via the gravity-fed bypass would divert water from Icicle Creek, however, more water would be left in Icicle Creek than under typical operations, when 42 cfs is diverted. Since this diversion rate would be less than the Hatchery's water right diversion rate of 42 cfs, no net decrease in stream flows are expected, and there would be no decrease in instream flow or effects to fish passage.

The gravity-fed bypass intake would be unscreened, meaning that fish could be entrained in the bypass pipeline. Entrained individuals would be carried via the conveyance pipeline to the sand settling basin on the LNFH grounds. Effects of entrainment would include risk of injury due to abrasion in the pipeline, and stress and potential for injury associated with capture and salvage from the sand settling basin and return to Icicle Creek. Capture and salvage would be done according to the Terms and Conditions of the LNFH operations consultations with the NMFS and USFWS;

however, handling activities, even when accomplished carefully and efficiently, are likely to result in some adverse effects, including stress, of all fish handled.

Potential effects to aquatic habitat quality from instream construction would include changes to stream geomorphology. The SWISP Project EIS **Water Resources Report** describes these types of changes in more detail. Geomorphological alterations could impact fish habitat quality and quantity by altering the availability of features such as pools and riffles. This impact would mainly occur within the area of streambed that would be lost long term due to construction of the IO&MA, which is approximately 0.15 acres.

Instream surface-disturbing activities, such as placement of cofferdams, partial removal of the fish ladder/sediment sluice, and construction of the intake structure would also affect stream geomorphology through direct physical alterations of the streambed as well as by mobilizing sediments that settle in downstream gravels or pools. However, sediment plumes would be temporary and minimized through BMPs (**Appendix B**), such as working in dewatered areas. As a result, the loss of geomorphological habitat features would be minor.

Placement of cofferdams to isolate the in-water work area in July, and their removal in November, would temporarily disturb fish if they are present in the area through noise and vibration from construction equipment. If present in or near the construction work area, most fish would be expected to move to other areas of Icicle Creek in response to the noise and vibration.

Preparation of the streambed, placement, and removal of the cofferdams would mobilize sediments on the Icicle Creek streambed. This could increase turbidity in and downstream of the work area during and shortly after cofferdam placement or removal, exposing fish to elevated levels of suspended sediment. Suspended sediments can result in short- and long-term effects on fish depending on the quantity and composition of sediment and length of exposure. Potential exposure would be minimized because, as above, most fish would be expected to move to other areas of Icicle Creek in response to the noise and vibration caused by placing and removing the cofferdams. Further, Reclamation would monitor and collect water samples to measure potential increases in turbidity to ensure compliance with Water Quality Standards for Surface Waters (WAC 173-201A) during cofferdam placement and removal.

Fish may be stranded inside the construction work area established by cofferdam placement. Reclamation would capture and remove fish stranded inside the work area. To minimize harm from capture, handling, and relocation into Icicle Creek, this process would be done by qualified biologists, in accordance with the USFWS (2012) *Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards for Bull Trout*.

The area isolated by the cofferdam would be partially dewatered prior to fish capture. To prevent injury or mortality from fish entrainment in sump pumps, Reclamation would screen sump pump intakes to prevent aquatic life from entering the intake. Fish screens or guards would comply with the most recent fish screening guidelines for anadromous salmonids prescribed by the NMFS. Areas isolated by cofferdams would be monitored for aquatic organisms, and fish would be captured and relocated from the construction work area in accordance with approved methods; this would reduce the potential for injury or mortality of fish and aquatic species during construction.

A pneumatic tool would be used to break apart large boulders to facilitate their removal from the intake construction area, and partially demolish existing intake facilities, such as the existing fish ladder/sediment sluice. The pneumatic tool would generate impact sounds, which can propagate into the surrounding water. High levels of underwater sound can have negative physiological effects on fish, the intensity of effects depends on physical, environmental, and biological factors, including the sound-generating activity, sound intensity, distance of fish from the point of origin, depth of fish in the water, size of fish, fish species, and ambient noise levels. While sound generated by the pneumatic tool is not expected to reach intensities associated with blasting or impact pile driving, some physiological effects on fish could occur if individuals were present in or near the work area. Because fish would be removed from work areas isolated by cofferdams as discussed above, effects would be minimized. However, there is a chance that individuals may elude capture and therefore be present during construction activities.

During construction in and adjacent to Icicle Creek, alteration of water quality parameters could also occur due to sediment entering the aquatic ecosystem. Many native salmonid species and aquatic invertebrates require high oxygen levels, and clear water with low turbidity (UCSRB 2007; USFWS 2015). High concentrations of limiting nutrients, such as phosphorus, can induce excessive growth of algae, resulting in lower dissolved oxygen concentrations, which may reduce habitat quality for aquatic species.

The Ecology total maximum daily load (TMDL) (see the SWISP Project EIS **Water Resources Report**) indicates phosphorus is the limiting nutrient in Icicle Creek. Cement is rich in calcium and contains aluminum and iron also. All three can readily bind phosphorus. Also, Setunge et al. (2009) reports freshwater contact with freshly cast concrete can lead to an increase in the pH level of water in contact with the concrete during the first four days from the casting of the concrete. To avoid the potential that construction would increase phosphorus in Icicle Creek, concrete used for proposed in-water infrastructure would be cured in place behind cofferdams for at least four days before exposure to Icicle Creek water. This would guard against fresh concrete increasing phosphorus in surface water.

In addition to increasing turbidity levels, sedimentation can alter substrate used by fish species for spawning and rearing. Adhering to BMPs to reduce the potential for impacts on water quality (**Appendix B**), would minimize the potential for water quality degradation and release of sediment into Icicle Creek during construction. The SWISP Project EIS **Water Resources Report** contains additional detail on effects to water quality and sedimentation from construction.

Changes to habitat quantity would arise from the changes to habitat quality as described above if the habitat quality alterations prevent species from using habitat. As described above, these would be temporary changes, generally lasting the duration of construction activities.

Long-term habitat loss would result from expanding the intake structure and IO&MA, and temporary habitat loss would occur from constructing the roughened channel and low-flow fishway within the area isolated by the cofferdam and dewatered work areas. As an approximation, the intake structure and IO&MA would cause about 0.15 acres of fill below the OHWM. This would result in a loss of streambed habitat for fish and aquatic invertebrates. General aquatic habitat, critical habitat

for Bull Trout and Upper Columbia River Steelhead, and EFH loss would also result from constructing the IO&MA within the OHWM of Icicle Creek. A long-term change in habitat of approximately 0.45 acres would result from construction of the roughened channel and low-flow fishway.

During Phase II, construction would not occur in Icicle Creek; therefore, the type of potential in-water effects described under Phase I would not occur. However, removing trees in the Icicle Creek riparian zone during conveyance pipeline replacement on USFWS property between the pipeline intake and sediment management area (PISMA) and the adjacent private parcel would reduce the amount of shading along this reach of Icicle Creek (see **Map A-5** in **Appendix A**), resulting in potential reductions to water quality parameters (including increased water temperature), especially during summer months. Inputs of woody materials to the creek from fallen trees and limbs, would also be reduced. Together, this would reduce habitat quality for aquatic species. The number of trees removed during Phase II construction would be minimized.

During Phase II construction, sediment that becomes mobilized by erosion would be added to Icicle Creek; this would increase turbidity downstream of the construction area, thereby decreasing habitat quality, including for critical habitat and EFH. WAC 173-201A-200 includes water quality standards, criteria, and monitoring for turbidity during construction; adhering to these standards would minimize this impact. Construction BMPs (**Appendix B**), including preparation of and adherence to, a stormwater pollution and prevention plan, would further minimize the release of sediment into Icicle Creek during construction. Seeding of disturbed surfaces with herbaceous vegetation would stabilize soils and minimize or prevent erosion and release of sediment into Icicle Creek as vegetation matured over one to several growing seasons following construction.

Temporary Hatchery water supply pumping at the spillway pool during Phase II would utilize NMFS-approved screened sump-pumps to ensure a continuous water supply while reducing the potential for injury or mortality of fish from entrainment in pump intakes. During the actual CIPP lining process (April 17 to May 20), temporary pumping would supply 20 cfs, and could be augmented by existing groundwater wells (up to 8 cfs). Sound generated by pumps may result in temporary behavioral impacts to fish and aquatic species, such as avoidance of the immediate area, while pumping is ongoing. This is because sound waves and vibration from pumping would propagate into the Icicle Creek water column via the air, and also via the pump intake within the water column. Effects would be temporary, lasting for the duration of pumping. Fish are expected to avoid the immediate area and displace into other areas of Icicle Creek while pumping is ongoing.

The potential for effects on fish and the aquatic ecosystem from surface disturbance and equipment use during rehabilitation of the conveyance pipeline on USFWS property between the PISMA and the adjacent private parcel would be small relative to effects from in-stream work, but there could be some short-term effects to habitat quality, such as alteration of water quality parameters from increased sedimentation. As described for Phase I, the potential for effects would be minimized by implementing water quality measures in **Appendix B**. Native reseeding in uplands would improve aquatic habitat quality by increasing bank stability, thereby reducing the potential for erosion and sediment transport into Icicle Creek.

Following construction of the proposed intake facilities, removed woody vegetation would be reestablished by planting native upland and riparian trees and shrubs (Phase III). Container plantings would be installed in disturbed upland areas, while riparian tree cuttings would be installed in the Icicle Creek riparian zone. This would improve riparian vegetation structure and function compared with existing conditions. Over time, and as planted vegetation matured, the amount of shade provided to Icicle Creek would be increased, helping to moderate stream temperatures, especially during summer months.

Extraordinary maintenance activities would occur every couple of years and would be expected to continue into the future. These activities would affect fish, including special status fish species, and aquatic ecosystems; the type of effects would depend on the type of maintenance activities that are required. Likely effects include temporary water quality reductions from increases in turbidity associated with removal of accumulated sediments from the fish screen area as needed.

Alternative C

Alterations to aquatic habitat quantity and quality, critical habitat, and EFH, and potential for injury or mortality of fish species, would be similar to those described in Alternative B. Under Alternative C, there would be less vegetation removal in the Icicle Creek riparian zone during conveyance pipeline rehabilitation (Phase II) than under Alternative B. This is because the entire conveyance pipeline length between the PISMA and the adjacent private parcel would be lined with CIPP, and no pipeline would be replaced. As a result, loss of shade-generating vegetation would be reduced, and more trees would remain to provide inputs of woody materials to the creek, compared with Alternative B. Therefore, potential impacts to habitat quality such as elevated water temperatures from reduced shading and alteration of water quality parameters from increased erosion and sedimentation would be reduced, relative to Alternative B. Extraordinary maintenance activities would be expected to occur every few years and would be expected to continue into the future. Impacts from extraordinary maintenance activities would be the same as described under Alternative B.

Alternative D

The types and nature of impacts to fish and aquatic ecosystems resulting from components and elements of the surface water intake facilities and Phase I construction activities would be the same as those described for Alternative B. However, under Alternative D, Phase I construction would be limited to 7:00 a.m. – 10:00 p.m. Additionally, instead of the cofferdams remaining in Icicle Creek until November 15 for two in-water work windows, they would be removed two weeks earlier, by October 31 of each year, and would be placed and removed for a total of four in-water work windows. As a result, Phase I construction would require four years, and four in-water work windows, to complete in comparison to the two in-water work windows described for Alternative B. The types of impacts to fish and aquatic ecosystems described under Alternative D would occur over separate in-water work windows, creating a longer total duration of impacts to fish and aquatic species.

Although the in-water work window would be two weeks shorter under Alternative D relative to Alternative B, it would still extend beyond the approved in-water work window for Icicle Creek of July 1 to August 15 (USACE 2018). Working outside the approved window would increase the

duration of impacts to aquatic habitat by extending the length of time that in-water work would occur, though to a lesser extent (2 weeks shorter) than Alternative B. This may result in changes to the number and types of species and life stages of fish species that are present in the Analysis Area. For example, the potential for injury or mortality of special status fish species may decrease slightly under Alternative D relative to Alternative B due to the 2-week shorter in-water work window. This is because salmon are particularly vulnerable to disturbance during the fall and winter when adults are migrating and spawning; there would be less overlap of the in-water work window with salmon migration and spawning periods under Alternative D, and thus, less potential for effects such as disturbance to interfere with these essential life history functions. There would also be lower potential for interference (e.g., due to reduced spawning habitat) with Bull Trout spawning in late fall as a result of the shorter in-water work window under Alternative D relative to Alternative B.

The in-water construction under Alternative D over additional seasons, including installation and removal of cofferdams, would result in additional impacts on listed and non-listed fish species and habitat, compared with Alternative B. Although the types of impacts would be the same as those described for Alternatives B, these impacts could be realized for an additional two construction seasons. These would include temporary alterations to fish passage, stream geomorphology, and water quality and quantity in Icicle Creek, and additional direct effects to fish species from construction noise, and stress from handling and salvage from the in-water work area. However, impacts would not occur during the first two weeks of November when flows and the risk of cofferdam failure would be higher. Further, because the surface water intake would remain unscreened for additional seasons, listed fish could continue to be entrained into the unscreened intake for a longer time. Because these effects would occur to listed fish species, they could be considered take. As described under Alternative B, impacts would be minimized through BMPs (**Appendix B**).

Inundating the area of the partially constructed intake headworks after cofferdam removal at the end of the 2022 in-water work window would potentially increase the possibility for injury or mortality of fish relative to Alternative B. This is because fish could become entrained in areas where water is isolated due to the partially constructed intake area. For example, there would likely be at least a small strip along the 2-foot foundation slab that could fill with water at higher flows and be isolated from the stream when flows decrease.

Fish may be stranded inside the construction work area established by cofferdam placement. USFWS personnel would capture and remove any fish found stranded inside the work area. To minimize harm from capture, handling, and relocation into Icicle Creek, this process would be done by qualified biologists, in accordance with the USFWS (2012) *Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards for Bull Trout.*

Limiting construction to workday hours of 7:00 a.m. and 10:00 p.m. under Alternative D would reduce impacts to some fish species, such as Bull Trout, which are primarily nocturnal. This is because species that are inactive during the day would be less likely to be disturbed by daytime construction activities because they would not be engaging in activities such as foraging that could otherwise be disrupted.

Under Alternative D, pumping of two high capacity pumps to provide 40 cfs of water to the Hatchery during Phase I construction would occur 24 hours per day, 7 days per week for 8 months (November 1, 2022 to June 30, 2023). Sound generated by pumps may result in temporary behavioral impacts to fish and aquatic species, such as avoidance of the immediate area, while pumping is ongoing, and these effects would last 8 months longer under Alternative D as compared to Alternative B under which pumping would occur for approximately 7 days in 2022 and 3 days in 2023. Avoidance of the immediate area and displacement into other areas of Icicle Creek while pumping is ongoing may interfere with overwintering, spawning, and migration of fish species for which the 8-month temporary Hatchery water supply pumping period overlaps these life history phases.

Although long-term reliable delivery of water and the ability to meet Hatchery production goals would be improved under this alternative in comparison to Alternative A – No Action, there would be a risk of temporary impacts to Hatchery production from relying on pumps operating continuously for 8 months from 2022-2023. If pumps fail, and back-up pumps do not respond effectively in time, there could be a catastrophic loss of fish. Further, pumping water from the spillway pool would recirculate Hatchery effluent water, as the pool is the location of the Hatchery's main discharge point. Over time, without water treatment, pathogen loading to the fish would be increased and water quality reaching the Hatchery decreased, compromising health of Hatchery fish.

During the second in-water work window in 2023, impacts resulting from preparation for and installation of cofferdams and the gravity bypass pipeline and gravity bypass outlet would be similar to those described above and under Alternative B, including temporary reduction of fish passage and potential blocking of spawning habitat due to cofferdam installation, potential entrainment of fish in the gravity bypass pipeline, disturbance from cofferdam placement, and noise and vibration from the use of construction equipment. Except for installing the gravity bypass pipeline and gravity bypass outlet, this would also be true for the 2024 and 2025 in-water work windows. Removing cofferdams two weeks earlier each season would minimize the risk of overtopping or failure in comparison to Alternative B. Overall, impacts to fish and aquatic species and habitats would be repeated over four construction seasons under Alternative D as opposed to two seasons under Alternative B.

During the 2024 in-water work window, impacts from construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel (which entail placement of cofferdams, dewatering of the construction area, regrading of the stream channel bottom, construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel and, removal of the cofferdam) would be the same as those described under Alternative B with additional (repeated) temporary impacts from mobilization and demobilization. Likewise, during the 2025 in-water work window, impacts from construction of the remaining portion of the roughened channel would be the same as those described under Alternative B with additional impacts from mobilization and demobilization. Phase I construction would not be completed until fall of 2025, approximately 29 months past the May 2023 Biological Opinion deadline.

Impacts from Phase II construction activities and schedule and Phase III revegetation efforts would be the same as those described under Alternative B.

Terrestrial Wildlife, Including Special Status Terrestrial Wildlife Species

The Analysis Area for terrestrial wildlife species and special status terrestrial wildlife species includes a 0.25-mile buffer around the Project Area to evaluate noise and other potential disturbance effects during construction (**Map A-11** in **Appendix A**). Perceptible effects from construction are not anticipated to extend beyond 0.25 miles from the Project Area.

Affected Environment

Wildlife diversity is generally related to the structure and composition of plant species in vegetative communities. Wetlands and mature forested areas with structurally diverse vegetation communities are likely to support the greatest number of species and populations of wildlife. Coniferous and deciduous forest and wetland environments provide habitat for a variety of wildlife species because of the vegetation diversity and availability of forage and nest sites. Large dying trees and snags can provide cavities for migratory and special status birds.

Mixed Conifer Forest (109.3 acres), Montane Deciduous Foothill and Shrubland (84.0 acres), Riparian Woodland and Shrubland (21.1 acres), and Freshwater Wetland (2.7 acres) are vegetation types in the terrestrial wildlife Analysis Area (**Map A-11** in **Appendix A**) that could provide suitable habitat for a range of wildlife species. However, only approximately 2.1 acres of Mixed Conifer Forest are in the intake construction area.

Conversely, early seral, sparsely vegetated, and disturbed habitats offer lower quality wildlife habitat and are unable to support the ecological requirements for many terrestrial wildlife species. Developed and Landscaped (265.3 acres), Disturbed Ponderosa Pine Woodland and Savanna (121.0 acres), Bedrock, cliffs, and talus slopes (67.7 acres), and Sparsely Vegetated Woodland and Shrubland (48.5 acres) comprise the remaining areas of the terrestrial wildlife Analysis Area (**Map A-11** in **Appendix A**).

Wildlife more vulnerable to human activities and development, such as larger mammal species like black bear and cougar, would be less likely to be found near roads and parcels with residential development, such as exists in the Analysis Area. Instead, the terrestrial wildlife Analysis Area likely includes more native and nonnative wildlife species adapted to human activity. This is because of the presence of roads, agricultural fields, residential properties, golf courses, and other developments in the area. Roads also function as a potential barrier to migration of larger mammal species, such as deer and elk.

Overall, terrestrial wildlife habitat in the Analysis Area is of lower quality than the surrounding area and is more affected by human development. Terrestrial wildlife, especially species sensitive to disturbance, are likely to use the surrounding higher quality habitat for their key ecological needs, such as nesting, roosting, and raising young. Developed portions of the Analysis Area may support wildlife species adapted to human activities and resilient to disturbances. Similarly, birds that would use trees and shrubs in the Project Area would likely be tolerant of human-related disturbances.

Bald eagle (*Haliaeetus leucocephalus*) nests have been documented in eight areas of Chelan County, including Fromm's Field near the confluence of Icicle Creek and Wenatchee River. This area was

last documented as occupied in 2005 (Kalasz and Buchanan 2016). Although there is suitable bald eagle foraging habitat in the area and it has been observed, no occupied bald eagle nests are known in the Analysis Area.

WDFW Priority Habitats

Icicle Creek, in the vicinity of the Analysis Area, has two potential Washington Department of Wildlife (WDFW) terrestrial priority habitats—biodiversity areas and riparian. However, these priority habitats do not occur in the reach of Icicle Creek in the Analysis Area. There is also a potential for snags and logs as priority habitat features, but most trees in the Analysis Area are younger and may not reach large diameter at breast height sizes to qualify as priority features. The Analysis Area is characterized mostly by disturbed habitats and younger, seral forests with limited potential to contain priority snags and logs.

The WDFW Priority Habitat database (WDFW 2020b) identifies a regular concentration priority habitat for mule deer that overlaps the Analysis Area near the existing intake facilities and upstream portion of the conveyance pipeline. Sensitive mule deer life history periods are from May 1-September 30 each year.

Special Status Terrestrial Wildlife Species

The Analysis Area does not support quality habitat or have key ecological elements for special status terrestrial wildlife listed species. The proximity of habitat to human development, areas of high recreation use, and areas with a density of roads makes the presence of these species very unlikely. In addition, the surrounding area has higher quality and less disturbed habitat that special status species would prefer. However, special status terrestrial wildlife species could inhabit the vicinity of the Analysis Area and have incidental occurrences in the Analysis Area while transitioning through it to areas of suitable habitat outside the Analysis Area. For example, there have been public sightings of gray wolf (*Canis lupus*) individuals transitioning through the forested areas surrounding the City of Leavenworth, however, the closest known gray wolf territory is approximately 7.5 miles to the south (WDFW GIS 2020).

Environmental Consequences

The indicators for terrestrial wildlife are as follows:

- Acres of suitable wildlife habitat
- Potential for disturbance, injury, or mortality of terrestrial wildlife

Alternative A

Wildlife habitat would not be removed, modified, or rehabilitated under this alternative. The surface water intake site would continue to be characterized by steep banks with Mixed Conifer Forest with some sparse riparian-associated shrubs. While existing conditions would remain, there would be no opportunities for reseeding or replanting to increase riparian and upland habitat quality. The potential for disturbance, injury, or mortality from ongoing O&M activities would continue. These activities would be of short duration and occur in an area of limited wildlife habitat quality with existing high levels of disturbance from human presence and traffic noise.

Alternative B

Temporary and localized disturbance impacts could occur during all phases of construction under Alternative B. Surface disturbing activities could remove or degrade wildlife habitat and cause disturbance and displacement of wildlife. Reduced visibility during nighttime work could increase wildlife collisions with worker vehicles, and thereby increase the potential for wildlife injury or mortality, particularly for nocturnal species. Removal of shrubs and trees during the bird nesting period could cause nest failure and mortality of migratory birds. Noise disturbances associated with construction activities could temporarily displace and disturb wildlife. Noise impacts are more pronounced during sensitive periods such as mule deer and mountain goat parturition and lactation periods when feeding young and hiding them from predators is paramount. These impacts would be avoided or minimized to negligible levels through implementation of biological resources BMPs (see **Appendix B**). Applicable BMPs include removing or modifying vegetation outside the breeding bird season, conducting nest surveys prior to activities and establishing buffer zones around active nests, and avoiding high noise disturbance activities during mule deer and mountain goat sensitive periods.

Phase I surface disturbing activities would have both short- and long-term impacts to terrestrial wildlife habitat in the intake construction area. Approximately 1.02 acres of short-term impacts to the Mixed Conifer Forest would occur due to site preparation. Long-term impacts, which would include replacing native vegetation with non-vegetated areas, would be approximately 0.18 acres. A native upland seed mix would be applied at the end of Phase I construction, in early fall or spring, for erosion control and restoration, thereby stabilizing soils and maintaining habitat in disturbed areas (approximately 0.84 acres). Most terrestrial wildlife in the Analysis Area are adapted to disturbed habitats departed from natural historic conditions and tolerant of human disturbances. In addition, they are typically mobile and can move away from temporary construction disturbance to nearby higher quality habitat. Therefore, effects on terrestrial wildlife from disturbance, injury or mortality would be negligible.

Removal or modification of trees in the intake construction area and adjacent pipeline replacement corridor could reduce nesting habitat for migratory birds. However, the minimal amount of vegetation removal at the intake construction area and adjacent pipeline replacement corridor, compared with the amount of suitable nesting habitat in the surrounding area means that the loss of suitable nesting areas at the intake construction area would be a negligible effect and would not significantly impact bird populations.

The majority of the project disturbances under Phase II would occur in developed and disturbed habitats, as approximately 0.4 acres of Mixed Conifer Woodland, 2.6 acres of Developed and Landscaped vegetation and 4.1 acres of Disturbed Ponderosa Pine Woodland and Savanna vegetation types would be affected. As under Phase I, effects on terrestrial wildlife from disturbance, injury or mortality would be negligible as these species would be expected to move away from temporary construction disturbance to nearby higher quality habitat.

Planting native riparian and upland vegetation under Phase III would improve terrestrial wildlife habitat by increasing riparian and upland species and structural diversity compared with current habitat conditions.

Alternative C

Impacts on terrestrial wildlife species from Phase II construction would be reduced compared to Alternative B. This is because the entire conveyance pipeline on USFWS property near the intake construction area would be rehabilitated by lining using CIPP, and no pipeline would be replaced. As a result, effects from potential disturbance, injury and mortality to terrestrial wildlife species would be slightly reduced, as would the amount of suitable wildlife habitat that would be removed, compared with Alternative B. Because total ground disturbance and native vegetation removal would be reduced under this alternative, large ponderosa pine, Douglas fir, and cottonwood would remain as habitat for wildlife species.

Alternative D

Impacts on terrestrial wildlife would be the same as described under Alternative B.

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Acronyms and Abbreviations

	Full Phrase
BMPs	Best Management Practices
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH	final designated critical habitat
CIPP	cure-in-place pipe
COIC	Cascade Orchard Irrigation Company
CUAs	contractor use areas
DPS	Distinct Population Segment
Ecology	Washington Department of Ecology
EFH	essential fish habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Ecologically Significant Unit
FC	federal candidate for listing
FE	federally endangered
Forest Service	U.S. Department of Agriculture, Forest Service
FT	federally threatened
IO&MA	intake operations and maintenance area
IPID	Icicle and Peshastin Irrigation District
LNFH, Hatchery	Leavenworth National Fish Hatchery
MBTA	Migratory Bird Treaty Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
OHWM	ordinary high water mark
O&M	operations and maintenance
PFT	federal proposed as threatened
pH	potential of hydrogen
PISMA	pipe intake and sediment management area

RCW	Revised Code of Washington
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RM	river mile
ROW	right-of-way
SC	Washington state candidate
SE	WNHP endangered
Sens	WNHP/state sensitive
ST	WNHP/state threatened
SWISP	Surface Water Intake Fish Screens and Fish Passage
TMDL	total maximum daily load
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WA GAP	Washington Gap Analysis Project
WDFW	Washington Department of Fish and Wildlife
WE	Washington Department of Fish and Wildlife state endangered
WNHP	Washington Natural Heritage Program
WT	Washington Department of Fish and Wildlife state threatened
WUA	weighted usable area

Chapter 1. General Project Information

The U.S. Department of the Interior, Bureau of Reclamation (Reclamation) has prepared an Environmental Impact Statement (EIS) for the Leavenworth National Fish Hatchery (hereafter, LNFH or Hatchery) Surface Water Intake Fish Screens and Fish Passage (SWISP) Project (**Map A-1** in **Appendix A**). The purpose of this specialist report is to provide a comprehensive environmental baseline and analysis of the potential impacts of the SWISP Project under four separate alternatives, including Alternative A, No Action.

1.1 Project Area

The Project Area is on and near the LNFH, near the City of Leavenworth in Chelan County, Washington. The Project Area includes the LNFH's surface water intake and primary point of diversion on Icicle Creek, and conveyance pipeline to the Hatchery. The surface water intake is on U.S. Fish and Wildlife Service (USFWS) property, while the conveyance pipeline crosses several private parcels before re-entering USFWS property. Access to private parcels is via existing easement agreements between the landowner and federal government. The Project Area also includes approximately 1.25 miles of Icicle Creek Road, from the surface water intake to a U.S. Department of Agriculture, Forest Service (Forest Service) kiosk to the west, as well as access roads and staging areas on the USFWS property. The Project Area is depicted on **Map A-1** in **Appendix A**.

1.2 Alternatives

Reclamation identified a reasonable range of alternatives for analysis in the EIS through the development of screening criteria, the assessment of Project *components* and *elements* against these criteria, and the consideration of scoping comments received. The major Project components are Intake, Fish Passage Sediment Management, Conveyance Pipeline, Temporary Hatchery Water Supply, and Access and Staging. Each *component* has technical and operational requirements; generally, there are different techniques to meet these requirements. These different techniques are termed *elements*.

Chapter 2 of the EIS describes the No Action Alternative and three action alternatives in detail, along with a summary comparison of the differences and common impacts between the alternatives. A summary of the alternatives and component elements considered but eliminated from detailed study is also provided. **Map A-2** through **Map A-8** in **Appendix A** depict the alternatives in detail.

1.2.1 Alternative A – No Action

The No Action Alternative represents continuation of current operation and maintenance (O&M) of the LNFH surface water intake and delivery system on Icicle Creek and provides a basis for comparison to the action alternatives. The existing intake and delivery system, constructed in 1939 and 1940, would remain in its current degraded condition and likely continue to deteriorate. All existing features listed and summarized below and depicted in **Map A-2** and **Map A-3** in

Appendix A, would remain in place and would not be modified, improved, or rehabilitated under this alternative.

- Low-head diversion dam
- Intake channel
- Intake trashrack structure
- Access road
- Fish ladder/Sediment sluice
- Gatehouse
- Outlet channel
- Conveyance pipeline
- Sand settling basin
- Inside and outside Screen Chambers

The diversion dam would continue to divert water from Icicle Creek to the intake channel, through an unscreened diversion. The start of the intake system would remain at the intake trashrack structure. The excavated intake channel above the intake trashrack structure and concrete intake channel below would continue to convey water through gravity flow to the gatehouse. The channel would remain unscreened. The intake trashrack structure at the entrance to the concrete intake channel would remain in operation. The trashrack's 6-inch bar spacing would continue to prevent large debris from entering the concrete intake channel. The road would not be modified or extended and would continue to provide access to the stairs leading to the intake trashrack structure. The existing fish ladder would not be modified to alter flow or enhance fish passage.

The existing gatehouse serves to transition surface water from the open intake channel to the enclosed conveyance pipeline. It houses a fine rack with 1.5-inch bar spacing and an overflow spill and sediment sluicing sections separated by a bulkhead. The fine rack limits the size of objects that enter the pipeline. A gate valve can be opened to flush sediment; however, it does not function reliably. The gatehouse would remain in place, and the outlet channel would continue to direct bypassed water and sluice material (sediment) from the gatehouse back to Icicle Creek.

The aging 31- to 33-inch diameter buried concrete pipeline would continue to convey water up to 42 cubic feet per second (cfs) from the gatehouse to the Hatchery. No sections would be lined or replaced and introduced sediment would continue to be transported to the Hatchery. Transported sediments would continue to degrade the existing pipeline. Before water enters the Hatchery's rearing units it is either routed into the sand settling basin (normal operation) or directly to the inside or outside screen chamber. The sand settling basin would continue to trap sediment and minimize the amount of remaining sediment from entering fish production facilities. Sediment and entrained fish would continue to be periodically removed from the sand settling basin in accordance with existing biological opinions (USFWS 2011; NMFS 2017). From the sand settling basin, water can be directed to either the inside or outside screen chamber before entering the Hatchery's rearing units. The screens in the inside and outside screen chambers are composed of vertical static screen panels that filter fish and debris from the Hatchery's water supply. The screen chambers do not

meet National Marine Fisheries Service (NMFS) current screening criteria (NMFS 2011) [1]. Screens must be manually cleaned, and entrained fish must be captured, removed, counted, and returned to Icicle Creek. LNFH reports the number and species of Endangered Species Act (ESA)-listed fish entrained in the intake and delivery system in their annual take report to NMFS and the USFWS.

Hatchery O&M is subject to both the National Pollution Discharge Elimination System (NPDES) permit from U.S. Environmental Protection Agency (EPA) and O&M consultations under the ESA Section 7 with NMFS and USFWS (USFWS 2011; NMFS 2017). Extraordinary maintenance would continue to be handled on a case-by-case basis as determined to be necessary by the Hatchery. ESA Section 7 consultation has been reinitiated with the USFWS for O&M of the Hatchery.

The Cascade Orchard Irrigation Company (COIC) is expected to relocate its point of diversion on Icicle Creek downstream of the Hatchery. Once the new point of diversion is constructed, COIC would no longer divert water at the current intake location.

1.2.2 Alternative B – Proposed Action

Reclamation proposes to rehabilitate the LNFH surface water intake and delivery system on Icicle Creek by constructing new headworks[2] and a creek-width roughened channel and replacing and lining the surface water conveyance pipeline to the Hatchery. In addition, the current access road would be modified and extended to provide better entry to an expanded Intake Operations and Maintenance Area (IO&MA). A conceptual drawing of the proposed intake facilities is included as **Map A-4** in **Appendix A**. See **Map A-5** and **Map A-6** in **Appendix A** showing activities proposed under Alternative B.

Intake and Fish Passage

Construction of the headworks and roughened channel would incorporate the existing low-head diversion dam and intake channel. The roughened channel would incorporate a portion of the fish ladder/sediment sluice; the unincorporated portion would be removed. Two self-cleaning, cylindrical, screens would be installed at the diversion headworks to comply with NMFS fish screening criteria, provide redundancy in case of screen maintenance, and to facilitate the Hatchery's ability to meet future water conservation goals. A low-flow boulder weir fishway would be integrated into the roughened channel to provide NMFS-compliant fish passage during typical low flows, and a portion of the roughened channel would be extended upstream of the diversion dam to facilitate fish passage overall and at higher flows in particular. The intake trashrack structure would be removed, and a new pipeline would be placed in the intake channel to connect the headworks to the conveyance pipeline. The intake channel would be filled to cover the pipeline and create the IO&MA to enable Hatchery personnel to safely and efficiently access, operate, and maintain the intake facilities. The existing stairway from the access road to the intake channel would be removed

[1] The existing inside and outside screen chambers meet NMFS standards for fish screening (NMFS 1997), but not current criteria (NMFS 2011). Even if the screen chambers were upgraded to NMFS current criteria, take would still occur. This is because take occurs at the point of entrainment, at the existing intake facilities on Icicle Creek. The screen chambers are at the distal end of the conveyance pipeline, approximately 6,300 feet from the existing intake facilities on Icicle Creek.

[2] Headworks means any dam, weir, barrage, or reservoir and all works appurtenant thereto, used for or in connection with the storage, control, conveyance, or distribution of water. For the SWISP Project, the headworks includes the combined intake structure elements, such as the intake structure, gates, and retaining walls.

as this area would become part of the IO&MA. See **Map A-4** in **Appendix A** for a conceptual drawing of the proposed intake facilities.

Sediment Management

Elements to manage sediment accumulated at the intake include a ramp on the upstream side of the roughened channel to help mobilize sediment over the feature, a vertical access pipe incorporated into the IO&MA behind the screens to enable a submersible pump to draw in screened water and force it through a hose and nozzle to mobilize sediment through propulsion, and a series of pipes, valves, and outlet channel at the pipeline intake and sediment management area (PISMA) to flush sediment through the intake pipeline back to Icicle Creek (as needed). Components of the PISMA would be placed at the former gatehouse location. See **Map A-4** in **Appendix A** for a conceptual drawing of the proposed intake facilities.

Conveyance Pipeline

Under Alternative B, approximately 2,180 feet of the conveyance pipeline would be replaced using cut and cover trenching on USFWS property and approximately 4,000 feet of conveyance pipeline would be lined with cure-in-place pipe (CIPP) on private parcels (**Map A-5** in **Appendix A**). Construction of several temporary access points (contractor use areas [CUAs]) along the existing conveyance pipeline alignment would be installed to provide ingress and egress for pipe lining on private lands. These areas would be restored to pre-construction conditions following lining activities.

The uppermost segment of the existing concrete cylinder pipeline on USFWS property would be removed and replaced with 520 feet of new 42-inch high-density polyethylene pipe in the same location. The 1,660 feet of the lower segment of pipeline on USFWS property would be constructed parallel to the existing concrete cylinder pipeline. The current control valve system at the sand settling basin on USFWS property would be replaced with a new control valve vault to allow safe pipe filling operations. After control valve connections are made, this segment of the existing pipeline would be decommissioned and abandoned-in-place. All rehabilitation, replacement, and modernization of the LNFH intake and delivery facilities would conclude at the control valve system; the sand settling basin and inside and outside screen chambers would remain unaltered.

Temporary Hatchery Water Supply

Temporary Hatchery water would primarily be supplied by a gravity-fed diversion. A 40 cfs water supply to LNFH would be maintained during Phase I construction[3]. Temporary pumping from the spillway pool would supply water while the gravity-fed bypass pipeline and outlet are installed and connected to the existing conveyance pipeline approximately 200-300 feet below the intake construction area. This would occur over an approximately 1-week period. It is likely that multiple pumps would be needed to supply this water.

A 20 cfs water supply to LNFH would be maintained during Phase II construction between April 17 to May 20. This would be needed when pipeline replacement, lining with CIPP, and pipeline

[3] During Phase I construction, the LNFH has agreed to a 40 cfs temporary Hatchery water supply, which is different than the LNFH's full surface water right of 42 cfs.

interconnections were underway, and would occur through pumping from the spillway pool adjacent to LNFH (**Map A-5** in **Appendix A**).

Access and Staging

Staging and storage sites for construction equipment and materials, and construction staff administration and vehicle parking would be located at various places on LNFH grounds (see **Map A-5** and **Map A-6** in **Appendix A**). Trucks hauling construction equipment and containing construction materials would be required to turn around approximately 1.25 miles southwest of the intake access road, at the Forest Service and Alpine Lakes Wilderness Area kiosk on Icicle Creek Road. Construction access to the conveyance pipeline would use existing roads, temporary access routes, and the pipeline right-of-way (ROW).

Construction

Construction of the SWISP Project would occur in three phases. Phase I would include construction of the intake access road and rehabilitation of the intake structures and facilities (e.g., fish screens, fish passage). Phase II would include replacement and lining of the conveyance pipeline. There would likely be temporal overlap between parts of Phase I and Phase II construction. For instance, in July 2022, it is likely that construction of the proposed intake facilities may overlap with pipeline replacement on the Hatchery grounds (see **Appendix C** in the SWISP Project EIS for additional assumptions). Phase III would include revegetation of upland and riparian areas that are proposed to be disturbed.

Phase I construction activities would occur up to 24 hours per day, 6 days per week, and up to 7 days per week. In addition, the in-water work window would be from July 1 to November 15 each year. Phase II construction activities and Phase III revegetation activities would not include any in-water work and would be limited to workday hours of 7:00 a.m. to 10:00 p.m., 5 days per week, and up to 6 days per week.

Phase I includes:

- Construction activities occurring up to 24 hours a day, up to 7 days a week.
- Construction occurring over two seasons primarily within the in-water work window of July 1 to November 15.
- Construction of intake access road (2022).
- Installation of temporary cofferdams[4] (2022 and 2023).
- Demolition of existing intake trashrack structure (complete), existing gatehouse (complete) and fish ladder/sediment sluice (partial) (2022).
- Construction of headworks, including the intake structure, retaining walls, and vertical access pipe for sediment management tools (2022).
- Placement of new intake pipeline (2022).

[4] Temporary cofferdams would likely consist of geo-bags, or non-woven geotextile bags. These are large bags made of synthetic materials, such as polyester, polypropylene, or polyethylene, which are filled with sand, rock, or other material, fastened shut, and used to protect structures or riverbanks from erosion or scour.

- Construction of IO&MA over the headworks, retaining walls, and intake pipeline (2022).
- Placement of guiderails, hydraulic equipment, NMFS-compliant fish screens, slide gates, covered control panel, and safety guardrails around the IO&MA (2022).
- Construction of the PISMA at former gatehouse location (2022).
- Rehabilitation of the outlet channel (2022).
- Construction of roughened channel, including upstream sediment ramp and low-flow boulder weir fishway (2023).
- Suppling LNFH with a temporary water supply of 40 cfs using a temporary above-ground, gravity-fed bypass pipeline connected to the conveyance pipeline or pumping from the spillway pool when necessary (2022).
- Post-construction seeding of disturbed areas that do not have a surface treatment (e.g., gravel) with an upland or riparian seed mix, as appropriate (2023).

Phase II includes:

- Construction activities occurring during workday hours of 7:00 a.m. to 10:00 p.m., 5 days per week, and up to 6 days per week.
- The majority of pipeline lining construction occurring over three seasons during a 4- to 5-week period between April and May.
- Pipeline replacement construction occurring year-round where practicable.
- Replacing conveyance pipeline segments on USFWS property (2022, 2023, and 2024).
- Utilizing existing roads and temporary access routes to gain access to CUAs, as coordinated with private landowners. No improvements are needed to existing roads and access routes.
- CIPP lining of the conveyance pipeline on private parcels from CUAs.
- Temporarily pumping Hatchery water out of the spillway pool during pipeline replacement, lining with CIPP, and pipeline interconnections. Pumping would take place between April 17 and May 20 during the Phase II construction period (2022, 2023, and 2024).
- Constructing new control valve vault and system on USFWS property (2022 and 2023).
- Post-construction seeding of disturbed upland areas (2022, 2023, and 2024).

Phase III includes:

- Planting of riparian tree cuttings in the riparian zone within the Phase I construction area (2024).
- Planting of containerized upland shrubs and trees in uplands within the Phase I construction area (2024).

Best Management Practices

Reclamation would implement practices to protect water quality and other resources and promote soil conservation during Project construction and O&M activities. While these measures are often called Best Management Practices (BMPs), they are conservation measures used to reduce Project impacts on resources and resource uses, including, but not limited to, fisheries and aquatic resources,

Tribal interests, public health and safety, and recreation. BMPs can be a 'thing' installed on-the-ground (e.g., silt fence, ground cover vegetation) or a 'process' used to plan and conduct an activity (e.g., marking stream buffers). The comprehensive list of BMPs is included in this report as **Appendix B**.

Permitting

Because Alternative B would include work within Icicle Creek, several federal and state regulatory permit approvals would be required before construction begins. Reclamation would obtain all required regulatory permits prior to construction implementation. Reclamation would use the Washington State Joint Aquatic Resources Permit Application form to apply for applicable permits. Permits that would be obtained include:

- U.S. Army Corps of Engineers (USACE) Section 404 Nationwide Permits
- Washington Department of Ecology (Ecology) Section 401 Water Quality Certification
- Washington Department of Fish and Wildlife (WDFW) Hydraulic Project Approval

Alterative B would also include the use of Icicle Creek Road on National Forest System lands, between the Snow Lakes Trailhead and the Forest Service and Alpine Lakes Wilderness Area kiosk. As a result, Reclamation would secure the required road use approval from the Forest Service, most likely under a special use permit. The kiosk is approximately 1.25 miles southwest of the intake facilities.

Operations and Maintenance

O&M activities would periodically occur on an as-needed basis as determined by Hatchery staff, including daily visual inspections of the proposed intake facilities. Periodic maintenance of the fish screens would be facilitated by construction of the proposed IO&MA, while O&M of the conveyance pipeline would be facilitated by the PISMA and the new control valve system at the sand settling basin.

Hatchery O&M is subject to both the NPDES permit from the EPA and O&M consultations under the ESA Section 7 with NMFS and USFWS (USFWS 2011; NMFS 2017). Extraordinary maintenance is handled on a case-by-case basis as determined to be necessary by the Hatchery.

1.2.3 Alternative C

Under Alternative C, Reclamation would rehabilitate the LNFH surface water intake and delivery system on Icicle Creek as described under Alternative B. However, under Alternative C, Reclamation would line the entire upper segment (520 feet) of the conveyance pipeline on USFWS property with CIPP instead of replacing it, as described under Alternative B (**Map A-7** and **Map A-8** in **Appendix A**). As a result, the mature trees in the Icicle Creek riparian zone found in this conveyance pipeline segment would not be removed. Under Alternative C, the length of the conveyance pipeline, from the PISMA to CUA 5 (4,520 feet), would be lined with CIPP. The remaining segments lined with CIPP on private parcels and replaced on the Hatchery grounds proper would be the same as described under Alternative B (see **Map A-7** in **Appendix A**). A conceptual drawing of the proposed intake facilities is included as **Map A-4** in **Appendix A**.

A 20 cfs water supply to LNFH would be maintained during Phase II construction between April 17 and May 20, as described under Alternative B. No temporary pumping would be necessary for pipeline replacement during Phase II construction because the upper segment of the conveyance pipeline on USFWS property would be lined with CIPP instead. As discussed under Alternative B, temporary pumping would be needed while the conveyance pipeline is lined with CIPP, and when pipeline interconnections were underway.

Hatchery O&M is subject to both the NPDES permit from the EPA and O&M consultations under the ESA Section 7 with NMFS and USFWS (USFWS 2011; NMFS 2017). Extraordinary maintenance is handled on a case-by-case basis as determined to be necessary by the Hatchery.

1.2.4 Alternative D

Under Alternative D, Reclamation would rehabilitate the LNFH surface water intake and delivery system on Icicle Creek as described under Alternative B but with the following differences. Phase I construction activities would be same as Alternative B but would be limited to workday hours of 7:00 a.m. to 10:00 p.m., 5 days per week, and up to 6 days per week. In addition, the in-water work window would be limited to July 1 to October 31 each year. Alternative D was developed to minimize the effects of 24 hours a day construction and reduce the overlap of cofferdam use with a period of greater high-flow risk. Phase II construction activities and schedule would be the same as described under Alternative B. Phase III revegetation efforts would be the same as described under Alternative B except would occur a year later (2025).

The components and elements of the surface water intake facilities and construction activities would be the same as described for Alternative B during Phase I; however, because construction would be limited to workday hours of 7:00 a.m. to 10:00 p.m. and the in-water work window would be two weeks shorter than under Alternative B, construction of Phase I under Alternative D would require four years (i.e., four in-water work windows from 2022 to 2025) to complete. The sequence of Phase I construction activities would be very similar to those listed for Alternative B but would extend through two additional in-water work windows during two additional years (2024 and 2025). Initial mobilization, construction of the intake access road, temporary Hatchery water supply during the in-water work window, access and staging, BMPs, permitting, and O&M would be unchanged from Alternative B. Details of the Phase I construction schedule for intake and fish passage and temporary Hatchery water supply components for Alternative D are provided below.

During the first in-water work window in 2022, preparation for and installation of cofferdams and the gravity bypass pipeline and gravity bypass outlet, demolition of the intake trashrack structure, gatehouse, fish ladder/sediment sluice (partial), and construction of the PISMA and outlet channel, would be the same as Alternative B (**Map A-6** in **Appendix A**). However, because of the shorter workdays and shorter in-water work window, construction of the intake structure would be limited to excavation, preparation and construction of the concrete slab foundation, and partial construction of the intake headworks. At the end of the 2022 in-water work window, the intake structure would be approximately 35 percent completed. Although the full extent of the intake headworks foundation would be in place, the area of the partially constructed intake headworks would be inundated between the 2022 and 2023 in-water work windows after cofferdam removal.

Demobilization of construction equipment in 2022 would leave the constructed elements of the intake structure in this condition until July 2023 when re-mobilization occurs.

From November 1, 2022 to June 30, 2023, the Hatchery's surface water would be supplied by pumping from the spillway pool on Icicle Creek adjacent to LNFH (**Map A-5** in **Appendix A**). Two high capacity pumps[5] would provide 40 cfs of water to the Hatchery during this period. An operational third pump would be on site as a backup. The pumps would operate 24 hours per day for the 8-month period; as a result, they would require 24 hour per day, 7 day per week monitoring by the construction contractor.

During the second in-water work window in 2023, preparation for and installation of cofferdams and the gravity bypass pipeline and gravity bypass outlet again would occur as described under Alternative B. The remaining 65 percent of construction of the intake structure components and elements would be completed before cofferdam removal. By the end of the 2023 in-water work window, fish screens would be in place and fully operational, and the temporary gravity bypass pipeline and gravity bypass outlet would be removed. In addition, the transition to the new intake structure would be completed by connecting intake facilities to the conveyance pipeline to deliver the LNFH surface water supply by October 31, 2023. Because the intake structure would be fully operational at the end of this in-water work window, there would be no need to supply temporary water to the Hatchery during the remainder of Phase I construction.

During the third in-water work window in 2024, mobilization similar to previous Phase I in-water work window construction seasons would be required before construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel could occur. Construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel would include placement of cofferdams, dewatering of the construction area, regrading of the stream channel bottom, construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel and finally, removal of the cofferdam.

During the fourth in-water work window in 2025, mobilization similar to previous Phase I in-water work window construction seasons would be required before construction on the remaining portion (right bank) of the roughened channel could occur. Construction of the remaining portion of the roughened channel would include placement of cofferdams, dewatering of the construction area, regrading of the stream channel bottom, construction of the roughened channel and finally, removal of the cofferdam. Once the entire roughened channel is complete and all cofferdams have been removed, the intake facilities would undergo final testing and commissioning to ensure proper operation and compliance with NMFS current screening and fish passage criteria for anadromous fish passage facilities (NMFS 2011), which would occur by October 31, 2025.

[5] Pumps are assumed to be high-lift, 16-inch, trailer-mounted with 150 horsepower diesel engines.

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Chapter 2. Relevant Laws, Regulations, and Policy

2.1 Federal Laws, Regulations, Statutes, and Orders

Columbia Basin Project Act of March 1943 (57 Stat. 14, Public Law 78-8) – This act reauthorized the Columbia Basin Project, bringing it under the provisions of the Reclamation Project Act of 1939.

Endangered Species Act of 1973 (ESA; 16 United States Code [USC] 1536) – This is a federal law designed to protect and prevent the extinction of fish, wildlife, and plant species and their critical habitats that are listed as threatened or endangered under the ESA. The act is administered by the USFWS for terrestrial species and some freshwater fish species and NMFS for anadromous fish[6] and marine species. The ESA requires USFWS and NMFS to designate critical habitat for listed species, defined as follows:

- Specific places in the geographical area occupied by a species at the time of listing, if the species has physical or biological features essential to conservation and those features may require special management considerations or protection
- Specific places outside the geographical area occupied by a species at the time of listing, if the USFWS and NMFS determines that the area itself is essential for conservation

Migratory Bird Treaty Act (MBTA), as amended (16 USC 703–711) – This act provides protection for migratory birds at the federal level, with a list of birds maintained by the USFWS. The MBTA protects the nests, eggs, and body parts of migratory birds from harm, sale, or other injuries.

Migratory Bird Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds – This executive order was issued on January 10, 2001 and it directs federal agencies that take actions that either directly or indirectly affect migratory birds to develop a memorandum of understanding and to work with the USFWS and other federal agencies to promote the conservation of migratory bird populations.

Bald and Golden Eagle Protection Act – This act protects bald and golden eagles and prohibits anyone from taking, possessing, or transporting any eagle or eagle parts (including nests, eggs, and feathers) without prior authorization. This includes all eagle nests regardless of their occupancy status.

Magnuson-Stevens Act (MSA), Section 305(b)(2) – This act requires federal agencies to consult with NMFS on activities that may adversely affect essential fish habitat (EFH). This is defined in the MSA as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to

[6] Anadromous is the term that describes fish born in freshwater who spend most of their lives in saltwater and return to freshwater to spawn, such as salmon and some species of sturgeon.

maturity. A federal action agency, or its official designee, must determine whether its actions may adversely affect EFH. If so, the agency must prepare an EFH assessment. If the action would not adversely affect EFH, then the agency must document this determination in its record.

Fish and Wildlife Coordination Act (16 USC 661–667e) – This act was enacted in 1934 and amended in 1958 (Public Law 85-624) and provides for equal consideration of wildlife conservation in coordination with other features of water resource development programs. Consultation with the USFWS and WDFW would be required when the water resource development portions of the program are being implemented, such as plans to control or modify any stream or other body of water.

***US v. Oregon* (*Sohappy v. Smith*, "Belloni Decision," Case 899, July 8, 1969) –** The agreement provides production and harvest objectives for the LNFH. Specifically, the LNFH is required to release 1.625 million Spring Chinook Salmon smolt to Icicle Creek; however, currently the Hatchery releases only 1.2 million smolt annually.

Noxious Weed Act of 1974 (Public Law 93-629, Jan 3, 1975; 7 USC 2801) – The act, as amended by the Food, Agriculture, Conservation and Trade Act of 1990, Section 1453 (Subsection 15, "Management of Undesirable Plants on Federal Lands") established a federal program to control the spread of noxious weeds. The U.S. Secretary of Agriculture was given the authority to declare plants noxious weeds and to limit the interstate spread of such plants without a permit. Each federal land management agency must develop and implement a program to control noxious weeds and establish cooperative agreements with the states regarding noxious weeds.

Carlson-Foley Act of 1968 (Public Law 90-583, Oct. 17, 1968, 82 Stat. 1146) and the Plant Protection Act of 2000 (Public Law 106-224, June 20, 2000, 114 Stat. 429) – These are two weed control acts that authorize federal agencies to manage noxious weeds on federal lands and to coordinate with other federal and state agencies.

Executive Order 13112 (Feb. 3, 1999) – This executive order authorizes improved coordination among federal agencies to address the growing environmental and economic threats of noxious weeds and invasive species. It restricts actions that may promote the introduction and spread of noxious weeds and invasive species.

Executive Order 11990, Protection of Wetlands (May 24, 1977) – This executive order directs all federal agencies to minimize the destruction, loss, or degradation of wetlands. It also directs them to preserve and enhance the natural beneficial values of wetlands in the conduct of the agency's responsibilities for the following:

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including water and related land resources planning, regulating, and licensing

Clean Water Act – Passed in 1972, this act regulates the discharge of pollutants into the nation's surface waters, including lakes, rivers, streams, wetlands, and coastal areas. The Clean Water Act made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit is obtained from the US EPA's NPDES permit program.

2.2 State and Local Laws

Washington State Hydraulic Code – This code protects fish and their habitats. Implementing elements of the project that use, divert, obstruct, or change the natural flow or bed of fresh State waters would require a hydraulic project approval from WDFW.

Revised Code of Washington (RCW) 17.10 – This code is the State's noxious weed law. It creates a noxious weed control board in each county, which establishes a list of noxious weeds for the county.

RCW 77.57.010 – This code mandates criteria for fish guards required on diversion devices—Penalties, remedies for failure.

RCW 77.57.030 – This code mandates criteria for fishways required in dams, obstructions, penalties, remedies for failure.

RCW 77.57.070 – This code mandates criteria for any diversion of water Screen, and associated fish bypass that is required.

Washington Administrative Code (WAC) Chapter 16-750 – This code includes the State noxious weed list, definitions, and descriptions of region boundaries for Class B weeds, and the schedule of monetary penalties.

WAC Chapter 173-201A-200 – This code includes aquatic life fresh water criteria for temperature, dissolved oxygen, turbidity, dissolved gas and pH for core summer salmonid habitat.

WAC 173-201A-260 (2)(a) and (b) – This code includes general criteria that apply to all aquatic life fresh water uses are for toxic, radioactive, and deleterious materials, and aesthetic values.

WAC 220-660-100 – This code includes criteria for freshwater habitat of special concern.

WAC 220-660-120 – This code includes criteria for staging areas, job site access, equipment use, construction materials, in water work and fish removal.

WAC 220-660-200 – This code includes criteria for fish passage improvement structures.

2.3 Other

In addition to the initial authorizations, LNFH operations are authorized, sanctioned, and influenced by the following treaties, judicial decisions, and specific legislation:

- Treaty with the Walla Walla, Cayuse, Umatilla Tribes, June 9, 1855
- Treaty with the Yakama, June 9, 1855
- Treaty with the Nez Perce, June 25, 1855
- Treaty with the Tribes of Middle Oregon, June 25, 1855
- Executive Order (Treaty with Bands of Colville), April 8, 1872
- Salmon and Steelhead Conservation and Enhancement Act, 94 Stat. 3299, December 22, 1980
- Pacific Salmon Treaty Act of 1985 (U.S./Canada Pacific Salmon Treaty), Public Law 99-5, 16 USC 3631, March 15, 1985
- *United States v. Confederated Tribes of the Colville Indian Reservation*, Civ. No. 3:68-cv-00513-KI (D. Or., August 13, 2008), aff'd 606 F.3d 698 (9th Cir. 2010)(No. 08-35961, DC No.), May 27, 2010 (reaffirmation of the Wenatchi's Icicle Creek fishing rights)

Chapter 3. Affected Environment

3.1 Analysis Area

The Analysis Area varies depending on what biological resource is being evaluated, as described below. Most impacts would be in the Project Area footprint, where the ground surface would be disturbed (**Map A-1** in **Appendix A**); however, some effects, such as changes in water characteristics and noise disturbances, can reach beyond the immediate Project Area.

The Analysis Area for vegetation and special status plant species are those areas within the Project Area that would be directly disturbed by the proposed Project (**Map A-9** in **Appendix A**).

The Analysis Area for fisheries, including special status species, and aquatic ecosystems, includes the area below the ordinary high water mark (OHWM) of Icicle Creek, from 230 feet upstream of the intake construction area at river mile (RM) 4.5, to the ecology compliance monitoring location at RM 2.3, downstream of the LNFH (**Map A-10** in **Appendix A**).

The Analysis Area for terrestrial wildlife species and special status terrestrial wildlife species includes a 0.25-mile buffer around the Project Area to evaluate noise and other potential disturbance effects during construction (**Map A-11** in **Appendix A**). Perceptible effects from construction are not anticipated to extend beyond 0.25 miles from the Project Area. This is because vegetation communities in the Analysis Area are departed from natural conditions and fragmented by development, and most of the Analysis Area provides lower-quality wildlife habitat and supports limited wildlife diversity and populations. Existing urban development and human-related disturbances limit wildlife use to those species adapted to disturbance.

3.2 Vegetation, Including Special Status Plant Species

3.2.1 Vegetation Types

Vegetation types in the Analysis Area were determined by querying Washington Gap Analysis Project (WA GAP) and NatureServe Ecological Systems Classifications (USGS 2020; NatureServe 2009) in the Analysis Area. These classifications were then refined using recent aerial imagery (Google Earth 2020), ground-truthing during a reconnaissance field visit by an EMPSi biologist on June 25, 2020, and by observing numerous photographs of the Analysis Area provided by Reclamation. The resulting map of vegetation types in the Analysis Area is shown in **Map A-9** in **Appendix A**. Acres and a brief description of each vegetation type in the Analysis Area are included in **Table 1**.

Vegetation at the intake construction area consists of Mixed Conifer Forests on the steeply-sloping hillsides above Icicle Creek. The Icicle Creek riparian zone is characterized primarily by ponderosa pine (*Pinus ponderosa*) and upland shrub species, though few and scattered willow (*Salix* spp.) and alder (*Alnus* spp.) shrubs are present at the immediate edge of Icicle Creek (see **Section 3.3.2**, Aquatic Habitat). In general, the riparian zone at this location lacks diversity in species composition and structure.

Table 1
Vegetation

Vegetation Type	Description	Acres[1]
Disturbed Ponderosa Pine Woodland and Savanna	Disturbed ponderosa pine (*Pinus ponderosa*) woodland and savanna is characterized by early seral or young conifers as dominants, limited complex overstory and understory structure, and patches of invasive species. Ponderosa pine is the predominant conifer; Douglas-fir (*Pseudotsuga menziesii*) may be present in the tree canopy but is usually absent. The understory can be shrubby, and may contain limited big sagebrush (*Artemisia tridentata*), greenleaf manzanita (*Arctostaphylos patula*), bearberry (*Arctostaphylos uva-ursi*), curl-leaf mountain-mahogany (*Cercocarpus ledifolius*), mallow-leaf ninebark (*Physocarpus malvaceus*), antelope bitterbrush (*Purshia tridentata*), snowberry (*Symphoricarpos albus*), choke cherry (*Prunus virginiana*), saskatoon (*Amelanchier alnifolia*), and rose species (*Rosa* spp.). Open stands support grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*), needle-and-thread grass (*Hesperostipa* spp.), needlegrass species (*Achnatherum* spp.), and Idaho fescue (*Festuca idahoensis*). The more mesic portions of this system may include pine reedgrass (*Calamagrostis rubescens*) or Geyer's sedge (*Carex geyeri*).	4.5
Developed and Landscaped	Includes vegetation of developed lands, including urban, suburban, and rural cities and villages, typically lawns, parks, horticultural gardens, and urban ponds. Impervious surfaces account for 20 to 80 percent of the total cover.	3.8
Mixed Conifer Forest	This system is characterized as dry, mixed forests dominated by Douglas-fir and/or ponderosa pine, and other typically seral species including lodgepole pine (*Pinus contorta*), western white pine (*Pinus monticola*), and western larch (*Larix occidentalis*). Understories are often dominated by graminoids, such as bluebunch wheatgrass, pine reedgrass, Geyer' sedge, and short sedge (*Carex rossii*). There may be a variety of shrubs, such as mountain maple (*Acer glabrum*), ground juniper (*Juniperus communis*), mallow-leaf ninebark, snowberry, white meadowsweet (*Spiraea betulifolia*), or thinleaf huckleberry (*Vaccinium membranaceum*) on mesic sites.	2.1
Open Water	Areas of non-vegetated, open water.	1.7
Total		**12.1**

Sources: Google Earth (2020), USGS (2020), NatureServe (2009), and ground reconnaissance
Notes:
[1] rounded to the nearest tenth of an acre

Other vegetation types in the vicinity but outside the Analysis Area that would not be subject to direct disturbance include Sparsely Vegetated Woodland and Shrubland, Montane Deciduous Foothill and Shrubland, Bedrock, Cliffs and Talus Slopes, Freshwater Wetland, Riparian Woodland and Shrubland, and Open Water (USGS 2020, NatureServe 2009). These vegetation types, which are in the Analysis Area for terrestrial wildlife and special status terrestrial wildlife species (see **Section 3.4**, Terrestrial Wildlife, Including Special Status Terrestrial Wildlife Species) are summarized below.

Sparsely Vegetated Woodland and Shrubland is characterized by low (less than 30 percent) tree canopy and shrub cover. Shallow rock formations and topography limit establishment of mature and dense vegetation. This system includes both woodlands and shrublands dominated by curl-leaf mountain mahogany. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush, with species of manzanita, currant (*Ribes* spp.), or snowberry (*Symphoricarpos* spp.) are often present. Undergrowth is often very sparse and dominated by bunchgrasses, usually bluebunch wheatgrass and Idaho fescue.

Montane Deciduous Foothill and Shrubland is characterized by dominant shrubs such as mountain maple, western serviceberry (*Amelanchier alnifolia*), oceanspray (*Holodiscus discolor*), mallow-leaf ninebark, cherry (*Prunus* spp.), smooth sumac (*Rhus glabra*), roses, and snowberry. Fescue (*Festuca* spp.), pine reedgrass, Geyer's sedge, prairie junegrass (*Koeleria macrantha*), bluebunch wheatgrass, and curly bluegrass (*Poa secunda*) are the most dominant grasses. Prairie-smoke (*Geum triflorum*), graceful cinquefoil (*Potentilla gracilis*), ternate desert-parsley (*Lomatium triternatum*), arrowleaf balsamroot (*Balsamorhiza sagittata*), and species of buckwheat (*Eriogonum* spp.) are important forbs.

Bedrock, Cliffs, and Talus Slopes are characterized by sparsely vegetated landscapes (less than 10 percent plant cover) of steep cliff faces, narrow canyons, and larger outcrops of various igneous, sedimentary, and metamorphic bedrock types. Unstable scree and talus typically occur below cliff faces. Features in the rock surface and less steep or more stable slopes may be occupied by small patches of dense vegetation, typically scattered trees or shrubs. Characteristic trees include Alaska cedar (*Callitropsis nootkatensis*), species of hemlocks (*Tsuga* spp.), western red-cedar (*Thuja plicata*), Douglas-fir, and species of firs (*Abies* spp.). Scattered shrubs that may be present include vine maple (*Acer circinatum*), green alder (*Alnus viridis*), and species of currants. Mosses or lichens may be very dense, well-developed, and display cover well over 10 percent.

Freshwater Wetland vegetation is characterized by a dense herbaceous layer typically with low diversity. Dominant species are sedges (*Carex* spp.), common spikerush (*Eleocharis palustris*), mountain rush (*Juncus arcticus* ssp. *littoralis*), bulrushes (*Schoenoplectus* spp.), and cattails (*Typha* spp.).

Riparian Woodland and Shrubland consists of deciduous, coniferous, and mixed conifer-deciduous forests that occur on streambanks and river floodplains of the lower montane foothill zones. Balsam poplar (*Populus balsamifera*) is a key indicator species along with quaking aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*), spring birch (*Betula occidentalis*), black spruce (*Picea mariana*), and white spruce (*Picea glauca*). Shrub understory can include red-osier dogwood (*Cornus sericea*), mountain maple, speckled alder (*Alnus incana*), paper birch, devil's club (*Oplopanax horridus*), and snowberry. Common ferns and forbs include subarctic ladyfern (*Athyrium filix-femina*), northern oak fern (*Gymnocarpium dryopteris*), and arrow-leaf groundswell (*Senecio triangularis*).

Land use activities, such as logging, agriculture, and residential development have substantially altered the historical vegetation within the Analysis Area and vicinity, resulting in fragmented native vegetation communities with nonnative vegetation components. The Trout Unlimited Icicle Creek Boulder Field Fish Habitat Improvement Project, located at Icicle Creek RM 5.6, will also create some vegetation disturbance. Climate change may also affect vegetation types in the Analysis Area. While models have shown variability in the predicted changes to dry coniferous forests (such as Disturbed Ponderosa Pine Woodland and Savanna, and Mixed Conifer Forest), these vegetation types are potentially vulnerable to the expected reduced winter snowpack accumulation and duration, as well as the associated earlier onset of summer drought. Extended droughts could increase susceptibility to insects and disease and may increase the risk of large wildfires (Peterson et al. 2014).

3.2.2 Invasive, Nonnative, and Noxious Weeds

Invasive plants are nonnative species that have been introduced into an environment that they did not evolve in. They are capable of establishing free-living populations in areas beyond their natural range of dispersal. These plants are characteristically adaptable and aggressive and lack natural enemies to limit their reproduction and spread. Their vigor, rapid growth, and high reproductive capacity allow them to outcompete native plants for key resources, resulting in their dominance of human-influenced and native ecosystems. Once established, invasive plants can cause significant harm to environmental and economic values.

Noxious weeds, a subset of invasive plants, are designated and regulated by state and federal laws because they are known to be detrimental to agriculture, commerce, natural resources, and public health. The RCW section 17.10.010 defines noxious weeds as plants that, when established, are "highly destructive, competitive, or difficult to control by cultural or chemical practices."

Noxious weed laws seek to protect the economy and the environment at federal, state, and county levels through the required management actions of prevention, eradication, or control of plants that are assessed as detrimental (Skinner et al. 2000). These laws list the species that are mandated for control, often using a structure of importance to determine priorities for control. Washington State updates its Noxious Weed List (WAC 16-750) annually through departmental rulemaking. It uses a three-tiered classification for management, based on the relative distribution, abundance, and potential impacts of the noxious weed species. Under RCW 17.10, each county weed board has the authority to develop and enforce a noxious weed list that reflects the concerns at the local level. The Chelan County noxious weed list represents the concerns and priorities at the local level; the list includes 108 noxious weeds and can be found at https://www.co.chelan.wa.us/noxious-weed/pages/weed-list.

Seven noxious weeds have been identified in the Analysis Area: diffuse knapweed (*Centaurea diffusa*), St. Johnswort (*Hypericum perforatum*), Dalmatian toadflax (*Linaria dalmatica* spp. *dalmatica*), Canada thistle (*Cirsium arvense*), kochia (*Kochia scoparia*), reed canarygrass (*Phalaris arundinacea*), and sulfur

cinquefoil (*Potentilla recta*) (USFWS 2001, USFWS 2003). The USFWS has noted that diffuse knapweed and Dalmatian toadflax are especially prolific in the area[7].

Ten nonnative plant species (not defined by the state of Washington as noxious weeds) have also been identified in the Analysis Area: Norway maple (*Acer platanoides*), prickly lettuce (*Lactuca serriola*), honeysuckle (*Lonicera* spp.), sweet clover (*Melilotus* spp.), plantain (*Plantago* spp.), bulbous bluegrass (*Poa bulbosa*), bittersweet (*Solanum dulcamara*), western salsify (*Tragopogon dubius*), clover (*Trifolium* spp.), and common mullein (*Verbascum thapsus*) (USFWS 2001).

3.2.3 Special Status Plant Species

This section describes special status plant species that have the potential to inhabit the Analysis Area.

In accordance with Section 7 of the ESA of 1973, as amended (16 USC 1531–1544), the Analysis Area was evaluated for the potential occurrences of ESA-listed threatened and endangered species. The USFWS Information for Planning and Consultation database identifies 2 endangered, and 1 candidate species in the Analysis Area (USFWS 2020). Federally endangered or threatened species are those that the Secretary of the Interior has officially listed under the ESA and for which a final rule has been published in the *Federal Register*. Candidate species are those that the USFWS has designated as candidates for listing as endangered or threatened and are included on a list published in the *Federal Register*. Candidate status indicates existing information warrants listing of the species but that other species have higher priority for listing. The status and preferred habitats of federally listed and proposed species protected under the ESA in the Analysis Area, as identified by the USFWS, are presented in **Table 2**.

The Washington Natural Heritage Program (WNHP) database maintains a list of endangered, threatened, sensitive, and extirpated plant species for the state. Although WNHP is not a regulatory agency, the program's list and rankings help inform conservation decisions relating to rare plants on federal, state, private, and Tribal lands. WNHP-listed species that could be found in the Analysis Area are shown in **Table 2**.

Table 2 summarizes the two ESA-listed plant species and one candidate species identified by the USFWS as potentially being found the Analysis Area: showy stickseed, Wenatchee Mountains checkermallow, and whitebark pine (USFWS 2020). None of these species have the potential to be found in the Analysis Area because suitable habitat is not present. Wenatchee Mountains checkermallow has final designated critical habitat in Chelan County, although none is in the Analysis Area (Ecology 2019). Similarly, the vegetation types in the Analysis Area typically do not provide suitable habitat for most of the other special status plant species listed in **Table 2**.

[7] Cappellini, M. (Environmental Compliance Biologist, USFWS), personal communication via email to E. Heether (Environmental Protection Specialist, Reclamation) on June 15, 2020.

Table 2
Special Status Plant Species and Potential to Occur in the Analysis Area.

Common Name *Scientific Name*	Status[1]	Preferred Habitat	Vegetation Types[2]	Potential for Occurrence
SPECIAL STATUS PLANTS				
Showy stickseed *Hackelia venusta*	FE, SE	Grows in openings of ponderosa pine and Douglas-fir (*Pseudotsuga menziesii*) forests on loose, well-drained, granitic rocky or sandy soils; it is a narrow endemic found on less than 1 acre of unstable talus slopes on the lower slopes of Turnwater Canyon, Chelan County.	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest; Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	No talus slope habitat in Analysis Area. The Proposed Action would have no effect on showy stickseed.
Wenatchee Mountains checkermallow *Sidalcea oregana* var. *calva*	FE, SE	Moist meadows with surface water or saturated upper soils, into early summer. Sites generally are dominated by perennial herbs and rhizomatous, perennial grasses; deciduous and coniferous trees and shrubs; ponderosa pine, Douglas-fir, and quaking aspen (*Populus tremuloides*) may also be present. May be found in perennial or intermittent streams, near seeps, springs, or small drainages.	Freshwater Wetlands	No suitable wetland habitat in Analysis Area. The Proposed Action would have no effect on Wenatchee Mountains checkermallow or its designated critical habitat.
Whitebark pine *Pinus albicaulis*	FC	Alpine and subalpine mixed conifer forests	Alpine and subalpine mixed conifer forests	No habitat present and outside of known elevation range
Tall agoseris *Agoseris elata*	Sens	Meadows, prairies, open woods, and exposed rocky ridges, from 500 to 7,800 feet. Range: Washington, Oregon, California.	Ponderosa Pine Woodland and Savanna	Yes
Palouse milkvetch *Astragalus arrectus*	ST	Grassy hillsides, sagebrush flats, river bluffs, and grassy or shrub-dominated openings of ponderosa pine and Douglas-fir, from 1,000 to 4,000 feet. Range: Washington, Idaho, and Oregon Palouse regions.	Ponderosa Pine Woodland and Savanna	Low; limited suitable habitat in Analysis Area. Analysis Area is mostly comprised of developed and disturbed habitats.
Common bluecup *Githopsis specularioides*	Sens	Dry open places at lower elevations in or next to forest, from 200 to 2,500 feet. Range: southeastern British Columbia south to California.	Dry-Mesic Montane Mixed Conifer Forest; Ponderosa Pine Woodland and Savanna	Low to moderate; limited undisturbed suitable habitat in the Analysis Area.

Common Name *Scientific Name*	Status[1]	Preferred Habitat	Vegetation Types[2]	Potential for Occurrence
Leavenworth desert-parsley *Lomatium roneorum*	SE	Rocky areas in xeric open steep slopes to gentle slopes under partial conifer canopy. Elevation unknown. Range: 40-100 square miles on the east slopes of the Cascade Mountains, Washington.	Ponderosa Pine Woodland and Savanna	Low; limited suitable habitat in Analysis Area. Analysis Area is mostly comprised of developed and disturbed habitats.
One-cone clubmoss *Lycopodium lagopus*	Sens	Grassy fields and edges of woods. Elevation unknown. Range: widely distributed in the northern U.S. and Canada.	Ponderosa Pine Woodland and Savanna	Low; limited suitable habitat in Analysis Area. Analysis Area is mostly comprised of developed and disturbed habitats.
Sierra cliffbrake *Pellaea brachyptera*	Sens	Arid sites with little vegetation and in sparse coniferous stands, such as with ponderosa pine and Douglas-fir, from 1,100 to 3,500 feet. Range: northern California to southwestern Oregon; disjunct in Washington.	Ponderosa Pine Woodland and Savanna	Low; limited suitable habitat in Analysis Area. Analysis Area is mostly comprised of developed and disturbed habitats.
Composite dropseed *Sporobolus compositus* var. *compositus*	Sens	Tallgrass and mixed-grass prairies, savanna communities, and disturbed areas. Range: Washington, British Columbia, Idaho, eastern Canada and several northeastern U.S. states.	Developed	Low to moderate; disturbed areas may provide habitat in Analysis Area.
Thompson's clover *Trifolium thompsonii*	ST	Lower mountain slopes and ridges in grasslands dominated by bunchgrasses and herbs and in adjacent open ponderosa pine and Douglas-fir, from 1,140 to 3,760 feet. Range: Chelan and Douglas Counties, Washington.	Ponderosa Pine Woodland and Savanna	Low; limited suitable habitat in Analysis Area. Analysis Area is mostly comprised of developed and disturbed habitats.

Sources: USFWS 2020; WNHP 2019; Camp and Gamon 2011; NatureServe 2020

Notes:

[1] FE = federally endangered; FT- federally threatened; FC = federal candidate for listing; PFT= federal proposed as threatened; CH = final designated critical habitat; SE = WNHP endangered; ST = WNHP/state threatened; SC= Washington state candidate; Sens = WNHP/state sensitive

[2] Vegetation types that are associated with preferred species habitat found in the region. See **Section 3.2.1** for descriptions of vegetation types in the Analysis Area; adapted from NatureServe Ecological Systems Classifications.

3.3 Fisheries, including Special Status Species and Aquatic Ecosystems

3.3.1 Physical Description of Aquatic Environment

Icicle Creek is a snowmelt-fed, 31.8-mile-long, fourth order tributary of the Wenatchee River (USFWS 2011). Icicle Creek originates at Josephine Lake at an altitude of 4,681 feet, east of the Cascade Crest, in the Alpine Lakes Wilderness Area. The Icicle Creek subbasin drains 136,759 acres (211 square miles) containing 14 glaciers and 102 lakes. The Forest Service manages 87 percent of the Icicle Creek catchment, 74 percent of which is in the Alpine Lakes Wilderness Area; the Forest Service manages it as a Tier 1 key watershed under the Northwest Forest Plan; therefore, public lands in the Icicle Creek subbasin are managed for at-risk salmonids and other fish species (USFWS 2011).

The measured flow in Icicle Creek ranges from a minimum of 44 cfs to a maximum of 14,100 cfs, according to readings taken from the U.S. Geological Survey (USGS) gauging station (No. 12458000) at RM 5.8, located above all major water diversions (Reclamation and USFWS 2018, pp. 43–49). The discharge of Icicle Creek is altered by water diversions, which can reduce the flow in the lower reaches to very low levels during summer and early fall. The City of Leavenworth and the Icicle-Peshastin Irrigation District (IPID) divert water above the Snow Lakes trailhead (RM 5.7), and LNFH and COIC divert water below the trailhead (RM 4.5). Irrigation diversions can remove 48 percent and 79 percent of the mean August and September flows, respectively. At times low flows have impeded passage of spawning ESA-listed fish species in many areas of Icicle Creek below the LNFH surface water intake (RM 4.5) (USFWS 2011). Downstream of the surface water intake, Icicle Creek splits to form the Hatchery Channel and the Historical Channel of Icicle Creek. The Hatchery and Historical Channels split at Structure 2 (RM 3.8) and rejoin one another at RM 2.9. The Hatchery Channel is a human-made, straight channelized section of this creek segment. This area is within the Analysis Area and does not provide suitable reproductive habitat for ESA-listed fish species.

The Historical Channel was previously used for Hatchery operations and is considered part of the Analysis Area. Under current operating practices, the LNFH diverts flow via Structure 2 from Icicle Creek into the Hatchery Channel at RM 3.8 to promote artificial recharge of the shallow aquifer, passing high flows during spring snowmelt, and additional attraction flow for the LNFH adult return ladder. Flow is prioritized through the Historical Channel throughout the year. However, flow may be reduced to operate fish monitoring equipment. Icicle Creek naturally flows through the Historical Channel without backwatering into the Hatchery Channel, at flows less than 300 cfs. Structure 5, at the downstream end of the Historical Channel, consists of a bridge with a foundation to support racks, dam boards and/or fish traps.

For more information on the physical condition of the aquatic environment please see the SWISP Project EIS **Water Resources Report**.

3.3.2 Aquatic Habitat

In the Analysis Area, Icicle Creek is characterized by steep slopes on both banks. The Historical Channel is classified as Riparian Woodland and Shrubland and Open Water (see **Section 3.2.1**,

Vegetation Types), however, vegetation on the banks of both the Historical and Hatchery Channels of Icicle Creek is primarily upland vegetation and shrub habitat (USFWS 2016). Thus, aquatic habitat within the channels essentially transitions to upland habitats with no intermediate riparian zone or floodplain. This, combined with high water fluctuations throughout the year (less than 100 cfs to over 14,000 cfs as described above), limits establishment of mature riparian vegetation in the Analysis Area. Although freshwater wetlands have been documented in the vicinity and are associated with the Historical Channel (see **Section 3.2.1**), there are no wetlands associated with Icicle Creek or the Hatchery Channel in the Analysis Area (USFWS 2016).

There are approximately 4.0 miles of instream (aquatic) habitat in the Analysis Area. Instream habitat includes the combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources (WDFW 2008).

In its entirety, Icicle Creek provides important, high quality, and relatively undisturbed instream habitat for a variety of anadromous and resident fish. However, aquatic habitat quality in lower Icicle Creek (which includes the Analysis Area) is considered impaired due to previous land uses, such as forestry practices, private land development in the historical floodplain and riparian zone, roads, and agriculture. The installation of dams and diversions have created passage barriers, decreased flows, altered in-stream morphology and floodplain function, degraded water quality, and caused overall in-stream habitat degradation (Chelan County and Ecology 2019; NMFS 2017). Current streamflow in Icicle Creek during low flow periods is too low for reliable fish passage at the low-head diversion dam or fish ladder/sediment sluice and reduces habitat availability (Reclamation 2020).

The construction of LNFH and continued development in the Icicle Creek subbasin has exacerbated aquatic habitat and fish passage issues (Chelan County and Ecology 2019; NMFS 2017). Two instream structures (Structure 2, at RM 3.8, and Structure 5, at RM 2.9) are used during hatchery operations and broodstock collection. Operation of these structures periodically limit fish passage on Icicle Creek. Currently, operation of Structures 2 and 5 may limit fish passage during spring and early summer when broodstock collection for LNFH is occurring (beginning as early as June 3). Structure 5 is closed once a 50-fish "trigger" has been hit or low Chinook returns warrant a closure. This also prohibits non-Hatchery fish from moving upstream of LNFH during this time. Until such time, Structure 5 remains open to fish passage (NMFS 2017). Structure 2 is reopened by June 24, and Structure 5 is reopened by July 7, restoring passage opportunities between RM 2.9 and 3.8 (USFWS 2011).

Operation of Structure 2 can also limit passage by decreasing flows in this reach when the gates are closed to divert water into the Hatchery Channel (Chelan County and Ecology 2019). The Icicle Creek Boulder Field at RM 5.6, upstream of the Analysis Area, also serves as a natural barrier under typical flow conditions, and thus, limits fish passage above the Analysis Area reach. However, low numbers of anadromous steelhead and Chinook Salmon can pass through the Boulder Field (Chelan County and Ecology 2019).

At the existing intake facilities, the low-head diversion dam diverts water from Icicle Creek to the intake channel, through an unscreened diversion. The diversion sediment sluice has been modified

to function as a fish ladder, however, fish passage is impeded because current flows at the fish ladder/sediment sluice do not meet NMFS guidelines for fish attraction. Fish passage is impeded during low flows in particular.

There is also potential for entrainment of anadromous and resident fish at the unscreened existing intake facilities. For example, from 2009 and 2013, the number of Steelhead (*Oncorhynchus mykiss*) removed from the existing intake facilities ranged from 30 to 63 individuals per year (excluding winter and spring months because of ice and debris buildup; Hall et al. 2014).

Icicle Creek within the Analysis Area has very steep banks, which limits riparian cover and does not provide much access to slow moving pools with overhanging banks, for fish to feed or rest. Stream velocities and substrate limit production of the macroinvertebrate community and does not offer significant foraging opportunity for fish species. Suitable spawning gravel/cobble patches and substrate is not common within the Analysis Area, and much of the substrate is embedded with fine sediment or armored making it unsuitable spawning habitat for ESA listed species (USFWS 2005). For more information regarding Icicle Creek water depth, velocity and water quality please see the SWISP Project EIS **Water Resources Report**.

Climate change effects (e.g., elevated temperatures and changes in precipitation patterns) are expected to shift the hydrograph so peak flows occur earlier in the year, with low flow periods spanning more of the summer months. These changes in streamflow are expected to impact aquatic habitat conditions and fish passage (Chelan County and Ecology 2019). Also, water temperature may increase as water input from snowmelt decreases, and input from rain increases, due to climate change.

3.3.3 Hatchery Fish Production History

Over the years, the LNFH production program has included a variety of species, including Spring and Summer Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*Oncorhynchus kisutch*), Steelhead, Sockeye Salmon (*Oncorhynchus nerka*), and various resident salmonids. Since 1974, the Spring Chinook Salmon has been the priority species, and the success of the program has allowed a commercial fishery, including sport and Tribal uses, in most years.

The LNFH currently rears only the "Carson lineage" stock of the Spring Chinook Salmon. This stock was derived from fish captured at Bonneville Dam, and genetic analysis indicates that these fish represent some unknown admixture of fish from the mid- and upper Columbia and Snake River populations (USFWS 2011). Enough adults return to LNFH annually to meet production targets, and the Hatchery typically does not import eggs or fry for release into Icicle Creek. However, disease in the broodstock in 2019 necessitated such action.

Currently, LNFH targets a release of 1.2 million Spring Chinook Salmon smolts into Icicle Creek (at approximately RM 2.7) during mid-April. Production goals at LNFH are set by the Columbia River Fish Management Plan under *U.S. vs. Oregon*. Initially this plan set a production goal for LNFH of 2.2 million Spring Chinook Salmon smolts annually, but this was renegotiated in 1991 to 1.625 million (release years 1993 to 2008) and in 2008 to 1.2 million (release year 2009; this is the current production goal of LNFH).

The migration corridor for LNFH-produced smolts and returning adult fish is approximately 489 RMs (2.8 RM of Icicle Creek, 26 RM of the Wenatchee River, and 460 RM of the Columbia River) and the Pacific Ocean. Adult salmon returning to the LNFH, in excess of brood stock needs, support a Tribal fishery, at and just downstream of the spillway pool at RM 2.8, and a sport fishery, from approximately RM 0 to 2.7, in Icicle Creek. Also, excess adults entering the Hatchery are given to Native American Tribes for food and Tribal ceremonies (USFWS 2011). For more information regarding the Tribal fishery, please see Section 3.10, Tribal Interests, in the EIS. For more information regarding the recreational fishery, please see the SWISP Project EIS **Recreation Resource Report**.

3.3.4 Fish and Aquatic Species

Salmonid species in the Analysis Area are Hatchery-reared Spring Chinook Salmon, Hatchery-reared Coho Salmon, Steelhead, Sockeye Salmon, Bull Trout (*Salvelinus confluentus*), non-native Brook Trout (*Salvelinus fontinalis*), Westslope Cutthroat Trout (*O. clarki lewisi*), Redband Trout (*O. mykiss gairdneri*), and Mountain Whitefish (*Prosopium williamsoni*). Native non-salmonids are also present in Icicle Creek, such as dace (*Rhinichthys* spp.), lamprey (*Lampetra* spp.), sculpin (*Cottus* spp.), and suckers (*Catostomus* spp.) (NMFS 2017). Those species that are listed under the ESA are described in more detail in **Section 3.3.5**, Special Status Species.

3.3.5 Special Status Species

This section describes special status fish species that have the potential to inhabit the Analysis Area.

In accordance with Section 7 of the ESA of 1973, as amended (16 USC 1531–1544), the Analysis Area was evaluated for the potential occurrences of ESA-listed threatened and endangered species. The USFWS Information for Planning and Consultation database identifies 2 threatened or endangered species in the Analysis Area (USFWS 2020). Federally endangered or threatened species are those that the Secretary of the Interior has officially listed under the ESA and for which a final rule has been published in the *Federal Register*. The status and preferred habitats of federally listed and proposed species protected under the ESA in the Analysis Area, as identified by the USFWS, are presented in **Table 3**. Species with potential to occur are discussed further below.

The WDFW maintains a list of state threatened, endangered, candidate, or sensitive species; most state-listed species are also ESA-listed. State listed species with potential to occur in the Project Area are presented in **Table 3.**

ESA-listed fish that may inhabit the Analysis Area are Bull Trout, Upper Columbia River Chinook Salmon, and Upper Columbia River Steelhead. Additionally, designated foraging, migrating, and overwintering critical habitat for Bull Trout and designated critical habitat for Upper Columbia River Steelhead occur in the Analysis Area (USFWS 2010; NMFS 2016). These species are briefly described below. More detailed information on the status and trends of these listed resources, and their biology and ecology, can be found in the species' recovery plans (UCSRB 2007; USFWS 2015) and 5-year reviews published in the *Federal Register*.

Table 3
Special Status Fish Species and Potential to Occur in the Analysis Area.

Common Name *Scientific Name*	Status[1]	Preferred Habitat	Vegetation Types[2]	Potential for Occurrence
SPECIAL STATUS FISH				
Bull Trout (*Salvelinus confluentus*)	FT, WC, CH	Bull trout require colder water temperature than most salmonids below (59 degrees Fahrenheit); clean stream substrates for spawning and rearing; complex habitats, including streams with riffles and deep pools, side channels, undercut banks, and lots of large instream wood/logs for shelter and foraging; and river, lake and ocean habitats that connect to headwater streams for annual spawning and feeding migrations.	Open Water	Yes. The Proposed Action may affect, and is likely to adversely affect Bull Trout and its critical habitat.
Hatchery Chinook Salmon (*Oncorhynchus tshawytscha*; Upper Columbia River spring-run)	N/A	Live in colder upper reaches of the Pacific Ocean and breed in the freshwater rivers and streams of the Pacific Northwest. Adults lay eggs in fast-moving freshwater streams and rivers. Juvenile salmon spend some time in the freshwater streams before moving to estuaries with a mix of freshwater and saltwater. As the salmon reach adulthood, they move out into the open ocean.	Open Water	Spring Chinook salmon broodstock used in the program are not included in an ESA-listed ESU. Little natural production from the native spring Chinook population is thought to occur in Icicle Creek (UCSRB 2007; NMFS 2017).
Steelhead (*O. mykiss*; Upper Columbia River steelhead)	FT, WC, CH	Occupy freshwater streams or lakes during spawning and then migrate back through brackish water to the open ocean to live during their adult non-spawning phase of their life cycle. Steelhead spend most of the year in estuaries or open ocean and only return to fresh water to spawn.	Open Water	Yes. The Proposed Action and its anticipated effects would be certified under the NMFS' 2017 FPRP III programmatic Biological Opinion.

Common Name *Scientific Name*	Status[1]	Preferred Habitat	Vegetation Types[2]	Potential for Occurrence
Pacific Lamprey *Entosphenus tridentatus*	State Priority Species, USFWS SSC	Riffle and side channel habitats are important for spawning and for ammocoete rearing. Because lamprey ammocoetes colonize areas and are relatively immobile in the stream substrates, good water quality is essential for rearing.	Open Water	Yes[3]
Mountain Sucker *Catostomus platyrhynchus*	State Priority Species, WC	Live in a variety of habitats, but favor clear water streams with a moderate gradient, with widths of 3 – 15 m and depths of less than 2 m, and rocky or gravelly bottoms.	Open Water	Yes
Leopard Dace *Rhinichthys falcatus*	State Priority Species, WC	Inhabits flowing pools and gravel runs of creeks and small to medium rivers. Also occurs in rocky margins of lakes	Open Water	Yes
Umatilla Dace *R. umatilla*	State Priority Species, WC	Prefer rivers with a cobble or stone bottom and relatively warm, productive waters. Yearling dace are commonly found in shallow cobble habitat near current.	Open Water	Yes
Westslope Cutthroat Trout *Oncorhynchus clarki lewisi*	USFWS SSC	Common in headwaters, lakes and streams, tending to thrive in streams with more pool habitat and cover, than streams with very few pools and little or no cover.	Open Water	Yes
SPECIAL STATUS AQUATIC INVERTEBRATES				
California floater *Anodonta californiensis*	WC	Clean, well-oxygenated water with a healthy population of planktonic organisms, host fish (larval stage), and gravel beds (newly metamorphosed clams). Adult clams require lakes or slow-moving rivers with soft sand or mud substrate.	Open Water	Yes

Sources: USFWS 2020; NatureServe 2020; WDFW 2020a; NMFS 2005

Notes:
[1] FE = federally endangered; FT- federally threatened; FC = federal candidate for listing; PFT= federal proposed as threatened; CH = final designated critical habitat; WE = WDFW state endangered; WT = WDFW state threatened; WC = WDFW state candidate; SE = WNHP endangered; ST = WNHP/state threatened; SC= Washington state candidate; Sens = WNHP/state sensitive
[2] Vegetation types that are associated with preferred species habitat found in the region. See **Section 3.2.1** for descriptions of vegetation types in the Analysis Area; adapted from NatureServe Ecological Systems Classifications.
[3] It is uncertain if Pacific Lamprey occur in the Analysis Area. There have been limited positive e-DNA tests and PIT tag detections, but the sources are unclear.

Bull Trout

The USFWS listed all U.S. populations of Bull Trout as a threatened species under the ESA in 1999 (64 *Federal Register* 58910, November 1, 1999). The 1999 listing applied to one distinct population segment (DPS) of Bull Trout within the coterminous United States by including Bull Trout in the Coastal-Puget Sound populations and Saint Mary-Belly River populations, with previous listings of three separate DPSs in the Columbia River, Klamath River, and Jarbidge River basins (63 *Federal Register* 31647, June 10, 1998; 64 *Federal Register* 17110, April 8, 1999; USFWS 2015).

The Bull Trout's current range within the coterminous United States includes the Columbia River and Snake River basins in Washington, Oregon, Montana, Idaho, and Nevada; Puget Sound and Olympic Peninsula watersheds in Washington; the Saint Mary basin in Montana; and the Klamath River basin of south-central Oregon. At the time of their coterminous United States listing in 1999, Bull Trout were estimated to have been extirpated from approximately 60 percent of their historical range (USFWS 2015).

Bull Trout are native to the Wenatchee River watershed (including Icicle Creek and other tributaries). Icicle Creek and other headwater areas of the basin offer some of the best habitat in the Mid-Columbia region. The Wenatchee River watershed has been designated as one of 24 Bull Trout core areas in the Mid-Columbia Recovery Unit. This is one of four core areas that contain the healthiest and most stable Bull Trout populations (USFWS 2015).

Bull Trout have specific habitat requirements, preferring river environments with cold water temperatures (often less than 54 degrees F); complex stream habitat with deep pools, overhanging banks and large woody debris; and connectivity between spawning and rearing areas and downstream foraging, migration, and overwintering habitats (USFWS 2015). Populations are isolated to headwater areas by downstream conditions that are too warm for incubation and early rearing (USFWS 2015).

Most of the Icicle Creek population of Bull Trout are resident, they spawn and rear in tributaries upstream of the Analysis Area and mature and forage throughout Icicle Creek, including in the Analysis Area. They could be present in the Analysis Area year-round. A small percentage of the population (15 to 20 percent) may migrate long distances to other subbasins of the Columbia River for foraging or overwintering, returning to spawning areas annually every few years. Bull Trout from other core areas also migrate to Icicle Creek for foraging and refuge habitat in and upstream of the Analysis Area. Most populations in the Wenatchee River Watershed spawn from mid-September to mid-October (USFWS 2015). However, there is no spawning or rearing habitat for Bull Trout in the Analysis Area, nor are there records of Bull Trout redds[8] in the Analysis Area (unpublished data on file with the USFWS Mid-Columbia Fish and Wildlife Conservation Office).

The main threats to Bull Trout are habitat destruction, modification, fragmentation, or curtailment (e.g., dewatering, sedimentation, thermal modification, water quality degradation) due to land and water management activities; interaction with nonnative species; and isolation and habitat fragmentation due to fish passage issues and impaired connectivity. Additionally, Bull Trout are

[8] Riverbed hollows made and used by fish for spawning.

vulnerable to the effects of climate change, such as elevated temperatures and changes to precipitation and hydrologic regimes (USFWS 2015). In the Analysis Area, Bull Trout spawning and rearing habitat is limited in late summer and early fall because of low instream flows in some years (**Table 4**, Current Listed Fish Habitat Limitations on Lower Icicle Creek). Entrainment is also an issue; in the 2017 Biological Opinion (NFMS 2017), the NMFS required LNFH to provide entrainment protection (fish screens) and fish passage for anadromous fish, which would also benefit Bull Trout.

Table 4
Current Listed Fish Habitat Limitations on Lower Icicle Creek

River Mile[1]	Affected Species/Life Stage	Months When Target WUA[2] Not Achieved (Average Year)	Months When Target WUA Not Achieved (Low-Flow Year)
0.2–2.4	• Steelhead rearing • Bull Trout spawning	• Late July–October • None	• Mid-June through October • September through October
2.7–3.9 (Historical Channel)	• Steelhead rearing/Bull Trout rearing	• None	• Mid-June through October
3.9–4.5	• Steelhead rearing/Bull Trout rearing	• Early August to late October	• Early to mid-April and mid-June through October
6.0-9.1	• Steelhead rearing/Cutthroat Trout rearing	• September	• No Data

[1]Analysis Area includes RM 2.3–4.5
[2]Weighted Usable Area (WUA): A quantity that can be used to describe the spatial habitat area of a specific fish species for a particular life stage
Source: Chelan County and Ecology 2019

Designated Bull Trout foraging, migrating, and overwintering critical habitat includes all areas of Icicle Creek in the Analysis Area that are accessible to Bull Trout (75 *Federal Register* 63897). The critical habitat designation for Bull Trout applies only to the stream channel, as defined by its OHWM by the USACE at 33 CFR 329.11. The critical habitat proposal does not extend to the floodplain or the adjacent land (USFWS 2010). Designated critical habitat receives protection against destruction or adverse modification. However, protections afforded under the critical habitat designation are expected to extend to any action that may adversely affect the habitat, potentially including activities on lands adjacent to or upstream of designated stream bed and banks (USFWS 2010).

Upper Columbia River Steelhead

Upper Columbia River Steelhead was listed as an Endangered species under the ESA in 1997 (62 *Federal Register* 43937, August 18, 1997); reclassified to Threatened in 2006 (71 *Federal Register* 833, January 5, 2006) and 2009 (74 *Federal Register* 42605, August 24, 2009; updated in 79 *Federal Register*

20802, April 14, 2014). This DPS includes naturally spawned anadromous Steelhead originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Yakima River to the U.S.–Canada border. It also includes Steelhead from six hatchery or artificial propagation programs: the Wenatchee River Program, Wells Hatchery Program (in the Methow and Okanogan Rivers), Winthrop National Fish Hatchery Program, Omak Creek Program, and Ringold Hatchery Program (79 *Federal Register* 20802) (NMFS 2016).

Upper Columbia River Steelhead exhibit complex life histories. Adults return to the Columbia River in the late summer and early fall. A portion of the returning run overwinters in the mainstem reservoirs, passing over the Upper Columbia River dams in April and May of the following year. Spawning occurs in the late spring following entry into the river. Steelhead currently spawn and rear in the Wenatchee River between Tumwater Canyon and Nason Creek, the Chiwawa River, and in Nason, Icicle, Peshastin, Chumstick, and Mission creeks (UCSRB 2007). Most Steelhead spawning in the wild are hatchery fish. Juvenile Steelhead generally spend one to three years rearing in freshwater before migrating to the ocean, and most adults return to the Upper Columbia River after one or two years at sea (UCSRB 2007). Redds for Upper Columbia River Steelhead have been identified in the Analysis Area within the Historical Channel and lower Icicle Creek (see **Map A-10** in **Appendix A**) (unpublished data on file with the USFWS Mid-Columbia Fish and Wildlife Conservation Office).

Upper Columbia River Steelhead critical habitat occurs in the Analysis Area. It is designated in the upper Wenatchee River and lower mainstem areas, as well as the tributaries above and below Tumwater Dam, including Icicle Creek. These waterbodies serve as major migration, spawning, and rearing areas for adults and juveniles (NMFS 2005).

Upper Columbia River Spring-run Chinook Salmon

The Upper Columbia River Spring-run Chinook Salmon Ecologically Significant Unit (ESU) was listed as Endangered in 1999 (64 *Federal Register* 14308, March 24, 1999) and 2005 (70 *Federal Register* 37159, June 28, 2005; updated in 79 *Federal Register* 20802, April 14, 2014). This ESU includes naturally spawned Spring-run Chinook Salmon originating from Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam (excluding the Okanogan River subbasin). It also includes Spring-run Chinook Salmon from six artificial propagation programs: the Twisp River Program, Chewuch River Program, Methow Program, Winthrop National Fish Hatchery Program, Chiwawa River Program, and White River Program (79 *Federal Register* 20802) (NMFS 2016). Spring Chinook salmon broodstock used in the LNFH program are not included in an ESA-listed ESU. Little natural production from the native spring Chinook population is thought to occur in Icicle Creek (NMFS 2017; UCSRB 2007).

Although Spring-run Chinook Salmon critical habitat is designated in the upper and lower mainstem Wenatchee River, including tributaries above Tumwater Dam that serve as major migration, spawning, and rearing areas for adults and juveniles, none occurs in the Analysis Area. This is because with the exception of the area bordered by the mainstem Wenatchee River, such tributaries as Icicle Creek in the lower Wenatchee River were excluded from the critical habitat listing (NMFS 2005). The Analysis Area is designated as EFH for both Chinook and Coho Salmon (NMFS 2017).

Spring-run Chinook Salmon enter the Upper Columbia tributaries from April through July; spawning occurs in the late summer, peaking in mid to late August. Juvenile Spring-run Chinook Salmon spend a year in freshwater before migrating to salt water in the spring of their second year of life, and most return as adults after two or three years in the ocean (UCSRB 2007). Primary spawning areas of Spring-run Chinook Salmon in the Wenatchee subbasin include Nason Creek and the Chiwawa, Little Wenatchee, and White rivers (UCSRB 2007). Spawning also occurs in Icicle Creek, and these spawners are believed to be primarily returns from LNFH. Between 2014 and 2019 spring-run Chinook redds were observed and counted. Redds were observed in the Historical Channel and near the intake construction area (unpublished data on file with the USFWS Mid-Columbia Fish and Wildlife Conservation Office).

Natural spawning of native anadromous fish (including the listed species discussed above) in Icicle Creek has been reduced from historical conditions as a result of habitat degradation, including flow diversions, and overfishing. Historical barriers to upstream passage, including historical LNFH infrastructure, also have limited natural anadromous fish spawning to the lower 2 river miles of Icicle Creek until improvements to fish passage were made in recent years (Chelan County and Ecology 2019). Current streamflow in Icicle Creek during low flow periods (late summer and early fall) is too low for reliable fish passage at the low-head diversion dam or fish ladder/sediment sluice and reduces habitat availability (see **Table 4**, Current Listed Fish Habitat Limitations on Lower Icicle Creek; Reclamation 2020; Chelan County and Ecology 2019).

Habitat degradation and loss is a major threat to the listed fish species described above. Historical land uses in the upper Columbia River (e.g., beaver trapping, mining, livestock grazing, water diversions, agriculture, and timber harvest) have reduced habitat diversity, connectivity, water quantity and quality, and riparian function in many assessment units within the Columbia River basin. Although the Wenatchee River subbasin supports the greatest diversity of populations and overall abundance of salmonids, several habitat conditions currently limit abundance, productivity, spatial structure, and diversity of salmon and steelhead. These are a lack of habitat diversity (e.g., pools and spawning areas, riparian vegetation) and quantity, excessive sediment load, anthropogenic barriers, a lack of channel stability, low flows, and high summer temperatures (NMFS 2016). Specific areas of concern regarding habitat conditions in the Analysis Area are passage conditions and upstream passage barriers in Icicle Creek at LNFH and the Icicle Creek Boulder Field (NMFS 2016).

Other Aquatic Special Status Species

Several Washington State Priority Species are found in the Analysis Area. These are the described ESA-listed salmon and trout species, Pacific Lamprey, Mountain Sucker, Leopard Dace, and Umatilla Dace (WDFW 2008). State priority species are the focus of specific management recommendations intended to protect and enhance populations and relevant habitats.

Pacific Lamprey and Westslope Cutthroat Trout are designated as species of special concern by USFWS (2016). While the USFWS determined a petition to list Pacific Lamprey under the ESA not to be warranted, it acknowledges that Pacific lamprey have declined in the Columbia River basin and has published Best Management Practices to Minimize Adverse Impacts to Pacific Lamprey (USFWS 2010).

The California floater is a Washington State candidate species. These freshwater clams require clean, well-oxygenated water for all life stages, as well as needing a healthy population of planktonic organisms on which to feed. Larval-stage clams need a healthy population of host fish on which to adhere. Newly metamorphosed clams require gravel beds with clean, well-aerated water. Adult clams require lakes or slow-moving rivers with soft sand or mud substrate (WDFW 1995). These clams may be found in instream habitat found in Icicle Creek, but due to high flow fluctuations and lack of slow-moving water throughout the year, presence is unlikely.

3.4 Terrestrial Wildlife, Including Special Status Terrestrial Wildlife Species

Wildlife species commonly seen in Chelan County are mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), yellow-pine chipmunk (*Tamias amoenus*), Douglas's squirrel (*Tamiasciurus douglasii*), raccoon (*Procyon lotor*), common garter snake (*Thamnophis sirtalis*), northern flicker (*Colaptes auratus*), and American robin (*Turdus migratorius*). Other common, but less frequently encountered species are Rocky Mountain elk (*Cervus elaphus nelsoni*), black bear (*Ursus americanus*), cougar (*Puma concolor*), bobcat (*Lynx rufus*), short-tailed weasel (*Mustela erminia*), bald eagle (*Haliaeetus leucocephalus*), and rubber boa (*Charina bottae*) (WDFW 2020b).

Wildlife diversity is generally related to the structure and composition of plant species in vegetative communities. Wetlands and mature forested areas with structurally diverse vegetation communities are likely to support the greatest number of species and populations of wildlife. Wetlands and riparian areas provide habitat for bats (*Myotis* spp.), shrews (*Sorex* spp.), common opossum (*Didelphis marsupialis*), and raccoon. These and similar species depend on water for foraging and breeding habitat. Coniferous and deciduous forest and wetland environments provide habitat for a variety of wildlife species because of the vegetation diversity and availability of forage and nest sites. Large dying trees and snags can provide cavities for migratory and special status birds.

Vegetation types in the terrestrial wildlife Analysis Area are summarized and described in **Section 3.2**. Mixed Conifer Forest (109.3 acres), Montane Deciduous Foothill and Shrubland (84.0 acres), Riparian Woodland and Shrubland (21.1 acres), and Freshwater Wetland (2.7 acres) are vegetation types in the terrestrial wildlife Analysis Area (**Map A-11** in **Appendix A**) that could provide suitable habitat for a range of wildlife species. However, only approximately 2.1 acres of Mixed Conifer Forest are in the Project Area.

Conversely, early seral, sparsely vegetated, and disturbed habitats offer lower quality wildlife habitat and are unable to support the ecological requirements for many terrestrial wildlife species. Developed and Landscaped (265.3 acres), Disturbed Ponderosa Pine Woodland and Savanna (121.0 acres), Bedrock, cliffs, and talus slopes (67.7 acres), and Sparsely Vegetated Woodland and Shrubland (48.5 acres) comprise the remaining areas of the terrestrial wildlife Analysis Area (**Map A-11** in **Appendix A**).

Wildlife more vulnerable to human activities and development, such as larger mammal species like black bear and cougar, would be less likely to be found near roads and parcels with residential development, such as exists in the Analysis Area. Instead, the terrestrial wildlife Analysis Area likely

includes more native and nonnative wildlife species adapted to human activity. This is because of the presence of roads, agricultural fields, residential properties, golf courses, and other developments in the area. Roads also function as a potential barrier to migration of larger mammal species, such as deer and elk.

Overall, terrestrial wildlife habitat in the Analysis Area is of lower quality than the surrounding area and is more affected by human development. Most vegetation in the Analysis Area is comprised of dry, sparsely vegetated, early seral ponderosa pine forest; it represents a small portion of the ponderosa pine ecosystem in the region. Because of this, terrestrial wildlife, especially species sensitive to disturbance, are likely to use the surrounding higher quality habitat for their key ecological needs, such as nesting, roosting, and raising young. Developed portions of the Analysis Area may support wildlife species adapted to human activities and resilient to disturbances.

The MBTA, as amended, protects migratory birds at the federal level, with a list of birds maintained by the USFWS. The entire state of Washington is within the Pacific Flyway. However, the terrestrial wildlife Analysis Area does not contain any designated important bird habitat. Birds that would use trees and shrubs in the Analysis Area would likely be tolerant of human-related disturbances, while bird species less tolerant would use less-disturbed and higher quality habitat such as the nearby Okanogan-Wenatchee National Forest lands. The nearest designated Important Bird Area is the Leahy Junction-Moses Coulee east of Wenatchee, approximately 25 miles from the Analysis Area. The breeding bird season is generally between March 1 to August 31 each year.

The terrestrial wildlife Analysis Area does not contain shrub-steppe systems, quality riparian communities, nor mature, dense canopy forest that could support a high diversity of migratory birds nor most special status birds. For example, white-headed woodpecker (*Picoides albolarvatus*), Lewis's woodpecker (*Melanerpes lewis*), and William's sapsucker (*Sphyrapicus thyroideus*) are USFWS birds of conservation concern that prefer mature conifer forests (USFWS 2008, USFWS 2020).

Similar to above, although the majority of the terrestrial wildlife Analysis Area does not support high quality habitat, migratory birds adapted to disturbance can use forest, shrubland, grassland, and to a lesser extent urban or developed vegetation communities for foraging and breeding. Some disturbance-tolerant birds include American robin (*Turdus migratorius*), hummingbirds, doves, and sparrows. Portions of the Hatchery Channel and Historical Channel are identified by the WDFW as waterfowl concentration priority habitat (eBird 2020a, 2020b, WDFW 2020b).

Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are protected by the Bald and Golden Eagle Protection Act. Bald eagles are found near lakes and rivers throughout the state of Washington. Bald eagle nests have been documented in eight areas of Chelan County, including Fromm's Field near the confluence of Icicle Creek and Wenatchee River. This area was last documented as occupied in 2005 (Kalasz and Buchanan 2016). Although there is suitable bald eagle foraging habitat in the Analysis Area and it has been observed, no occupied bald eagle nests are known in the Analysis Area. The frequency of bald eagle observations at the LNFH is highest during winter and likely represent nonbreeding bald eagles coming south from Canadian provinces (eBird 2020b).

3.4.1 WDFW Priority Habitats

This section provides information on state priority habitats and species established by the WDFW. Of the 20 priority habitats recognized by the WDFW, 11 are in Chelan County (WDFW 2020b). Icicle Creek, in the vicinity of the Analysis Area, has two potential terrestrial priority habitats—biodiversity areas and riparian. However, these priority habitats do not occur in the reach of Icicle Creek in the Analysis Area. There is also a potential for snags and logs as priority habitat features, but most trees in the Analysis Area are younger and may not reach large diameter at breast height sizes to qualify as priority features. Priority snags have a diameter at breast height of greater than 30 centimeters (12 inches) in eastern Washington; they are greater than 2 meters (6.5 feet) high. Priority logs are greater than 30 centimeters (12 inches) in diameter at the largest end and greater than 6 meters (20 feet) long. The Analysis Area is characterized mostly by disturbed habitats and younger, seral forests with limited potential to contain priority snags and logs.

Biodiversity areas are defined as being one of the following: 1) The area has been identified as biologically diverse through a scientifically based assessment conducted over a landscape scale, such as an ecoregion, county- or city-wide, or watershed, and 2) The area is within a city or an urban growth area, contains habitat that is valuable to fish or wildlife, and is mostly composed of native vegetation. Relative to other vegetated areas in the same city or urban growth area, the mapped area is vertically diverse with, for example, multiple canopy layers, snags, or downed wood; horizontally diverse, such as containing a mosaic of native habitats; or supports a diverse community of species, as identified by a qualified professional. These areas may have more limited wildlife functions than other priority habitat areas due to their general nature and constraints, in that they are often isolated or surrounded by highly urbanized lands.

The WDFW Priority Habitat database (WDFW 2020b) identifies a regular concentration priority habitat for mule deer that overlaps the Analysis Area near the intake construction area and upstream portion of the conveyance pipeline. Sensitive mule deer life history periods are from May 1-September 30 each year.

3.4.2 Special Status Terrestrial Wildlife Species

This section describes special status terrestrial wildlife species that have the potential to inhabit the Analysis Area.

In accordance with Section 7 of the ESA of 1973, as amended (16 USC 1531–1544), the Analysis Area was evaluated for the potential occurrences of ESA-listed threatened and endangered species. The USFWS Information for Planning and Consultation database identifies 6 threatened or endangered species, and 1 proposed threatened species, in the Analysis Area (USFWS 2020). Federally endangered or threatened species are those that the Secretary of the Interior has officially listed under the ESA and for which a final rule has been published in the *Federal Register*. Proposed species are those that the Secretary of the Interior has officially proposed for listing as endangered or threatened and for which a proposed rule has been published in the *Federal Register*. The status and preferred habitats of federally listed and proposed species protected under the ESA in the Analysis Area, as identified by the USFWS, are presented in **Table 5**. Species with potential to occur are discussed further below.

The WDFW maintains a list of state threatened, endangered, candidate, or sensitive species; most state-listed species are also ESA-listed. In the revised 2020 State Listed Species, 18 mammals and 13 birds are listed as state endangered, threatened, or sensitive. An additional 102 species were designated as candidates for state listing (WDFW 2020a). State listed species with potential to occur in the Project Area are presented in **Table 5.**

Table 5
Special Status Wildlife Species and Potential to Occur in the Analysis Area.

Common Name *Scientific Name*	Status[1]	Preferred Habitat	Vegetation Types[2]	Potential for Occurrence
SPECIAL STATUS TERRESTRIAL WILDLIFE - MAMMALS				
Canada lynx *Lynx canadensis*	FT, WT	Occurs in boreal and montane regions dominated by coniferous or mixed forest with thick undergrowth, but also sometimes enters open forest, rocky areas, and tundra to forage for abundant prey	Mixed Conifer Forest; Ponderosa Pine Woodland and Savanna	No; no continuous undisturbed conifer forest habitat present. The Proposed Action would have no effect on Canada lynx or its critical habitat.
Gray wolf *Canis lupus*	FE, WE	Mountainous forests and expansive diverse ecosystems with suitable ungulate prey base; security habitat is greater than 300 meters (984 feet) from roads.	Mixed Conifer Forest; Ponderosa Pine Woodland and Savanna	No; no known wolf pack territories are in the Analysis Area, though they are transient in nature and have been reported in the vicinity of the Analysis Area (WDFW et al. 2019). The Proposed Action may affect, but is not likely to adversely affect, the gray wolf.
Grizzly bear *Ursus arctos horribilis*	FT, WE	Now found mostly in arctic tundra, alpine tundra, and subalpine mountain forests; most populations require huge areas of suitable habitat	Subalpine Montane Forest	No; no continuous undisturbed forest habitat present. The Proposed Action would have no effect on grizzly bear or its proposed critical habitat.
North American wolverine *Gulo gulo luscus*	PFT, WC	Large expanse of minimally disturbed forest	Mixed Conifer Forest; Ponderosa Pine Woodland and Savanna	No; no habitat present. The Proposed Action would have no effect on North American wolverine.

Common Name *Scientific Name*	Status[1]	Preferred Habitat	Vegetation Types[2]	Potential for Occurrence
Western gray squirrel *Sciurus griseus*	WT	Mature stands of most conifer, hardwood, and mixed hardwood-conifer habitats	Mixed Conifer Forest; Ponderosa Pine Woodland and Savanna; Developed – Low Density	Low; limited habitat in Analysis Area.
SPECIAL STATUS TERRESTRIAL WILDLIFE - BIRDS				
Marbled murrelet *Brachyramphus marmoratus*	FT, WE	Large conifer trees for nesting and marine waters for foraging	Mixed Conifer Forest; Ponderosa Pine Woodland and Savanna	No; no habitat present. The Proposed Action would have no effect on marbled murrelet or its critical habitat.
Northern spotted owl *Strix occidentalis caurina*	FT, WE	Mature, old-growth forests for nesting, roosting, and foraging; second-growth forests for dispersal	Mixed Conifer Forest; Ponderosa Pine Woodland	No (nesting); no suitable nesting habitat; the Analysis Area does not have large tracts of mature forest with canopy cover greater than 30 percent; there is low potential that this species may disperse through the Analysis Area (Buchanan 2016). The Proposed Action would have no effect on northern spotted owl or its critical habitat.
Olive-sided Flycatcher *Contopus cooperi*	USFWS SCC	Boreal forest and western coniferous forests, from sea level to over 10,000 feet elevation. Prefer forest openings or gaps for nesting areas with dead or dying trees.	Mixed Conifer Forest; Ponderosa Pine Woodland and Savanna	Low (nesting); limited undisturbed woodlands.
Yellow-billed cuckoo *Coccyzus americanus*	FT, WE	Breeds in open woodlands, parks, deciduous, riparian woodlands; nests in tall cottonwood and willow riparian woodlands, moist thickets, orchards, or overgrown pasture	Riparian; Mixed Conifer Forest; Ponderosa Pine Woodland and Savanna; Shrubland and chaparral, Developed – Low Density	No; Analysis Area does not have suitable riparian habitat for breeding and foraging. The Proposed Action would have no effect on yellow-billed cuckoo or its proposed critical habitat.

Common Name *Scientific Name*	Status[1]	Preferred Habitat	Vegetation Types[2]	Potential for Occurrence
Lewis's woodpecker *Melanerpes lewis*	USFWS SCC	Open forest and woodland, often logged or burned, including oak, coniferous forest (primarily ponderosa pine), riparian woodland and orchards, less commonly in pinyon-juniper. Requires dead trees for nesting cavities	Conifer Forest; Conifer Woodland; Recently Burned	Low (Breeding); Limited suitable habitat with older dead or dying trees to provide cavities in the Analysis Area.

Sources: USFWS 2020; NatureServe 2020; WDFW 2020a

Notes:
[1] FE = federally endangered; FT- federally threatened; FC = federal candidate for listing; PFT= federal proposed as threatened; CH = final designated critical habitat; WE = WDFW state endangered; WT = WDFW state threatened; WC = WDFW state candidate; SE = WNHP endangered; ST = WNHP/state threatened; SC= Washington state candidate; Sens = WNHP/state sensitive
[2] Vegetation types that are associated with preferred species habitat found in the region. See **Section 3.2.1** for descriptions of vegetation types in the Analysis Area; adapted from NatureServe Ecological Systems Classifications.

The Analysis Area does not support quality habitat or have key ecological elements for special status terrestrial wildlife listed species. The proximity of habitat to human development, areas of high recreation use, and areas with a density of roads makes the presence of these species very unlikely. In addition, the surrounding area has higher quality and less disturbed habitat that special status species would prefer. However, special status terrestrial wildlife species could inhabit the vicinity of the Analysis Area and have incidental occurrences in the Analysis Area while transitioning through it to areas of suitable habitat outside the Analysis Area. For example, there have been public sightings of gray wolf (*Canis lupus*) individuals transitioning through the forested areas surrounding the City of Leavenworth, however, the closest known gray wolf territory is approximately 7.5 miles to the south (WDFW GIS 2020).

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Chapter 4. Environmental Consequences

4.1 Methods

For the purposes of this analysis, impact duration is defined as follows:

- Temporary: impacts that would only occur during construction and maintenance.
- Short-term: impacts that would be less than 3 years in duration.
- Long-term: impacts that would be 3 years or greater in duration.

4.1.1 Analysis Indicators

Vegetation, Including Special Status Plant Species

- Acres of native vegetation disturbed
- Changes in the extent of nonnative, invasive, or noxious weeds
- Changes in species or vegetation community structural diversity
- Potential for direct removal or injury of special status plant species.
- Acres of suitable habitat loss for special status plant species.

Fisheries, Including Special Status Species and Aquatic Ecosystems

- Changes in habitat quantity, including spawning habitat (count of redds), EFH (miles), and critical habitat (miles)
- Changes to habitat quality (connectivity/fish passage, water quality (temperature, dissolved oxygen, potential of hydrogen [pH], and turbidity, total phosphorus), and geomorphology)
- Potential for disturbance, injury, or mortality of aquatic wildlife

Terrestrial Wildlife, Including Special Status Terrestrial Wildlife Species

- Acres of suitable wildlife habitat
- Potential for disturbance, injury, or mortality of terrestrial wildlife or special status terrestrial wildlife species

4.1.2 Issue Statements

Vegetation, Including Special Status Plant Species

- Commenters request that the environmental impact statement (EIS) should identify and disclose any impacts to culturally important plant species.
- Commenters requested that the EIS should identify any species (e.g., fish, mammals, birds, and plants) listed, proposed, and/or candidates as "threatened" or "endangered" under ESA within the project area. This information should also identify species of concern. For any listed species, the EIS should identify their designated critical habitat area(s) and discuss implementation of their recovery plans. The EIS should evaluate impacts to these species from the proposed project and alternatives.

- Commenters suggested that Reclamation work with USFWS staff to develop an ESA consultation timeline that includes review and acceptance of sections of the draft Biological Assessment as it is being prepared. Specific critical check-in points include review of (1) the project description and conservation measures; (2) the action area, and (3) draft effects analysis.
- Commenters noted that Reclamation should include the following in the Biological Assessment: 1) construction; (2) operation and maintenance as described in the 90 percent Basis of Design Report; (3) monitoring; and (4) an adaptive management plan, if applicable.
- Commenters stated that if any impacts to listed species are identified, Reclamation should inform USACE so they can document it for their permit.

Fisheries, Including Special Status Species and Aquatic Ecosystems

- Commenters expressed concern that during the construction phase of the project, Reclamation should ensure that all practicable means are in place to ensure minimal damage to the surrounding ecosystem and reduce any materials or human-made materials from entering the waterbody and flowing downstream.
- Commenters would like Reclamation to quantify the areal extent (i.e., acreage) of impacts to riverine and riparian resources in the EIS for both direct and indirect impacts. The acreage values for the direct and indirect impact footprints should include the acreage for riverine, as well as riparian areas. For Icicle Creek, the loss of channel length and riparian habitat should also be quantified by linear feet since channel length is a more intuitive metric than the acreage values. In addition to the areal or linear extent, impacts to aquatic resources should also be quantified by the expected change in the function these resources perform, including fishery support functions, or change in the condition of the resource.
- Commenters requested that the EIS evaluate the functions and values of the riparian habitat/buffer areas along Icicle Creek within the project area.
- Commenters recommended that the EIS evaluate plans to revegetate and maintain the existing riparian habitat and buffer with native plant species.
- Commenters would like the EIS to evaluate potential project impacts to bull trout habitat for rearing, migration, and spawning. In particular, Icicle Creek provides habitat for bull trout (*Salvelinus confluentus*), which is listed as a threatened species under ESA.
- Commenters requested that Reclamation consider Standard Hydraulic Project Approval Provisions for Blasting/Explosives to protect fish life: Before any blasting, capture and safely move food fish, game fish, and other fish life from an in-water work area extending 75 feet upstream and 75 feet downstream from the blast site. Place block nets upstream and downstream of the in-water work area before capturing and removing fish life. Capture and safely move fish life from the work area to the nearest suitable free-flowing water away from the blast. Place a bubble curtain around the blast site to minimize impacts to fish. Use approved fish scare tactics before blasting. If at all possible, use a cofferdam, bypass, or similar structure to physically separate the blast site from the flowing stream.
- Commenters recommended that the EIS should include a strong description of the existing conditions relative to fish passage and entrainment as the environmental baseline to set up the effects analysis well by describing the change from existing to planned.

- Commenters noted that the EIS should disclose if there is noise associated with the Project components that could impact juvenile and adult fish behavior in LNFH or in Icicle Creek. Noise and vibration must be kept at levels that do not adversely affect adult and juvenile migration behavior and residency in Icicle Creek in order to avoid adverse impacts to the Tribal fishery and to avoid negative impacts (stress) to adults held and juveniles rearing at LNFH.
- Commenters requested that the level of LNFH production and fish health is not altered due to the proposed Project.
- Commenters noted that the EIS should address concerns over meeting the temperature total maximum daily load (TMDL) on lower Icicle Creek and recognize that proposed changes to riparian buffers have to meet stream temperature requirements. Reclamation should consider early temperature monitoring (during the proposed construction window) to start as soon as possible in order to establish baseline background temperature data.
- Commenters requested that Ecology's Quality Assurance Project Plan standards are met by the Project in general.
- Commenters recommended that the EIS should look at the OHWM as the boundary for the Analysis Area, and keep the analysis separate from discussions directly related to wetlands. The area below the OHWM needs to be described in the EIS from an ecological standpoint for baseline conditions, as well as considered in the discussions of potential impacts (e.g., numbers of trees removed). Reclamation should consider how these types of direct impacts will be offset, given private landowner concerns over large woody debris addition to Icicle Creek.
- Commenters would like the EIS analysis to capture potential construction impacts to all fish species that could occur during migration and spawning and for example, if there is fish passage provided during construction.
- Commenters would like Reclamation to prevent/minimize turbidity impacts on Icicle Creek during Project construction.
- Commenters asked that the EIS identify areas where it would be possible to avoid and minimize riparian disturbance based on existing conditions, and in areas where permanent loss of riparian habitat is predicted, describe the plan for how impacts could be offset. The offsets need to be in the watershed, and not necessarily on site.
- Commenters recommended that the EIS identify times during construction where fish passage is not provided, and that even though there would be short-term negative impacts there would also be long-term beneficial impacts related to compliance with state and federal requirements.
- Commenters requested that the EIS should identify any species (e.g., fish, mammals, birds, and plants) listed, proposed, and/or candidates as "threatened" or "endangered" under ESA within the project area. This information should also identify species of concern. For any listed species, the EIS should identify their designated critical habitat area(s) and discuss implementation of their recovery plans. The EIS should evaluate impacts to these species from the proposed project and alternatives.

- Commenters suggested that Reclamation work with USFWS staff to develop an ESA consultation timeline that includes review and acceptance of sections of the draft Biological Assessment as it is being prepared. Specific critical check-in points include review of (1) the project description and conservation measures; (2) the action area, and (3) draft effects analysis.
- Commenters noted that Reclamation should include the following in the Biological Assessment: 1) construction; (2) operation and maintenance as described in the 90 percent Basis of Design Report; (3) monitoring; and (4) an adaptive management plan, if applicable.
- Commenters stated that if any impacts to listed species are identified, Reclamation should inform USACE so they can document it for their permit.

Terrestrial Wildlife, Including Special Status Terrestrial Wildlife

- Commenters would like the EIS to consider chronic and acute noise impacts to mule deer and mountain goats. Avoiding and minimizing noise between May 1-September 30 during the parturition and lactation seasons would be desirable if possible.
- Commenters requested that the EIS should identify and disclose impacts to culturally-important wildlife species.
- Commenters stated that the EIS should identify impacts to wildlife habitat resulting from the loss or alteration of Waters of the U.S.
- Commenters suggested that the EIS should analyze impacts on herpetofauna, and should use the WDFW Washington State Herp Atlas (https://wdfw.wa.gov/publications/02135).
- Commenters requested that the EIS should identify any species (e.g., fish, mammals, birds, and plants) listed, proposed, and/or candidates as "threatened" or "endangered" under ESA within the project area. This information should also identify species of concern. For any listed species, the EIS should identify their designated critical habitat area(s) and discuss implementation of their recovery plans. The EIS should evaluate impacts to these species from the proposed project and alternatives.
- Commenters suggested that Reclamation work with USFWS staff to develop an ESA consultation timeline that includes review and acceptance of sections of the draft Biological Assessment as it is being prepared. Specific critical check-in points include review of (1) the project description and conservation measures; (2) the action area, and (3) draft effects analysis.
- Commenters noted that Reclamation should include the following in the Biological Assessment: 1) construction; (2) operation and maintenance as described in the 90 percent Basis of Design Report; (3) monitoring; and (4) an adaptive management plan, if applicable.
- Commenters stated that if any impacts to listed species are identified, Reclamation should inform USACE so they can document it for their permit.

4.1.3 Assumptions

Vegetation, Including Special Status Plant Species

- Existing vegetation in the Analysis Area would be preserved to the extent possible by limiting the construction footprint to the smallest size possible and following other vegetation protection BMPs.
- Vegetation types that are less departed from natural, historic conditions have higher ecosystem value and more resilience to human and environmental stressors compared to more departed vegetation types (e.g. disturbed or early seral ponderosa pine woodland).
- Revegetation with native seeding and plantings would rehabilitate sites to pre-construction conditions or better in one to five years.
- There would be no effects on culturally-important plant species, as Native American Tribes have not identified these species in the Analysis Area.
- Disturbed and modified vegetation types have limited potential to support and maintain special status plant species.

Fisheries, Including Special Status Plants and Aquatic Ecosystems

- Impacts on fish and aquatic resources are directly related to changes within aquatic habitats.
- BMPs will limit impacts on fish and aquatic resources.
- Special status fish species would move away from direct, short-term disturbances to nearby higher quality habitat during project activities.
- Conservation measures for ESA-listed fish species will be developed under Section 7 consultation and would reduce impacts to most fish and aquatic species.
- Successful installation and utilization of screening will reduce take of ESA-listed fish species.
- Successful completion of the roughened channel and low-flow boulder weir fishway will facilitate and improve fish passage for all aquatic species over a greater range of flows.

Terrestrial Wildlife, Including Special Status Terrestrial Wildlife Species

- Vegetation types less departed from natural, historic conditions provide higher quality wildlife habitat than more disturbed vegetation types.
- Wildlife show preference to higher quality habitat and avoid areas with more disturbance. Special status terrestrial wildlife species prefer higher-quality habitat and less disturbed vegetation types.
- Impacts to wildlife are closely tied to impacts to vegetation types.
- Most terrestrial wildlife in the Analysis Area are adapted to disturbed habitats departed from natural historic conditions and tolerant of human disturbances. In addition, they are typically mobile and can move away from temporary construction disturbance to nearby higher quality habitat.
- Mobile terrestrial wildlife and special status terrestrial wildlife species would generally move away from project disturbances to nearby higher quality habitat during project activities. Exceptions could occur during breeding periods when young are less mobile and more vulnerable to disturbances.

- Since the Analysis Area does not provide quality habitat to support special status terrestrial species and these species have the ability to move away from temporary disturbances, the proposed project would have minimal or no effects on special status terrestrial wildlife species.
- There would be no effects on culturally-important wildlife species, as Native American Tribes have not identified these species in the Analysis Area.

4.2 Alternative A – No Action Alternative

4.2.1 Vegetation, Including Special Status Plant Species

The No Action Alternative would continue current maintenance and operations of the LNFH surface water intake and delivery system. There would be no additional surface disturbance in the Analysis Area because all existing features of the intake and delivery system would remain in place and would not be removed, modified, or rehabilitated. As such, existing vegetation communities would not be affected. No surface disturbance would occur that would increase the potential for the introduction or spread of noxious weeds or nonnative, invasive plants, though these species would likely continue to spread on their own through natural (e.g., water flows, wind) and anthropogenic (e.g., recreational activity, vehicle traffic) processes.

Under Alternative A, the existing intake facilities would not be altered. Vegetation at the existing intake facilities, which is dominated by Mixed Conifer Forest and a few scattered, seral riparian associated shrubs at the immediate edge of Icicle Creek, would not be disturbed. While existing conditions would remain, there would be no opportunities for reseeding or replanting to increase riparian species and structural diversity under this alternative.

There is no potential for ESA-listed plant species to occur in the Analysis Area because suitable habitat is not present there; as a result, there would be no disturbance to these species under Alternative A. As described above, there would be no additional surface disturbance in the Analysis Area because all existing features of the intake and delivery system would remain in place and would not be removed, modified, or rehabilitated. As such, no surface disturbance would occur that would increase the potential for direct removal or injury of special status plant species, result in loss of suitable habitat for special status plant species, or increase the potential for the introduction or spread of noxious weeds or nonnative, invasive plants, though these species would likely continue to spread on their own through natural and anthropogenic processes.

4.2.2 Fisheries, Including Special Status Species and Aquatic Ecosystems

The No Action Alternative represents the continuation of the current operations of the LNFH surface water intake and delivery system as well as ongoing O&M activities. Continuing O&M under the No Action Alternative would not fulfill the requirements of the 2017 Biological Opinion (NMFS 2017). This is because continued operation of the LNFH under the baseline condition would leave the existing fish ladder/sediment sluice and low-head diversion dam in place. The fish ladder would not be modified to alter flow or enhance fish passage and current regulatory criteria would not be met. Current flows at the fish ladder/sediment sluice would continue to not meet NMFS guidelines for fish attraction. Therefore, these pieces of infrastructure would continue to limit habitat quality

(connectivity) by inhibiting ESA-listed species passage within the Icicle Creek aquatic ecosystem during low flows (see **Table 4**).

The No Action Alternative would also leave the existing unscreened diversion and conveyance pipeline in place. This continued operation of infrastructure would maintain the current potential for take of ESA-listed species due to entrainment and need for removal from the existing intake facilities. For example, between 30 and 63 Steelhead were removed from the existing intake facilities each year between 2009 and 2013 (Hall et al. 2014). Under existing conditions, between 2008 and 2018, 34 Bull Trout have been entrained in the surface water intake and delivery system (Potter 2019).

NMFS relied on the Hatchery and Genetics Management Plan's description of the proposed action to complete the formal consultation with the release of the September 2017 Biological Opinion (NMFS 2017). For this consultation to remain valid, the USFWS and Reclamation must implement the conservation actions included as part of the proposed action evaluated in the consultation. Without completing the fish screening and fish passage improvements by May 2023, the USFWS and Reclamation may be required to reinitiate consultation with NMFS.

Several assessments of LNFH facilities have noted that much of the infrastructure is nearing the end of its expected working lifetime. Repair and improvements are needed to ensure that infrastructure failure does not result in a catastrophic loss of Hatchery facilities or fish production resources. O&M activities would continue, including daily visual inspections of existing intake facilities. Extraordinary maintenance would occur every couple of years and would be expected to continue into the future. This includes the removal of sediment from the intake channel. Failure of the diversion or water delivery system would be an emergency situation. The timing and extent of potential impacts from extraordinary maintenance or emergency repairs would depend on the nature, extent, and timing of the necessary repairs.

As a result of the existing infrastructure within the Analysis Area, the impacts it has on fish passage and aquatic habitat conditions would continue. These include the limitations on fish passage, habitat quantity and connectivity, and habitat quality as described in **Section 3.3.2**.

Under the No Action Alternative, the existing intake facilities and delivery infrastructure would remain in place and continue to degrade, causing infrastructure problems for the Hatchery and causing it to become even more unreliable. For example, the conveyance pipeline would continue to degrade resulting from the sediments transported through it. This unreliability would jeopardize the Hatchery's ability to meet the *U.S. v. Oregon* agreement annual objectives for the LNFH to release 1.625 million Spring Chinook Salmon smolt to Icicle Creek.

Catastrophic failure of any part of the water delivery system could result in the loss of one to two years of Chinook Salmon broodstock at the Hatchery. This could result in a failure to meet *U.S. v. Oregon* mitigation requirements and would impact the amount of fish returning annually in the out-years. Effects of catastrophic failure could last five to eight years, depending on how long Hatchery production is down to complete necessary repairs.

4.2.3 Terrestrial Wildlife, Including Special Status Terrestrial Wildlife Species

Impacts to terrestrial wildlife are tied to wildlife habitat or their associated vegetation type. Similar to impacts described in **Section 4.2.1**, wildlife habitat would not be removed, modified, or rehabilitated under this alternative. The intake facilities area would continue to be characterized by steep banks with Mixed Conifer Forest with some sparse riparian-associated shrubs. While existing conditions would remain, there would be no opportunities for reseeding or replanting to increase riparian and upland habitat quality. The potential for disturbance, injury, or mortality from ongoing O&M activities would continue. These activities would be of short duration and occur in an area of limited wildlife habitat quality with existing high levels of disturbance from human presence and traffic noise.

The potential for special status terrestrial wildlife species to occur in the Analysis Area is low to negligible. Temporary disturbance impacts from operations and maintenance activities would continue. These impacts are considered negligible for special status terrestrial wildlife species.

4.3 Alternative B – Proposed Action

4.3.1 Vegetation, Including Special Status Plant Species

Vegetation Types

Construction activities under Alternative B would result in short- and long-term disturbance of vegetation types in the Analysis Area, as described by phase of construction below. Incorporating BMPs to preserve existing vegetation to the extent possible, and minimize damage to trees and native vegetation (**Appendix B**, Best Management Practices) would serve to minimize the acres of native vegetation disturbed during construction.

In the Analysis Area, the vegetation types Developed and Landscaped, and Disturbed Ponderosa Pine Woodland and Savanna, are departed from natural historical conditions. Thus, construction disturbance in these areas would have a relatively minor effect on species or structural diversity. Impacts on vegetation types under each phase of construction are described below.

Phase I

Phase I surface disturbing activities would have both short- and long-term impacts to vegetation. Approximately 1.02 acres of short-term impacts to the Mixed Conifer Forest would occur due to site preparation. Long-term impacts, which would include replacing native vegetation with non-vegetated areas, would be approximately 0.18 acres. Impacts on intact vegetation would be minimized because most construction activities would either occur in non-vegetated areas of Icicle Creek, and where existing development is present (e.g. building the intake pipeline within the existing intake channel, and building the PISMA within the footprint of the existing gatehouse.

Some large trees between Icicle Creek Road and Icicle Creek may need to be removed to allow for construction equipment and personnel to access the work area. A native upland seed mix would be applied at the end of Phase I construction, in early fall or spring, for erosion control and restoration, thereby stabilizing soils and maintaining or increasing species diversity in disturbed areas (approximately 0.84 acres). Structural diversity would likely be reduced, since trees may need to be

removed, but only herbaceous species would be seeded. Other vegetation that is removed during Phase I construction would be reestablished to the extent practical, maintaining structural diversity (see *Phase III*).

Construction at the intake construction area would also remove several scattered riparian shrubs in the riparian zone of Icicle Creek. Vegetation disturbance would be limited to the extent practicable to facilitate the work. In general, the riparian zone at this location lacks diversity in species composition and structure, so this impact would be relatively minor. Additionally, riparian planting during Phase III would increase species and structural diversity in the riparian zone.

In-water construction during Phase I, such as installation of the temporary cofferdams, construction of the headworks, and construction of the roughened channel and low-flow boulder weir fishway, would not impact vegetation. Project construction and operations would not substantially change water availability outside the natural flow changes to vegetation and therefore would not degrade or remove downstream vegetation.

Phase II

Phase II includes use of temporary access roads, staging areas, five contractor use areas (CUAs) to rehabilitate the conveyance pipeline, cut and cover corridors for pipeline replacement, and construction of the control valve vault. Phase II construction disturbance would occur on approximately 0.4 acres of Mixed Conifer Woodland, 2.6 acres of Developed and Landscaped, and 4.1 acres of Disturbed Ponderosa Pine Woodland and Savanna vegetation types. As described above, most vegetation is departed from natural historical conditions and construction disturbance in these areas would have a relatively minor effect on species or structural diversity. Further, most Phase II construction would occur in areas that are already disturbed, developed, or unvegetated; clearings and cuts through vegetation will be minimized (**Appendix B**, Best Management Practices). Seeding of disturbed areas would occur at the end of Phase II, in the early fall or spring, to provide erosion control and restoration, minimizing changes in species or structural diversity.

Phase III

Revegetation, Phase III, would restore native vegetation communities to pre-disturbance conditions or better and occur after construction Phases I and II. Revegetation would be done according to a revegetation plan, (see **Appendix C**, Leavenworth National Fish Hatchery Intake Planting Plan) and planting would occur in early fall. Container plantings would be installed in disturbed upland areas at the intake construction area, while riparian tree and shrub cuttings would be installed in the riparian zone of Icicle Creek. The native species selected for planting include a diversity of upland and riparian trees and shrubs. In combination with the herbaceous seedings in Phases I and II, once the tree and shrub species are reestablished, the upland and riparian vegetation at the site would have greater species diversity and structural diversity. Replanting with native species would move the area closer to natural historic conditions.

Nonnative, Invasive Plants and Noxious Weeds

Ground disturbance and vegetation removal during construction during Phase I and II, such as along access roads, at CUAs, at staging areas, and along the conveyance pipeline on USFWS property, may increase the potential to introduce or spread nonnative, invasive plants or noxious

weeds, resulting in additional infestations in the Analysis Area compared with current conditions. This is because surface disturbing-activities may increase weed establishment or spread (Sheley et al. 2011). To reduce the potential for this effect, construction materials and equipment would be cleaned to remove dirt, vegetation, and other organic materials before arriving on site, in accordance with Reclamation's Cleaning Manual (Reclamation 2010) and would be subject to inspection before entering the site (**Appendix B**, Best Management Practices).

Special Status Plant Species

There is no potential for ESA-listed plant species to occur in the Analysis Area because suitable habitat is not present there; as a result, there would be no potential for direct removal or injury to these species, or loss of suitable habitat, under Alternative B.

As described above, construction activities under Alternative B would result in short- and long-term surface disturbance within the Developed and Landscaped, Disturbed Ponderosa Pine Woodland and Savanna, and Mixed Conifer Forest in the Analysis Area. These vegetation types typically provide low suitability for other special status plant species listed in **Table 2**. As a result, the potential for direct removal or injury of special status plant species would be minor, as would loss of suitable habitat for special status plant species.

Surface disturbance under Alternative B could increase the potential for introduction and spread of noxious weeds or nonnative, invasive plants, reducing habitat quality for special status plant species. Incorporating BMPs to preserve existing vegetation to the extent possible (**Appendix B**, Best Management Practices) would serve to minimize the acres of ground disturbance during construction, and the potential for weed introduction and spread, which would preserve existing habitat quality for special status plants to the extent possible.

4.3.2 Fisheries, Including Special Status Species, and Aquatic Ecosystems

Under Alternative B, the existing intake facilities and delivery infrastructure would be replaced and rehabilitated, improving the reliability of water delivery and the Hatchery's ability to meet the *U.S. v. Oregon* agreement annual objectives for the LNFH to release 1.625 million Spring Chinook Salmon smolts to Icicle Creek.

Alternative B would have long-term beneficial effects to fisheries, including special status fish, and aquatic ecosystems in the Analysis Area. Alternative B would provide NMFS-compliant fish screening, reducing potential for injury or mortality to fish species, including ESA-listed species, due to entrainment in the existing intake facilities. The low-flow boulder weir fishway would provide NMFS-compliant fish passage for anadromous salmonids during typical low flows, and the portion of the roughened channel extended upstream of the existing low-head diversion dam would facilitate fish passage overall and at higher flows in particular. This would increase connectivity of aquatic habitat in Icicle Creek, and access to high-quality aquatic habitat upstream of the Analysis Area. Improving habitat connectivity and fish passage, which is currently limited in the Analysis Area, would allow for a more complete expression of essential life history characteristics related to reproduction, feeding, rearing, and migration.

Despite localized and temporary habitat losses for expansion of the intake structure and IO&MA and for constructing the roughened channel and low flow fishway (described in further detail below), habitat quantity in the Analysis Area would increase overall because the roughened channel would facilitate natural sediment movement past the existing intake facilities. This would ultimately improve habitat quality downstream of the intake facilities by decreasing the amount of spawning gravels that are currently entrained in the intake facilities and lost from the Icicle Creek system, and instead retaining these gravels in Icicle Creek. This could result in increased availability of spawning habitat and number of redds of Spring Chinook Salmon, which have been observed in the Analysis Area. Corresponding beneficial effects on critical habitat for Bull Trout and Upper Columbia River Steelhead and EFH would be expected since these habitats occur in the Analysis Area.

After Phase I and Phase II construction, the woody vegetation that would be removed in the intake construction area would be reestablished by planting of native upland and riparian trees and shrubs to restore vegetation communities to pre-disturbance conditions or better. Container plantings would be installed in disturbed upland areas at the intake construction area, while riparian cuttings would be installed in the Icicle Creek riparian zone. Revegetation of riparian shrubs and trees would increase shading of Icicle Creek, improving aquatic habitat quality by buffering stream temperatures, and maintaining dissolved oxygen levels in the creek, especially during summer months. It would also stabilize streambanks, helping to decrease erosion and sediment transport into Icicle Creek. However, there would be a delay of several years between the time trees were removed and the time planted trees became large enough to provide these benefits.

Increased fish passage and access to upstream habitat, and minimization of injury, mortality, and take of ESA-listed fish species from installing NMFS-compliant screening, would work in conjunction with other plans and projects in or near the Analysis Area to benefit fisheries, including special status fish species and aquatic ecosystems in the Analysis Area in the long term. These include the Trout Unlimited Icicle Creek Boulder Field Fish Habitat Improvement Project, continued implementation of the Recovery Plan for Upper Columbia River Spring Chinook Salmon and Steelhead and the USFWS Bull Trout Recovery Plan, relocating and replacing the City of Leavenworth water supply pipeline and fish screen, replacing and relocating the IPID's fish screens, and improving fish passage at the IPID and City of Leavenworth diversion dam. These projects would increase fish passage, improve stream geomorphology and water quality parameters, and lower the potential for injury or mortality of aquatic species (e.g., by reducing entrainment in water diversions). For example, the Trout Unlimited Icicle Creek Boulder Field Fish Habitat Improvement Project would create accessibility to more than 26 mainstem miles of high-quality fish habitat in Icicle Creek available above the boulder field. The habitat above the boulder field includes more than 20 miles of virtually undisturbed National Forest System lands and wilderness (Trout Unlimited 2020a, 2020b).

Temporary impacts from Phase I construction would occur during the in-water work window of July 1 to November 15; two construction seasons would be needed to complete Phase I construction. The proposed in-water work window extends beyond the approved in-water work window for Icicle Creek of July 1 to August 15 (USACE 2018). Although the proposed extended window would have to be approved by regulatory agencies prior to construction, working outside the approved window would increase the duration of impacts to aquatic habitat by extending the

length of time that in-water work would occur. This may result in changes to the number and types of species and life stages of fish species that are present in the Analysis Area relative to the shorter, approved work window. For example, Upper Columbia River Steelhead adults return to the Columbia River in the late summer and early fall, so conducting in-water work within this window may affect more individuals than if work was restricted to the approved window of July 1 to August 15.

The proposed extended in-water work window would also increase the potential for injury or mortality of special status fish species. Salmon are particularly vulnerable to these effects during the fall and winter, when adults are migrating and spawning, and the extended in-water work window would overlap this sensitive period. It would also increase the potential for interference with spawning Spring Chinook Salmon or Bull Trout (which spawn in late summer and late fall, respectively). This may come about because potential spawning habitat may be unavailable to fish species, either because it was isolated behind a cofferdam, or because it was removed during construction of the intake structure and IO&MA, roughened channel, or another in-stream Project component.

Species that are present in the Analysis Area in late summer through fall (in addition to those present in early summer) would be subject to impacts including changes in habitat quantity, quality, and potential for injury or mortality. Specific impacts are described in more detail below.

Potential temporary effects to habitat quality during in-water construction activities include effects to habitat connectivity and fish passage. Fish passage would be temporarily reduced because cofferdams would be installed to isolate the in-water work area. At no point would the entire width of Icicle Creek be blocked, but cofferdams would temporarily reduce the effective width of Icicle Creek while installed, potentially limiting, but not completely blocking, passage opportunities. For Bull Trout, this could result in migration delays to spawning habitat upstream of the Analysis Area, and post-spawn migrations from spawning and rearing habitat to foraging, migrating, and overwintering habitat in and downstream of the Analysis Area. Effects would be minimized through BMPs (**Appendix B**) that require cofferdam installation maintain a minimum water depth of 0.8 feet within the greatest amount of natural streambed width as possible to facilitate fish passage while cofferdams are in place. Fish passage criteria in *Icicle Creek Fish Passage Evaluation for the Leavenworth National Fish Hatchery* (Anglin et al. 2013, pages 26-28) would be consulted for minimum depth and maximum velocity criteria, and attempts would be made to provide fish passage to the greatest extent practical across the natural stream channel width and hydrograph.

Because cofferdams would be in Icicle Creek beyond the low flow timeframe (lowest flows typically occur from July through September), this creates risk of cofferdam failure during high flows. High flows generally occur in May and June, but winter months can have high flows or extensive snow and ice conditions. Occasionally peak annual floods have occurred in July and October, which may require adjustment to the start and completion date for a given construction year (Reclamation 2020). Floods would be a concern for inundating areas and overtopping a cofferdam. Geo-bag cofferdams would not be suitable for use in Icicle Creek during heavy or prolonged precipitation or rain-on-snow events that typically occur between November and April, or during typical flows resulting from spring runoff in May and June.

Cofferdam failure during high flows could release tons of sediment or rock into Icicle Creek. Depending on the volume and type of material released, there could be long-term changes to the Icicle Creek streambed, primarily by increasing the proportion of sands, gravels, and fine sediments. Released materials could reduce ESA-listed fish habitat quantity or quality by burying or degrading suitable spawning substrate in Icicle Creek. Depending on the timing of cofferdam failure, released materials could bury ESA-listed fish species redds or eggs, which could be considered take under the ESA.

During low summer flows, constricting the stream and providing a minimum water depth of 0.8 feet would likely be an improvement over baseline water depth conditions, as the water across the width of the stream under the No Action Alternative could be less than 0.8 feet deep during previous low-flow conditions.

During Phase I, the temporary Hatchery water supply of 40 cfs via the gravity-fed bypass would divert water from Icicle Creek, however, more water would be left in Icicle Creek than under typical operations, when 42 cfs is diverted. Since this diversion rate would be less than the Hatchery's water right diversion rate of 42 cfs, no net decrease in stream flows are expected, and there would be no decrease in instream flow or effects to fish passage.

The gravity-fed bypass intake would be unscreened, meaning that fish could be entrained in the bypass pipeline. Entrained individuals would be carried via the conveyance pipeline to the sand settling basin on the LNFH grounds. Effects of entrainment would include risk of injury due to abrasion in the pipeline, and stress and potential for injury associated with capture and salvage from the sand settling basin and return to Icicle Creek. Capture and salvage would be done according to the Terms and Conditions of the LNFH operations consultations with the NMFS and USFWS; however, handling activities, even when accomplished carefully and efficiently, are likely to result in some adverse effects, including stress, of all fish handled.

Potential effects to aquatic habitat quality from instream construction would include changes to stream geomorphology. The SWISP Project EIS **Water Resources Report** describes these types of changes in more detail. Geomorphological alterations could impact fish habitat quality and quantity by altering the availability of features such as pools and riffles. This impact would mainly occur within the area of streambed that would be lost due to construction of the IO&MA, which is approximately 0.15 acres.

Instream surface-disturbing activities, such as placement of cofferdams, partial removal of the fish ladder/sediment sluice, and construction of the intake structure would also affect stream geomorphology through direct physical alterations of the streambed as well as by mobilizing sediments that settle in downstream gravels or pools. However, sediment plumes would be temporary and minimized through BMPs (**Appendix B**), such as working in dewatered areas. As a result, the loss of geomorphological habitat features would be minor.

Placement of cofferdams to isolate the in-water work area in July, and their removal in November, would temporarily disturb fish if they are present in the area through noise and vibration from construction equipment. If present in or near the construction work area, most fish would be expected to move to other areas of Icicle Creek in response to the noise and vibration.

Preparation of the streambed, placement, and removal of the cofferdams would mobilize sediments on the Icicle Creek streambed. This could increase turbidity in and downstream of the work area during and shortly after cofferdam placement or removal, exposing fish to elevated levels of suspended sediment. Suspended sediments can result in short- and long-term effects on fish depending on the quantity and composition of sediment and length of exposure. Potential exposure would be minimized because, as above, most fish would be expected to move to other areas of Icicle Creek in response to the noise and vibration caused by placing and removing the cofferdams. Further, Reclamation would monitor and collect water samples to measure potential increases in turbidity to ensure compliance with Water Quality Standards for Surface Waters (WAC 173-201A) during cofferdam placement and removal.

Fish may be stranded inside the construction work area established by cofferdam placement. Reclamation would capture and remove fish stranded inside the work area. To minimize harm from capture, handling, and relocation into Icicle Creek, this process would be done by qualified biologists, in accordance with the USFWS (2012) *Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards for Bull Trout*.

The area isolated by the cofferdam would be partially dewatered prior to fish capture. To prevent injury or mortality from fish entrainment in sump pumps, Reclamation would screen sump pump intakes to prevent aquatic life from entering the intake. Fish screens or guards would comply with the most recent fish screening guidelines for anadromous salmonids prescribed by the NMFS. Areas isolated by cofferdams would be monitored for aquatic organisms, and fish would be captured and relocated from the construction work area in accordance with approved methods; this would reduce the potential for injury or mortality of fish and aquatic species during construction.

A pneumatic tool would be used to break apart large boulders to facilitate their removal from the intake construction area, and partially demolish existing intake facilities, such as the existing fish ladder/sediment sluice. The pneumatic tool would generate impact sounds, which can propagate into the surrounding water. High levels of underwater sound can have negative physiological effects on fish, the intensity of effects depends on physical, environmental, and biological factors, including the sound-generating activity, sound intensity, distance of fish from the point of origin, depth of fish in the water, size of fish, fish species, and ambient noise levels. While sound generated by the pneumatic tool is not expected to reach intensities associated with blasting or impact pile driving, some physiological effects on fish could occur if individuals were present in or near the work area. Because fish would be removed from work areas isolated by cofferdams as discussed above, effects would be minimized. However, there is a chance that individuals may elude capture and therefore be present during construction activities.

During construction in and adjacent to Icicle Creek, alteration of water quality parameters could also occur due to sediment entering the aquatic ecosystem. Many native salmonid species and aquatic invertebrates require high oxygen levels, and clear water with low turbidity (UCSRB 2007; USFWS 2015). High concentrations of limiting nutrients, such as phosphorus, can induce excessive growth of algae, resulting in lower dissolved oxygen concentrations, which may reduce habitat quality for aquatic species.

The Ecology TMDL (see the SWISP Project EIS **Water Resources Report**) indicates phosphorus is the limiting nutrient in Icicle Creek. Cement is rich in calcium and contains aluminum and iron also. All three can readily bind phosphorus. Also, Setunge et al. (2009) reports freshwater contact with freshly cast concrete can lead to an increase in the pH level of water in contact with the concrete during the first four days from the casting of the concrete. To avoid the potential that construction would increase phosphorus in Icicle Creek, concrete used for proposed in-water infrastructure would be cured in place behind cofferdams for at least four days before exposure to Icicle Creek water. This would guard against fresh concrete increasing phosphorus in surface water.

In addition to increasing turbidity levels, sedimentation can alter substrate used by fish species for spawning and rearing. Adhering to BMPs to reduce the potential for impacts on water quality (**Appendix B**), would minimize the potential for water quality degradation and release of sediment into Icicle Creek during construction. The SWISP Project EIS **Water Resources Report** contains additional detail on effects to water quality and sedimentation from construction.

Changes to habitat quantity would arise from the changes to habitat quality as described above if the habitat quality alterations prevent species from using habitat. As described above, these would be temporary changes, generally lasting the duration of construction activities.

Long-term habitat loss would result from expanding the intake structure and IO&MA, and temporary habitat loss would occur from constructing the roughened channel and low-flow fishway within the area isolated by the cofferdam and dewatered work areas. As an approximation, the intake structure and IO&MA would cause about 0.15 acres of fill below the OHWM. This would result in a loss of streambed habitat for fish and aquatic invertebrates. General aquatic habitat, critical habitat for Bull Trout and Upper Columbia River Steelhead, and EFH loss would also result from constructing the IO&MA within the OHWM of Icicle Creek. A long-term change in habitat of approximately 0.45 acres would result from construction of the roughened channel and low-flow fishway.

During Phase II, construction would not occur in Icicle Creek; therefore, the type of potential in-water effects described under Phase I would not occur. However, removing trees in the Icicle Creek riparian zone during conveyance pipeline replacement on USFWS property between the PISMA and the adjacent private parcel would reduce the amount of shading along this reach of Icicle Creek, resulting in potential reductions to water quality parameters (including increased water temperature), especially during summer months. Inputs of woody materials to the creek from fallen trees and limbs, would also be reduced. Together, this would reduce habitat quality for aquatic species. The number of trees removed during Phase II construction would be minimized.

During Phase II construction, sediment that becomes mobilized by erosion would be added to Icicle Creek; this would increase turbidity downstream of the construction area, thereby decreasing habitat quality, including for critical habitat and EFH. WAC 173-201A-200 includes water quality standards, criteria, and monitoring for turbidity during construction; adhering to these standards would minimize this impact. Construction BMPs (**Appendix B**), including preparation of and adherence to, a stormwater pollution and prevention plan, would further minimize the release of sediment into Icicle Creek during construction. Seeding of disturbed surfaces with herbaceous vegetation would

stabilize soils and minimize or prevent erosion and release of sediment into Icicle Creek as vegetation matured over one to several growing seasons following construction.

Temporary Hatchery water supply pumping at the spillway pool during Phase II would utilize NMFS-approved screened sump-pumps to ensure a continuous water supply while reducing the potential for injury or mortality of fish from entrainment in pump intakes. During the actual CIPP lining process (April 17 to May 20), temporary pumping would supply 20 cfs, and could be augmented by existing groundwater wells (up to 8 cfs). Sound generated by pumps may result in temporary behavioral impacts to fish and aquatic species, such as avoidance of the immediate area, while pumping is ongoing. This is because sound waves and vibration from pumping would propagate into the Icicle Creek water column via the air, and also via the pump intake within the water column. Effects would be temporary, lasting for the duration of pumping. Fish are expected to avoid the immediate area and displace into other areas of Icicle Creek while pumping is ongoing.

The potential for effects on fish and the aquatic ecosystem from surface disturbance and equipment use during rehabilitation of the conveyance pipeline on USFWS property between the PISMA and the adjacent private parcel would be small relative to effects from in-stream work, but there could be some short-term effects to habitat quality, such as alteration of water quality parameters from increased sedimentation. As described for Phase I, the potential for effects would be minimized by implementing water quality measures in **Appendix B**. Native reseeding in uplands would improve aquatic habitat quality by increasing bank stability, thereby reducing the potential for erosion and sediment transport into Icicle Creek.

Following construction of the proposed intake facilities, removed woody vegetation would be reestablished by planting native upland and riparian trees and shrubs (Phase III). Container plantings would be installed in disturbed upland areas, while riparian tree cuttings would be installed in the Icicle Creek riparian zone. This would improve riparian vegetation structure and function compared with existing conditions. Over time, and as planted vegetation matured, the amount of shade provided to Icicle Creek would be increased, helping to moderate stream temperatures, especially during summer months.

Extraordinary maintenance activities would occur every couple of years and would be expected to continue into the future. These activities would affect fish, including special status fish species, and aquatic ecosystems; the type of effects would depend on the type of maintenance activities that are required. Likely effects include temporary water quality reductions from increases in turbidity associated with removal of accumulated sediments from the fish screen area as needed.

4.3.3 Terrestrial Wildlife, Including Special Status Terrestrial Wildlife Species

Temporary and localized disturbance impacts could occur during all phases of construction under Alternative B. Surface disturbing activities associated with access roads, CUAs, staging areas, and replacement of the conveyance pipeline could remove or degrade wildlife habitat and cause disturbance and displacement of wildlife. Reduced visibility during nighttime work could increase wildlife collisions with worker vehicles, and thereby increase the potential for wildlife injury or mortality, particularly for nocturnal species. Removal of shrubs and trees during the bird nesting period could cause nest failure and mortality of migratory birds. Noise disturbances associated with

construction activities could temporarily displace and disturb wildlife. Noise impacts are more pronounced during sensitive periods such as mule deer and mountain goat parturition and lactation periods when feeding young and hiding them from predators is paramount. These impacts would be avoided or minimized to negligible levels through implementation of biological resources BMPs (see **Appendix B**). Applicable BMPs include removing or modifying vegetation outside the breeding bird season, conducting nest surveys prior to activities and establishing buffer zones around active nests, and avoiding high noise disturbance activities during mule deer and mountain goat sensitive periods.

Impacts to wildlife are closely tied to vegetation types they occur in. The majority of the terrestrial wildlife Analysis Area is comprised of Developed and Landscaped (265 acres) and Disturbed Ponderosa Pine Woodland and Savanna (121 acres; see **Map A-11** in **Appendix A**). Both of these vegetation types have limited potential to support high wildlife diversity due to degraded and modified vegetation communities as well as human disturbances, thus, vegetation removal in these types would have relatively minor effects on terrestrial wildlife.

There are no areas of the Riparian Woodland and Shrubland vegetation type that would directly be disturbed, although 21.1 acres are within approximately 0.25 miles of the Project Area (within the terrestrial wildlife Analysis Area). This habitat type occurs around the Icicle Creek Historical Channel, and would be separated from construction activities by the Hatchery Channel, the Hatchery grounds, and disturbed or developed vegetation types. As a result, potential disturbance impacts to wildlife using the Riparian Woodland and Shrubland vegetation type in the Historical Channel are expected to be negligible.

Similarly, mature coniferous and deciduous forest provide habitat for a variety of wildlife species because of the vegetation diversity and availability of forage and nest sites. Mixed Conifer Forest that could be directly disturbed by proposed project activities near the intake construction area. However, there are approximately 109 acres of Mixed Conifer Forest in the surrounding wildlife Analysis Area which wildlife would be able to easily move to in order to avoid direct disturbance in the work area. Furthermore, the larger surrounding region (e.g., the Okanogan-Wenatchee National Forest) has more natural and undisturbed conifer forests, which terrestrial wildlife would prefer and could move to during project activities. As a result, potential disturbance impacts to wildlife using the Mixed Conifer Forest vegetation type are expected to be minimal to negligible.

No acres of Montane Foothill- Deciduous Shrubland would be directly disturbed and the 84 acres in the terrestrial wildlife Analysis Area are separated from the project area by Icicle Creek, Icicle Creek Road, other vegetation types, and developed areas. As a result, potential disturbance impacts to wildlife using the Montane Foothill- Deciduous Shrubland vegetation type are expected to be negligible.

Effects from specific phases of construction under Alternative B are described below.

Phase I

Approximately 1.02 acres of Mixed Conifer Forest could be removed short term during Phase I construction activities; approximately 0.18 acres of which would be removed long term. Most

terrestrial wildlife in the Analysis Area are adapted to disturbed habitats departed from natural historic conditions and tolerant of human disturbances. In addition, they are typically mobile and can move away from temporary construction disturbance to nearby higher quality habitat. Therefore, effects on terrestrial wildlife from disturbance, injury or mortality would be negligible.

Removal or modification of trees in the intake construction area and adjacent pipeline replacement corridor could reduce nesting habitat for migratory birds. However, the minimal amount of vegetation removal at the intake construction area and adjacent pipeline replacement corridor, compared with the amount of suitable nesting habitat in the surrounding area means that the loss of suitable nesting areas at the intake construction area would be a negligible effect and would not significantly impact bird populations.

Furthermore, revegetation efforts, including seeding disturbed areas with a native herbaceous seed mix under Phase I would mitigate habitat loss over the long term by returning vegetation to pre-construction conditions. Planting native riparian and upland vegetation (see *Phase III*) would improve habitat by increasing riparian and upland species and structural diversity compared with current habitat conditions.

Phase II

The majority of the project disturbances under Phase II would occur in developed and disturbed habitats, as approximately 0.4 acres of Mixed Conifer Woodland, 2.6 acres of Developed and Landscaped vegetation and 4.1 acres of Disturbed Ponderosa Pine Woodland and Savanna vegetation types would be affected. As under Phase I, effects on terrestrial wildlife from disturbance, injury or mortality would be negligible as these species would be expected to move away from temporary construction disturbance to nearby higher quality habitat. Implementation of migratory bird and vegetation BMPs (**Appendix B**, Best Management Practices), as described above, would avoid or minimize impacts to nesting birds. Revegetation efforts, including seeding disturbed areas with a native herbaceous seed mix would mitigate habitat loss over the long term by returning habitat to pre-construction conditions.

Phase III

Revegetation efforts could cause temporary disturbance and displacement of wildlife due to human presence. Impacts would last only a short duration during tree and shrub plantings. Planting native riparian and upland vegetation would improve terrestrial wildlife habitat by increasing riparian and upland species and structural diversity compared with current habitat conditions.

Special Status Terrestrial Wildlife Species

Special status terrestrial wildlife species have no to low potential for occurrence in the Analysis Area (see **Table 5**). Temporary and localized disturbance from project activities under Alternative B, as described above, could occur if special status terrestrial wildlife species are present. However, most special status species require higher quality and continuous habitat which is lacking in the Analysis Area. Therefore, changes to acres of suitable special status terrestrial species habitat are not anticipated. These species also tend to be less tolerant of human disturbance and would avoid Developed and Landscape and Disturbed Ponderosa Pine Woodland and Savanna vegetation types.

Potential for disturbance, injury, and mortality of terrestrial special status species would be negligible.

4.4 Alternative C

As described in **Section 1.2**, Alternatives, construction activities under Phase I do not differ between Alternative B and Alternative C. Impacts described under Alternative B Phase I would be the same for vegetation, fisheries and aquatic ecosystems, terrestrial wildlife, and special status species.

4.4.1 Vegetation, Including Special Status Plant Species

Phase I

Since construction activities under Phase I would not differ between Alternative B and Alternative C, impacts from Phase I as described under Alternative C would be the same as those described under Alternative B.

Phase II

Impacts on native vegetation from Phase II construction would be reduced compared to Alternative B. This is because the entire conveyance pipeline on USFWS property near the intake construction area would be rehabilitated by lining using CIPP, and no pipeline would be replaced. Thus, total ground disturbance and native vegetation removal would be reduced under this alternative; disturbance of the 0.4 acres of Mixed Conifer Woodland that would occur under Alternative B would not occur and large ponderosa, Douglas fir, and cottonwoods would remain. The reduction in total ground disturbance would also reduce the likelihood of increasing the extent of nonnative, invasive, and noxious plant species. Less native reseeding would be required during Phase II under this alternative, which may slightly reduce opportunities to increase species structural diversity compared to Alternative B.

Phase III

Impacts would be similar to those described for Alternative B, except that slightly less revegetation effort would be required since there would be less ground disturbance and vegetation removal during conveyance pipeline rehabilitation under Phase II. Less native vegetation would need to be replanted under this alternative which may slightly reduce opportunities to increase species diversity and structural diversity compared to Alternative B.

Special Status Plant Species

Impacts on ESA-listed plant species would be as described for Alternative B. For other special status plant species, the potential for direct removal and suitable habitat loss would be reduced relative to Alternative B, because less vegetation removal in the Icicle Creek riparian zone would occur. Further, the reduction in total ground disturbance would also reduce the likelihood of increasing the extent of nonnative, invasive, and noxious plant species, preventing degradation of current habitat quality for special status plant species.

4.4.2 Fisheries, Including Special Status Fish and Aquatic Ecosystems

Alterations to aquatic habitat quantity and quality, critical habitat, and EFH, and potential for injury or mortality of fish species, would be similar to those described in Alternative B. Under Alternative C, there would be less vegetation removal in the Icicle Creek riparian zone during conveyance pipeline rehabilitation (Phase II) than under Alternative B. This is because the entire conveyance pipeline length between the PISMA and the adjacent private parcel would be lined with CIPP, and no pipeline would be replaced. As a result, loss of shade-generating vegetation would be reduced, and more trees would remain to provide inputs of woody materials to the creek, compared with Alternative B. Therefore, potential impacts to habitat quality such as elevated water temperatures from reduced shading and alteration of water quality parameters from increased erosion and sedimentation would be reduced, relative to Alternative B. Extraordinary maintenance activities would be expected to occur every few years and would be expected to continue into the future. Impacts from extraordinary maintenance activities would be the same as described under Alternative B.

4.4.3 Terrestrial Wildlife, Including Special Status Terrestrial Wildlife Species

Under Alternative C, impacts on terrestrial wildlife species and special status terrestrial wildlife species would be similar to those described in Alternative B. However, under Alternative C, there would be less vegetation removal in the Icicle Creek riparian zone during conveyance pipeline rehabilitation (Phase II) than under Alternative B. Disturbance of the 0.4 acres of Mixed Conifer Woodland that would occur under Alternative B would not occur under Alternative C. This is because the entire conveyance pipeline length between the PISMA and the adjacent private parcel would be lined with CIPP, and no pipeline would be replaced. As a result, effects from potential disturbance, injury and mortality to terrestrial wildlife species would be slightly reduced, as would the amount of suitable wildlife habitat that would be removed, compared with Alternative B. Because total ground disturbance and native vegetation removal would be reduced under this alternative, large ponderosa pine, Douglas fir, and cottonwood would remain as habitat for wildlife species. Overall, effects to terrestrial wildlife indicators would be negligible.

4.5 Alternative D

4.5.1 Vegetation, Including Special Status Plant Species

Effects would be the same as described under Alternative B.

4.5.2 Fisheries, Including Special Status Fish and Aquatic Ecosystems

The types and nature of impacts to fish and aquatic ecosystems resulting from components and elements of the surface water intake facilities and Phase I construction activities would be the same as those described for Alternative B. However, under Alternative D, Phase I construction would be limited to 7:00 a.m. – 10:00 p.m. Additionally, instead of the cofferdams remaining in Icicle Creek until November 15 for two in-water work windows, they would be removed two weeks earlier, by October 31 of each year, and would be placed and removed for a total of four in-water work windows. As a result, Phase I construction would require four years, and four in-water work windows, to complete in comparison to the two in-water work windows described for Alternative B. The types of impacts to fish and aquatic ecosystems described under Alternative D would occur

over separate in-water work windows, creating a longer total duration of impacts to fish and aquatic species.

Although the in-water work window would be two weeks shorter under Alternative D relative to Alternative B, it would still extend beyond the approved in-water work window for Icicle Creek of July 1 to August 15 (USACE 2018). Working outside the approved window would increase the duration of impacts to aquatic habitat by extending the length of time that in-water work would occur, though to a lesser extent (2 weeks shorter) than Alternative B. This may result in changes to the number and types of species and life stages of fish species that are present in the Analysis Area. For example, the potential for injury or mortality of special status fish species may decrease slightly under Alternative D relative to Alternative B due to the 2-week shorter in-water work window. This is because salmon are particularly vulnerable to disturbance during the fall and winter when adults are migrating and spawning; there would be less overlap of the in-water work window with salmon migration and spawning periods under Alternative D, and thus, less potential for effects such as disturbance to interfere with these essential life history functions. There would also be lower potential for interference (e.g., due to reduced spawning habitat) with Bull Trout spawning in late fall as a result of the shorter in-water work window under Alternative D relative to Alternative B.

The in-water construction under Alternative D over additional seasons, including installation and removal of cofferdams, would result in additional impacts on listed and non-listed fish species and habitat, compared with Alternative B. Although the types of impacts would be the same as those described for Alternatives B, these impacts could be realized for an additional two construction seasons. These would include temporary alterations to fish passage, stream geomorphology, and water quality and quantity in Icicle Creek, and additional direct effects to fish species from construction noise, and stress from handling and salvage from the in-water work area. However, impacts would not occur during the first two weeks of November when flows and the risk of cofferdam failure would be higher. Further, because the surface water intake would remain unscreened for additional seasons, listed fish could continue to be entrained into the unscreened intake for a longer time. Because these effects would occur to listed fish species, they could be considered take. As described under Alternative B, impacts would be minimized through BMPs (**Appendix B**).

Inundating the area of the partially constructed intake headworks after cofferdam removal at the end of the 2022 in-water work window would potentially increase the possibility for injury or mortality of fish relative to Alternative B. This is because fish could become entrained in areas where water is isolated due to the partially constructed intake area. For example, there would likely be at least a small strip along the 2-foot foundation slab that could fill with water at higher flows and be isolated from the stream when flows decrease.

Fish may be stranded inside the construction work area established by cofferdam placement. USFWS personnel would capture and remove any fish found stranded inside the work area. To minimize harm from capture, handling, and relocation into Icicle Creek, this process would be done by qualified biologists, in accordance with the USFWS (2012) *Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards for Bull Trout.*

Limiting construction to workday hours of 7:00 a.m. and 10:00 p.m. under Alternative D would reduce impacts to some fish species, such as Bull Trout, which are primarily nocturnal. This is because species that are inactive during the day would be less likely to be disturbed by daytime construction activities because they would not be engaging in activities such as foraging that could otherwise be disrupted.

Under Alternative D, pumping of two high capacity pumps to provide 40 cfs of water to the Hatchery during Phase I construction would occur 24 hours per day, 7 days per week for 8 months (November 1, 2022 to June 30, 2023). Sound generated by pumps may result in temporary behavioral impacts to fish and aquatic species, such as avoidance of the immediate area, while pumping is ongoing, and these effects would last 8 months longer under Alternative D as compared to Alternative B under which pumping would occur for approximately 7 days in 2022 and 3 days in 2023. Avoidance of the immediate area and displacement into other areas of Icicle Creek while pumping is ongoing may interfere with overwintering, spawning, and migration of fish species for which the 8-month temporary Hatchery water supply pumping period overlaps these life history phases.

Although long-term reliable delivery of water and the ability to meet Hatchery production goals would be improved under this alternative in comparison to Alternative A – No Action, there would be a risk of temporary impacts to Hatchery production from relying on pumps operating continuously for 8 months from 2022-2023. If pumps fail, and back-up pumps do not respond effectively in time, there could be a catastrophic loss of fish. Further, pumping water from the spillway pool would recirculate Hatchery effluent water, as the pool is the location of the Hatchery's main discharge point. Over time, without water treatment, pathogen loading to the fish would be increased and water quality reaching the Hatchery decreased, compromising health of Hatchery fish.

During the second in-water work window in 2023, impacts resulting from preparation for and installation of cofferdams and the gravity bypass pipeline and gravity bypass outlet would be similar to those described above and under Alternative B, including temporary reduction of fish passage and potential blocking of spawning habitat due to cofferdam installation, potential entrainment of fish in the gravity bypass pipeline, disturbance from cofferdam placement, and noise and vibration from the use of construction equipment. Except for installing the gravity bypass pipeline and gravity bypass outlet, this would also be true for the 2024 and 2025 in-water work windows. Removing cofferdams two weeks earlier each season would minimize the risk of overtopping or failure in comparison to Alternative B. Overall, impacts to fish and aquatic species and habitats would be repeated over four construction seasons under Alternative D as opposed to two seasons under Alternative B.

During the 2024 in-water work window, impacts from construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel (which entail placement of cofferdams, dewatering of the construction area, regrading of the stream channel bottom, construction of the low-flow boulder weir fishway and the left bank portion of the roughened channel and, removal of the cofferdam) would be the same as those described under Alternative B with additional (repeated) temporary impacts from mobilization and demobilization. Likewise, during the 2025 in-water work window, impacts from construction of the remaining portion of the roughened channel would be

the same as those described under Alternative B with additional impacts from mobilization and demobilization. Phase I construction would not be completed until fall of 2025, approximately 29 months past the May 2023 Biological Opinion deadline.

Impacts from Phase II construction activities and schedule and Phase III revegetation efforts would be the same as those described under Alternative B.

4.5.3 Terrestrial Wildlife, Including Special Status Terrestrial Wildlife Species

Effects would be the same as described under Alternative B.

4.6 Short-Term Uses and Long-Term Productivity

Alternative B, Alternative C, and Alternative D would improve long-term productivity of biological resources, especially fisheries. This would come about from improved fish passage and access to upstream habitat, and minimization of take from upgrading to current fish passage and screening criteria. In addition, Phase III rehabilitation would increase the structural diversity and species composition of upland and riparian vegetation near the intake construction area compared with existing conditions. This would potentially improve the long-term productivity of vegetation communities, wildlife habitat, and water quality.

4.7 Unavoidable Adverse Impacts

Under the No Action alternative, adverse impacts to fish passage, aquatic habitat quantity and connectivity, and habitat quality resulting from the existing surface water intake and delivery system would continue. Continuing current operations and maintenance of the deteriorating facilities would not fulfill the requirements of the 2017 Biological Opinion (NMFS 2017). The unreliability of the system would also jeopardize the Hatchery's objectives for Spring Chinook Salmon production.

4.8 Irreversible and Irretrievable Commitment of Resources

There are no irreversible or irretrievable commitments for biological resources.

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Chapter 5. Glossary

Invasive plants—Nonnative plants that have been introduced into an environment that they did not evolve in and are capable of establishing free-living populations in areas beyond their natural range of dispersal.

Noxious weeds—Designated and regulated by state and federal laws because they are known to be detrimental to agriculture, commerce, natural resources, and public health. Noxious weeds are a subset of invasive plants.

Riparian Zone—The land adjacent to streams, rivers, ponds, lakes, and those wetlands whose soils and vegetation are influenced by ponded or channelized water. They are the transition areas between aquatic and upland habitats often with elements of both ecosystems (WAC 220-660-030).

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Appendix A

Maps

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BUREAU OF RECLAMATION

Map A-1
Project Area Overview

- Potential Temporary Disturbance Area
- Staging
- Temporary Pump
- Road
- LNFH Production Facilities and Associated Structures
- Pipeline Rehabilitation
- Construction Vehicle Turnaround
- Temporary Access Routes
- Spillway Pool
- Trailhead
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Land Ownership

- Private
- Chelan-Douglas Land Trust
- Fish and Wildlife Service
- Forest Service
- Icicle Irrigation District
- City of Leavenworth
- Chelan County

To HWY 2

To HWY 2

Icicle Rd

E Leavenworth Rd

Fishing Access Rd

Icicle Creek

Fish Hatchery Rd

Leavenworth National Fish Hatchery

Spillway Pool

Structure 5

Icicle Creek Rd

Hatchery Channel

Cyo Rd

Intake Facilities

Structure 2

Historical Channel

Icicle Creek Rd

Forest Service Wilderness Area Kiosk

Snow Lakes Trailhead

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
November 11, 2020
L_SWISP_RRpts_overview.mxd
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N

0 500 1,000

Feet

BUREAU OF RECLAMATION

Map A-2
Alternative A: No Action

- Existing Intake Facilities
- Spillway Pool
- Trailhead
- Vehicle Parking
- Road
- Conveyance Pipeline
- LNFH Production Facilities and Associated Structures
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Icicle Rd
E Leavenworth Rd
Fishing Access Rd
Icicle Creek
Fish Hatchery Rd
Leavenworth National Fish Hatchery
Spillway Pool
Structure 5
Section of Worst Condition Pipeline (8 feet)
Icicle Creek Rd
Cyo Rd
Hatchery Channel
Structure 2
Historical Channel
Section of Worst Condition Pipeline (6 feet); at Bifurcation Point
Forest Service Wilderness Area Kiosk
Snow Lakes Trailhead
flow >>

N

0 250 500
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
November 11, 2020
L_SWISP_RRpts_AltAnoAction.mxd

BUREAU OF RECLAMATION

Map A-3
Alternative A: No Action (Intake)

Conveyance Pipeline

Stairs

Intake Trashrack Structure

Intake Channel

Access Road

Icicle Creek Rd

Gatehouse

flow >>

Outlet Channel

Fish Ladder/ Sediment Sluice

Low-Head Diversion Dam

Icicle Creek

flow >>

N

0 50 100

Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
November 11, 2020
L_SWISP_RRpts_AltAnoActionIntake.mxd
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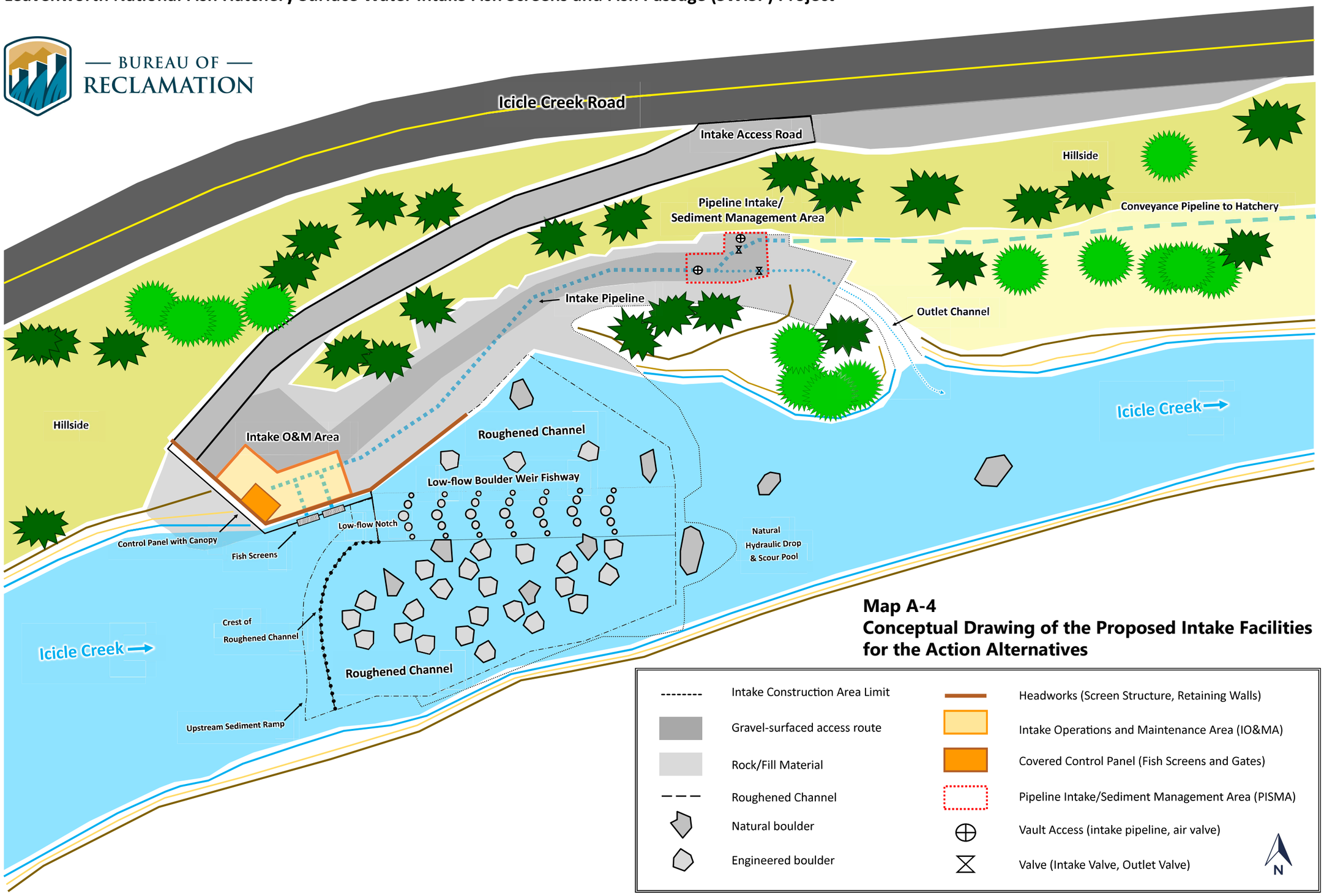
Leavenworth National Fish Hatchery Surface Water Intake Fish Screens and Fish Passage (SWISP) Project

BUREAU OF RECLAMATION



Map A-4
Conceptual Drawing of the Proposed Intake Facilities for the Action Alternatives

--------	Intake Construction Area Limit		Headworks (Screen Structure, Retaining Walls)
	Gravel-surfaced access route		Intake Operations and Maintenance Area (IO&MA)
	Rock/Fill Material		Covered Control Panel (Fish Screens and Gates)
— — —	Roughened Channel		Pipeline Intake/Sediment Management Area (PISMA)
	Natural boulder	⊕	Vault Access (intake pipeline, air valve)
	Engineered boulder	⧖	Valve (Intake Valve, Outlet Valve)

N

BUREAU OF RECLAMATION

Map A-5
Alternative B (Proposed Action) and Alternative D

Phase I

- Intake Facilities
- Temporary Access Route

Phase II

- Construction Area
- Contractor Use Area (CUA)
- Temporary Pump and Pipeline
- Temporary Access Route
- Conveyance Pipeline lined with Cure-in-Place Pipe (approximately 4,000 feet)
- Pipeline Replacement
- Access Routes

Phase I and II

- Staging and Storage Site for Construction Equipment and Materials, and Construction Staff Administration
- Construction Vehicle Turnaround/ Vehicle Parking
- Road
- Spillway Pool
- Trailhead
- LNFH Production Facilities and Associated Structures
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Icicle Rd
E Leavenworth Rd
Fishing Access Rd
Contractor trailer, storage
Reclamation trailer
Icicle Creek
Fish Hatchery Rd
Leavenworth National Fish Hatchery
Spillway Pool
Structure 5
Staging
Control Valve Vault
Icicle Creek Rd
5
Replacement Pipeline (Approx. 1,660 feet)
4
Cyo Rd
Staging
Hatchery Channel
3
Intake Facilities *See Map 2-5 for Additional Details
1
Icicle Creek
Historical
Structure 2
2
Replacement Pipeline (Approx. 520 feet)
flow >>
Icicle Creek Rd
Forest Service Wilderness Area Kiosk
Icicle Creek
Snow Lakes Trailhead

N

0 250 500
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
November 11, 2020
L_SWISP_RRpts_AltBproposed.mxd
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BUREAU OF RECLAMATION

Map A-6
Alternative B (Proposed Action) and Alternative D: Intake

Phase I
- Intake Facilities
- Gravity Bypass Outlet
- Gravity Bypass Pipeline
- Temporary Access Route

Phase II
- Conveyance Pipeline lined with Cure-in-Place Pipe
- Pipeline Replacement
- Construction Area
- Contractor Use Area (CUA)

N

0 50 100
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
November 11, 2020
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BUREAU OF RECLAMATION

Map A-7
Alternative C

Phase I

- Intake Facilities
- Temporary Access Route

Phase II

- Construction Area
- Contractor Use Area (CUA)
- Temporary Pump and Pipeline
- Temporary Access Route
- Conveyance Pipeline lined with Cure-in-Place Pipe (approximately 4,520 feet)
- Pipeline Replacement
- Access Routes

Phase I and II

- Staging and Storage Site for Construction Equipment and Materials, and Construction Staff Administration
- Construction Vehicle Turnaround/ Vehicle Parking
- Road
- Spillway Pool
- Trailhead
- LNFH Production Facilities and Associated Structures
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Icicle Rd
E Leavenworth Rd
Fishing Access Rd
Contractor trailer, storage
Reclamation trailer
Icicle Creek
Fish Hatchery Rd
Leavenworth National Fish Hatchery
Spillway Pool
Structure 5
Staging
Control Valve Vault
Icicle Creek Rd
5
Replacement Pipeline (Approx. 1,660 feet)
4
Cyo Rd
Staging
Hatchery Channel
3
Intake Facilities
*See Map 2-7 for Additional Details
Icicle Creek
Historical
Structure 2
2
flow >>
Icicle Creek Rd
Forest Service Wilderness Area Kiosk
Icicle Creek
Snow Lakes Trailhead

N

0 250 500
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
November 11, 2020
L_SWISP_RRpts_AltC.mxd
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BUREAU OF RECLAMATION

Map A-8
Alternative C (Intake)

Phase I

- Intake Facilities
- Gravity Bypass Outlet
- Gravity Bypass Pipeline
- Temporary Access Route

Phase II

- Conveyance Pipeline lined with Cure-in-Place Pipe

0 50 100
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
November 11, 2020
L_SWISP_RRpts_AltCproposedIntake.mxd

BUREAU OF RECLAMATION

Map A-9
Vegetation Analysis Area

- Vegetation Analysis Area
- Vegetation Classification
  - Developed and Landscaped
  - Disturbed Ponderosa Pine Woodland and Savanna
  - Mixed Conifer Forest
- LNFH Production Facilities and Associated Structures
- Spillway Pool
- Intake Facilities
- Conveyance Pipeline
- Road
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Fish Hatchery Rd
Leavenworth National Fish Hatchery
Icicle Creek Rd
Icicle Creek
flow >>
Spillway Pool
Structure 5
Hatchery Channel
Cyo Rd
Structure 2
Historical Channel
Intake Facilities

0 150 300
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
November 11, 2020
L_SWISP_RRpts_vegetation.mxd
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BUREAU OF RECLAMATION

Map A-10
Fisheries, Aquatic Ecosystems, and Water Resources Analysis Area

- Fisheries, Aquatic Ecosystems, and Water Resources Analysis Area
- Intake Facilities
- Trailhead
- Conveyance Pipeline
- LNFH Production Facilities and Associated Structures
- Boulder Field
- Ecology Compliance Point
- Spillway Pool
- Construction Vehicle Turnaround
- Temporary Pump
- Road
- LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Icicle Rd
E Leavenworth Rd
Ecology Compliance Point
Flow
Fishing Access Rd
Icicle Creek
Fish Hatchery Rd
Leavenworth National Fish Hatchery
Spillway Pool
Structure 5
Icicle Creek Rd
Cyo Rd
Hatchery Channel
Intake Facilities
Structure 2
Historical Channel
Forest Service Wilderness Area Kiosk
Boulder Field
Snow Lakes Trailhead

N

0 250 500
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
November 11, 2020
L_SWISP_RRpts_FishWildlife.mxd
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BUREAU OF RECLAMATION

Map A-11
Terrestrial Wildlife Analysis Area

Terrestrial Wildlife Analysis Area

Intake Facilities

Construction Vehicle Turnaround

Conveyance Pipeline

LNFH Production Facilities and Associated Structures

Spillway Pool

Contractor Staging Area

Temporary Pump

Road

LNFH Sand Settling Basin and Inside and Outside Screen Chambers

Vegetation Classification

- Developed and Landscaped
- Sparsely Vegetated Woodland and Shrubland
- Disturbed Ponderosa Pine Woodland and Savanna
- Mixed Conifer Forest
- Montane Foothill- Deciduous Shrubland
- Bedrock, Cliffs, and Talus Slopes
- Open Water
- Riparian Woodland and Shrubland
- Freshwater Wetland

0 250 500
Feet

Source: Reclamation GIS 2020
U.S. Department of the Interior
Bureau of Reclamation
Columbia Cascades Area Office
November 13, 2020
L_SWISP_RRpts_WildlifeTerrestrial.mxd
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Appendix B

Best Management Practices

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Appendix B. Best Management Practices

B.1 Best Management Practices

To minimize impacts on resources from the Proposed Action, the Best Management Practices (BMPs) described in **Table B-1** would be implemented. BMPs are drawn from the following sources:

- Biological opinions for LNFH operations, issued by the USFWS (addressing threatened Bull Trout; USFWS 2011) and by the NMFS (addressing endangered spring Chinook Salmon and threatened Steelhead; NMFS 2015, NMFS 2017a).
- General Conservation Measures (GCMs) for ESA-listed salmonids in the programmatic biological opinion for USACE permitting of fish passage and restoration actions in Washington State (FPRPIII; NMFS 2017a).
- GCMs for Bull Trout and other ESA-listed salmonids in the programmatic biological opinion for the Washington State fish passage and habitat enhancement and restoration program (NMFS and USFWS 2008)[1].
- Measures described in the construction specifications, including measures associated with site layout, temporary access, staging and stockpile areas, equipment use, erosion control, dust abatement, timing of in-water work and worksite isolation, and spill prevention and control.

Reclamation would also obtain required regulatory permits and implement terms and conditions contained therein. If permit requirements, BMPs, or other measures contradict each other, the contract specification requires that the contractor abide by the most stringent of requirements. A list of general, applicable permit conditions is included following **Table B-1**.

[1] This combined agency programmatic biological opinion expired on December 31, 2013. The USACE and NMFS reinitiated consultation and NMFS has issued subsequent biological opinions for the nationwide permit program. However, the USACE has been operating under consultation extensions from USFWS, with the most recent extension expiring June 30, 2020. Reclamation anticipates that ESA Section 7 consultation with the USFWS for the SWISP Project will result in similar conservation measures as those contained in the expired programmatic biological opinion.

Table B-1. Best Management Practices

Resource Topic	Best Management Practice
General	• Heavy equipment use will be limited to that with the least adverse effects on the environment (e.g. minimally-sized, low ground pressure equipment, use of matting, etc.; NMFS 2017a). • Conduct operations to prevent unnecessary destruction, scarring, or defacing of natural surroundings in the vicinity of the work.
Air Quality and Climate	• Dust control and abatement measures will be implemented during construction. • Vehicle traffic on unpaved surfaces would be limited to 10 miles per hour to minimize dust generation. • Vehicle traffic on government rights-of-way, dirt roads, and paved roads through LNFH property would be limited to 10 miles per hour. • Prevent, control, and abate dust pollution on government rights-of-way. • Provide labor, equipment, and materials, and use efficient methods wherever and whenever required to prevent dust nuisance or damage to persons, property, or activities. • Provide means for eliminating atmospheric discharges of dust during mixing, handling, and storing of cement, pozzolan, and concrete aggregate. • Use reasonably available methods and devices to prevent, control, and otherwise minimize atmospheric emissions or discharges of air contaminants. • Do not operate equipment and vehicles that show excessive exhaust gas emissions until corrective repairs or adjustments reduce such emissions to acceptable levels.
Geology and Soils	• The number of temporary access roads will be minimized, and roads will be designed to avoid adverse effects like creating excessive erosion (NMFS 2017a). • Temporary roads and trails across slopes greater than 30 percent will be avoided when feasible (NMFS 2017a). • Existing roadways or travel paths will be used whenever possible (NMFS 2017a).
Water Resources (Stream Conditions)	• Coffer dam placement will maintain natural stream flow, minus the 40 cfs diversion to the hatchery, within the greatest amount of natural streambed width as possible. • Additional flow outage shall require the prior written approval of the COR, and of appropriate Federal and State water quality control agencies.

Resource Topic	Best Management Practice
Water Resources (Water Quality)	**General** • Perform construction activities by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, or other pollutants or wastes into streams, flowing or dry watercourses, lakes, wetlands, reservoirs, or underground water sources. • Measures shall be taken to ensure that no petroleum products, hydraulic fluid, fresh cement, sediments, sediment-laden water, chemicals, or any other toxic or deleterious materials are allowed to enter or leach into waters of the U.S. (NMFS 2017a). • The use of acids for cleaning or preparing concrete surfaces for repair will not be permitted. **In-water work** • Prepare a Work Area Isolation Plan for all work below the bankfull elevation requiring flow diversion or isolation. Include the sequencing and schedule of dewatering and rewatering activities, plan view of all isolation elements, as well as a list of equipment and materials to adequately provide appropriate redundancy of all key plan functions (e.g., an operational, properly sized backup pump and/or generator) (NMFS 2017a). • Use of rapidly deployable prefabricated cofferdam systems would minimize impacts to subgrade and surrounding water. • When conducting in-water or bank work, machine hydraulic lines will be filled with vegetable oil for the duration of the Project to minimize impacts of potential spills and leaks. • Spill prevention and clean-up kits will be on site when heavy equipment is operating within 25 feet of the water (NMFS 2017a). • To the extent feasible, work requiring use of heavy equipment will be completed by working from the top of the bank (i.e. landward of the OHWM or extreme high tide line) (NMFS 2017a). • Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities around the water (NMFS 2017a). • Equipment will cross the stream in-water only under the following conditions: (NMFS 2017a). o A. Equipment is free of external petroleum-based products, soil and debris has been removed from the drive mechanisms and undercarriage; and o B. The substrate is bedrock or coarse rock and gravel; or o C. Mats or logs are used in soft bottom situations to minimize compaction while driving across streams; and

Resource Topic	Best Management Practice
Water Resources (Water Quality, continued)	○ D. Stream crossings will be performed at right angles (90 degrees) to the bank if possible; and ○ E. No stream crossings will be performed at spawning sites when spawners of ESA listed fishes are present or eggs or juvenile fish could be in the gravel; and ○ F. The number of crossings will be minimized. • Project operations will cease under high flow conditions that could inundate the Project Area, except as necessary to avoid or minimize resource damage (NMFS 2017a). • If high flow or high tide conditions that may cause siltation are encountered during the Project, work shall stop until the flow subsides or the tide falls (NMFS 2017a). • Where practicable, a turbidity and/or debris containment device shall be installed prior to commencing in-water work (NMFS 2017a). • When working in-water, some turbidity monitoring may be required, subject to the Corps permit requirements or CWA section 401 certification. Turbidity monitoring generally is required when working in streams with more than 40 percent fines (silt/clay) in the substrate. Turbidity will be monitored only when turbidity generating work takes place, for example, installation of coffer dams, pulling the culvert in-water, reintroducing water. The applicant will measure the duration and extent of the turbidity plume (visible turbidity above background) generated. The data will be submitted to the Corps, NMFS, and the USFWS immediately following Project construction. Turbidity measurements will be taken in NTUs and are used by project proponents to develop procedures to minimize turbidity and estimate take for future projects (NMFS 2017a). • Equipment used in the instream channel will have containment methods to address possible fuel and oil leaks. **Erosion and spill prevention and control** • A Temporary Erosion and Sediment Control plan and a Spill Prevention Control and Containment plan, commensurate with the size of the Project, must be prepared and carried out to prevent pollution caused by surveying or construction operations (NMFS 2017a). • A Spill Prevention, Control, and Clean-Up plan will be prepared prior to construction for every project that utilizes motorized equipment or vehicles (NMFS 2017a). • A spill prevention and countermeasures plan (SPCC) in accordance with 40 CFR, Part 112 is required where release of oil and oil products could reasonably be expected to enter into or upon navigable waters of the United States or adjoining shorelines in quantities that may be harmful (40 CFR, Part 110), and aggregate on site oil storage capacity is over 1,320 gallons. Only containers with capacity of 55 gallons and greater are included in determining on site aggregate storage capacity.

Resource Topic	Best Management Practice
Water Resources (Water Quality, continued)	**Erosion and spill prevention and control, continued** o Prevent, stop, and control spills or leaks during construction activities: o Stop source of spill or leak. o Stop migration of spill or leak. o Place berm of sorbent material around perimeter of spill. o Solidify free standing oil. • A supply of emergency erosion control materials will be on hand and temporary erosion controls will be installed and maintained in place until site restoration is complete (NMFS 2017a). • Landward erosion control methods shall be used to prevent silt-laden water from entering waters of the U.S. These may include, but are not limited to, filter fabric, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas (NMFS 2017a). • Control pollutants by use of sediment and erosion controls, wastewater and stormwater management controls, construction site management practices, and other controls including State and local control requirements. • Sediment and Erosion Controls: o Establish methods for controlling sediment and erosion which address vegetative practices, structural control, silt fences, straw dikes, sediment controls, and operator controls as appropriate. o Institute stormwater management measures as required, including velocity dissipators, and solid waste controls which address controls for building materials and offsite tracking of sediment. • Pollution Prevention Measures: o Use methods of dewatering, unwatering, excavating, or stockpiling earth and rock materials which include prevention measures to control silting and erosion, and which will intercept and settle any runoff of sediment-laden waters. o Prevent wastewater from general construction activities such as drainwater collection, aggregate processing, concrete batching, drilling, grouting, or other construction operations, from entering flowing or dry watercourses without the use of approved turbidity control methods. o Divert stormwater runoff from upslope areas away from disturbed areas.

Resource Topic	Best Management Practice

Water Resources
(Water Quality, continued)
	Erosion and spill prevention and control, continued
	• Turbidity Prevention Measures:
	  o Use methods for prevention of excess turbidity which include, but are not restricted to, intercepting ditches, settling ponds, gravel filter entrapment dikes, flocculating processes, recirculation, combinations thereof, or other approved methods that are not harmful to aquatic life.
	  o Wastewaters discharged into surface waters shall meet conditions of Clean Water Act section 402, the National Pollutant Discharge Elimination System (NPDES) permit.
	  o Do not operate mechanized equipment in waterbodies without having first obtained a Clean Water Act section 404 permit, and then only as necessary to construct crossings or perform the required construction.
	• Clean up spills or leaks in a manner that complies with applicable Federal, State, and local laws and regulations.
	• Dispose of spilled or leaked materials:
	  o Handle and dispose of spilled or leaked materials contaminated with 50 ppm or greater polychlorinated biphenyls.
	  o Handle and dispose of spilled or leaked materials not contaminated or contaminated with less than 50 ppm polychlorinated biphenyls in accordance with applicable Federal, State, and local regulations.
	Discharge water and wastes
	• All discharge water created by construction (e.g. concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) will be treated to avoid negative water quality and quantity impacts. Removal of fines may be accomplished with bioswales; concrete washout water with an altered pH, may be infiltrated (NMFS 2017a).
	• Wastewater from Project activities and water removed from within the work area shall be routed to an upland disposal site (landward of the OHWM or extreme high tide line) to allow removal of fine sediment and other contaminants prior to being discharged to the waters of the U.S. (NMFS 2017a).
	• All waste material such as construction debris, silt, excess dirt or overburden resulting from the Project will generally be deposited above the limits of flood water in an upland disposal site. However, material from pushup dikes may be used to restore microtopography (e.g., filling drainage channels) (NMFS 2017a).

Resource Topic	Best Management Practice
Water Resources (Water Quality, continued)	**Storage and staging** • When not in use, vehicles and equipment containing oil, fuel, and/or chemicals will be stored in a staging area located at least 150 feet from the Corps' jurisdictional boundary of wetlands and waterbodies. If possible, staging will be located at least 300 feet away from the Corps' jurisdictional boundary of wetlands and waterbodies, and on impervious surfaces to prevent spills from reaching ground water. If moving equipment between the staging area and the worksite would create unacceptable levels of disturbance (for example, requiring multiple stream crossings, multiple passes over sensitive vegetation), a closer staging location with an adequate spill prevention plan may be proposed (NMFS 2017a). • Equipment will not be stored overnight in the instream channel. • Do not stockpile or deposit excavated materials or other construction materials, near or on, stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff or can in any way encroach upon the watercourse. • Petroleum Product Storage Tanks Management. o Place oil or other petroleum product storage tanks at least 20 feet from streams, flowing or dry watercourses, lakes, wetlands, reservoirs, and any other water source. o Do not use underground storage tanks. o Construct storage area dikes at least 12 inches high or graded and sloped to permit safe containment of leaks and spills equal to storage tank capacity located in the area plus sufficient freeboard to contain the 25-year rainstorm. Line diked areas with an impermeable barrier at least 50 mils thick. o Areas for refueling operations: Lined with impermeable barrier at least 40 mils thick covered with 2 to 4 inches of soil. **Reclamation of temporary disturbance** • All temporary access will be removed (including gravel surfaces) and planted after Project completion (NMFS 2017a). • Within 7 calendar days from Project completion, any disturbed bank and riparian areas shall be protected using native vegetation or other erosion control measures as appropriate. For erosion control, sterile grasses may be used in lieu of native seed mixes. Alternative methods (e.g. spreading timber harvest slash) may be used for erosion control if approved by the Corps (NMFS 2017a).

Resource Topic	Best Management Practice
Water Resources (Water Rights)	• A total of 40 cfs shall be continuously provided to the LNFH during Phase I construction. • A total of 20 cfs shall be continuously provided to the LNFH during Phase II construction activities taking place from April 17 to May 20.
Biological Resources (Vegetation)	• Preserve natural landscape and preserve and protect existing vegetation not required or otherwise authorized to be removed. • Protect vegetation from damage or injury caused by construction operations, personnel, or equipment by the use of protective barriers or other approved methods. • Minimize, to the greatest extent practicable, clearings and cuts through vegetation. • Do not use trees for anchorages except in emergency cases or as approved by Reclamation. Where approved, wrap the trunk with a sufficient thickness of approved protective material before rope, cable, or wire is placed. • Use safety ropes where tree climbing is necessary; do not use climbing spurs. • Before bringing construction equipment on site, clean it to remove dirt, vegetation, and other organic material to prevent introduction of noxious weeds, and invasive plant and animal species. • Contractor cleaning procedures shall result in equipment being cleaned as well or better than the procedures described in Reclamation Cleaning Manual (Reclamation 2010). Reclamation will inspect construction equipment following procedures described in Reclamation Cleaning Manual before allowing the equipment onsite. • Restore contractor use areas to pre-construction condition. • Areas of temporary disturbance must be re-seeded according to a revegetation plan.

Resource Topic	Best Management Practice
Biological Resources (Fisheries and Aquatic Ecosystems)	**Riparian areas** • The removal of riparian vegetation for access will be minimized (NMFS 2017a). • All native, non-invasive organic material (large and small wood) cleared from the action area for access will remain on site (NMFS 2017a). • Boundaries of clearing limits associated with site access and construction will be marked to avoid or minimize disturbance of riparian vegetation, wetlands, and other sensitive sites (NMFS 2017a). • If native riparian vegetation is disturbed it will be replanted with native herbaceous and/or woody vegetation after Project completion. Planting will be completed between October 1 and April 15 of the year following construction. Plantings will be maintained as necessary for 3 years to ensure 50 percent herbaceous and/or 70 percent woody cover in year 3, whatever is applicable. For riparian impact areas greater than 0.5 of an acre, a final monitoring report will be submitted to the Corps in year 3. Failure to achieve the 50 percent herbaceous and 70 percent woody cover in year 3 will require the permittee to submit a plan with contingency measures to achieve standards or reasons to modify standards (NMFS 2017a). • Per NWP 27, post-planting monitoring may be required for up to 10 years in order to ensure an 80 percent planting survival rate is met. • Fencing will be installed as necessary to prevent access to revegetated sites by livestock, beavers or unauthorized persons. Beaver fencing will be installed around individual plants where necessary (NMFS 2017a).

Resource Topic	Best Management Practice
Biological Resources (Fisheries and Aquatic Ecosystems, continued)	**Fisheries and aquatic wildlife** • Instream work is limited to July 1 through November 15. • A minimum depth of 0.8 ft shall be maintained within the greatest amount of the natural stream channel width at all times with placement of cofferdams to facilitate fish passage. Fish passage criteria in Icicle Creek Fish Passage Evaluation for the Leavenworth National Fish Hatchery (Anglin et al. 2013, p. 26-28) should be consulted for minimum depth and maximum velocity criteria. The maximum velocity criteria on pages 26-28 are conservative, but attempts should be made to provide fish passage to the greatest extent practical across the natural stream channel width and hydrograph. • Work site dewatering will follow the Dewatering and Fish Capture Protocol in Appendix D (NMFS and USFWS 2008). Fish removal from dewatered work sites would be overseen by a fisheries biologist. Electrofishing for fish relocation/work area isolation must follow the most recent NMFS guidelines (NMFS 2017a). Record all incidents of listed fish being observed, captured, handled, and released (USFWS 2011). • Re-watering of the construction site occurs at such a rate as to minimize loss of surface water downstream as the construction site streambed absorbs water (NMFS and USFWS 2008). • The design of passage structures will follow the appropriate design standards in the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual (NMFS and USFWS 2008). • Roughened channels will be designed to standards contained in the most current version of the NMFS Anadromous Salmonid Fish Facility Design manual (NMFS and USFWS 2008). • Post-construction monitoring of the low-flow fishway would be done to ensure effectiveness. • Boulder weirs will be low in relation to channel dimensions so that they are completely overtopped during channel-forming, bankfull flow events. Boulder weirs will be placed diagonally across the channel or in more traditional upstream pointing "V" or "U" configurations with the apex oriented upstream (NMFS and USFWS 2008). • Boulder weirs will be constructed to allow upstream and downstream passage of all native listed fish species and life stages that occur in the stream at all flows (NMFS and USFWS 2008). • Boulder weirs shall be designed and inspected by a multidisciplinary team (including a salmon or trout biologist) that has experience with these types of structures (NMFS and USFWS 2008).

Resource Topic	Best Management Practice
Biological Resources (Fisheries and Aquatic Ecosystems, continued)	• Screens, including screens installed in temporary pump intakes, will be designed to meet standards in the most current version of the NMFS Anadromous Salmonid Passage Facility Design manual (NMFS and USFWS 2008). • Pumps used to dewater the work isolation area or supply temporary hatchery water during construction, will have a fish screen installed, operated and maintained according to NMFS' fish screen criteria (NMFS 2017a). • All fish screens will be sized to match the water users documented or estimated historic water use or legal water right, whichever is less. Water diversion rates shall not exceed the design capacity of the screen, as calculated by following NMFS Anadromous Salmonid Passage Facility Design manual (NMFS and USFWS 2008). • Irrigation diversion intake and return points will be designed (to the greatest degree possible) to prevent all native fish life stages from swimming or being entrained into the irrigation system (NMFS and USFWS 2008). • Do not use jackhammers in excess of 30 pounds without Reclamation approval. Blasting is not permitted. • Monitor, capture, and release listed fish species in the sand settling basin in accordance with applicable protocol in NMFS (2017a), USFWS (2011), and as identified through consultation for the Project's Biological Assessment. • Schedule annual intake maintenance to avoid the Bull Trout upstream migration period (USFWS 2011). • Disturbing natural-origin spawning salmon and Steelhead during hatchery maintenance activities of diversions and instream structures shall be avoided, as shall disturbing salmon and Steelhead redds (NMFS 2017b).

Resource Topic	Best Management Practice
Biological Resources (Terrestrial Wildlife)	• Schedule all necessary vegetation removal, trimming, and grading of vegetated areas outside of the bird breeding season (generally March 1 to August 31) to the maximum extent practicable. • Avoid construction activities during the bird breeding season to the extent practicable. When Project activities cannot occur outside the bird nesting season (March 1 to August 31), conduct surveys prior to scheduled activity to determine if active nests are present within the Wildlife Analysis Area and buffer any active nesting locations found during surveys. Surveys should be conducted by a qualified biologist no more than seven days prior to disturbance activities. If active nests are detected during these surveys a no-activity buffer zone around the nest will be established by a qualified biologist based on species, Project disturbance level, topography, existing disturbance levels, and habitat type until fledging has occurred. During ongoing Project activities if a bird establishes a new nest the nest vegetation will not be removed or modified but no buffer zone will be required. If there is a pause in Project activities greater than seven days an additional nesting bird survey would be needed. • Reclamation would minimize the highest construction noise disturbance to avoid or minimize impacts on mule deer and mountain goat during sensitive periods to the extent practicable. This is between mid-spring to early fall (May 1-September 30).
Cultural Resources	• As required by the Washington State Historic Preservation Officer, the *Plan and Procedures for the Inadvertent Discovery of Cultural Resources and Human Remains* (Inadvertent Discovery Plan) will be followed in the case of inadvertent discovery of cultural resources or human remains during construction. • A professional archaeological monitor will be present during ground-disturbing activities.
Land Use	• Restore contractor use areas to pre-construction condition.

Resource Topic	Best Management Practice
Transportation	• Perform work on rights-of-way established by the government as necessary to construct and maintain any roads, bridges, or drainage structures required for establishment and use of haul routes for construction operations. • Use existing available public highways, roads, or bridges as haul routes subject to applicable local regulations. • Minimize interference with or congestion of local traffic. • Provide barricades, flaggers, and other necessary precautions for safety of the public where haul routes cross public highways or roads. • Maintain roadways, parking areas, and haul routes in a sound, smooth condition. • Promptly repair ruts, broken pavement, potholes, low areas with standing water, and other deficiencies to maintain road surfacing and drainage in original or specified condition. • Meet requirements of the Manual on Uniform Traffic Control Devices for Streets and Highways, Part 6 (Temporary traffic control; https://mutcd.fhwa.dot.gov/) and WAC 296-155-305 (Signaling and flaggers). • Provide cones, delineators, concrete safety barriers, barricades, flasher lights, danger signals, signs, and other temporary traffic control devices as required to protect work and public safety. • Provide flaggers and guards as required to prevent accidents and damage or injury to passing traffic. • Do not begin work along public or private roads until traffic control devices for warning, channeling, and protecting motorists are in place in accordance with approved traffic control plan. • Provide unobstructed, smooth, and dustless passageway for one lane of traffic through construction operations except at times when vehicles will be turning around at the USFS kiosk or backing onto the Intake Access Road. • Provide unobstructed, smooth, and dustless passageway for one lane of traffic through construction operations. • Maintain convenient access to driveways and buildings along line of work. • Protect roads closed to traffic with effective barricades and warning signs. Illuminate barricades and obstructions from sunset to sunrise. • Remove traffic control devices when no longer needed.
Noise	• Do not use jackhammers in excess of 30 pounds without Reclamation approval. Blasting is not permitted.
Recreation	• There are no construction activities (such as parking, storage, or vehicle turnaround) allowed in the Forest Service Snow Lakes Trailhead parking lot.

Resource Topic	Best Management Practice
Visual Resources	• Minimize, to the greatest extent practicable, clearings and cuts through vegetation. Irregularly shape authorized clearings and cuts to soften undesirable aesthetic impacts.
Socioeconomics and Environmental Justice	• Reclamation policy is to avoid impacts on Indian sacred sites whenever possible. Continued coordination with affected Tribes may result in future identification of sacred sites. If this occurs, Reclamation would further evaluate impacts on these resources. Consultation with the Yakama Nation and Confederated Tribes of the Colville Reservation would identify how to protect sacred sites if they were identified and how to provide continued access if any such sites were affected by Project construction. • In-water work would not occur in the spillway pool during the Tribal fishing preparations or season.
Utilities	• A locate for underground utilities would be coordinated with the Washington Utility Notification Center (http://www.callbeforeyoudig.org/washington/index.asp) prior to construction.
Hazardous Materials and Public Health and Safety	• Vehicle traffic on government rights-of-way, dirt roads, and paved roads through LNFH property would be limited to 10 miles per hour. • Nuisance flows from seepage and leakage through the cofferdams will be managed to maintain a safe working environment. • Hazardous Waste Disposal: o Dispose by removal from jobsite. o Recycle hazardous waste whenever possible. o Dispose of hazardous waste materials that are not recycled at appropriately permitted treatment or disposal facilities. o Transport hazardous waste in accordance with 49 CFR 171-179. • Provide protection for personnel and existing facilities from harm due to demolition activities. • Arrange protective installations to permit operation of existing equipment and facilities by the government while work is in progress. • Inadvertent discovery of hazardous wastes or materials will be reported to Reclamation and Ecology within 24 hours of discovery. Construction in the vicinity of the discovery would cease until the appropriate disposal procedures were identified and carried out in coordination with Reclamation and Ecology.

Resource Topic	Best Management Practice
Tribal Interests	• Reclamation policy is to avoid impacts on Indian sacred sites whenever possible. Continued coordination with affected Tribes may result in future identification of sacred sites. If this occurs, Reclamation would further evaluate impacts on these resources. Consultation with the Yakama Nation and Confederated Tribes of the Colville Reservation would identify how to protect sacred sites if they were identified and how to provide continued access if any such sites were affected by Project construction.

Sources: As noted in table.

B.2 Regulatory Permit Terms and Conditions

Reclamation will obtain required regulatory permits and comply with the general, regional, and permit-specific terms and conditions contained therein. A general list of anticipated terms and conditions is included below. Regulating agencies may also impose additional conditions on a project-by-project basis.

B.1.1 U.S. Army Corps of Engineers Section 404 Nationwide Permits

USACE General Conditions for all NWPs

- Aquatic Life Movements. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species.
- Spawning Areas. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable.
- Suitable Material. Material used for construction or discharged must be free from toxic pollutants in toxic amounts.
- Fills Within 100-Year Floodplains. The activity must comply with applicable FEMA-approved state or local floodplain management requirements.
- Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.
- Removal of Temporary Fills. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.
- Proper Maintenance. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.
- Tribal Rights. No NWP activity may cause more than minimal adverse effects on tribal rights (including treaty rights), protected tribal resources, or tribal lands.
- Endangered Species. (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the effects of the proposed activity has been completed.
- Endangered Species. (d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species-specific permit conditions to the NWPs.

- Migratory Birds and Bald and Golden Eagles. The permittee is responsible for ensuring their action complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.
- Historic Properties. (a) In cases where the district engineer determines that the activity may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.
- Discovery of Previously Unknown Remains and Artifacts. If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed.
- Water Quality. Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)).
- Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification.

USACE Seattle District NWP Regional Conditions

- Construction Boundaries: Permittees must clearly mark all construction area boundaries before beginning work on projects that involve grading or placement of fill. Boundary markers and/or construction fencing must be maintained and clearly visible for the duration of construction. Permittees should avoid and minimize removal of native vegetation (including submerged aquatic vegetation) to the maximum extent possible.
- Temporary Impacts and Site Restoration: Native soils removed from waters of the U.S. for project construction should be stockpiled and used for site restoration. Restoration of temporarily disturbed areas must include returning the area to pre-project ground surface contours. If native soil is not available from the project site for restoration, suitable clean soil of the same textural class may be used. The permittee must revegetate disturbed areas with native plant species sufficient in number, spacing, and diversity to restore affected functions. Revegetation must begin as soon as site conditions allow within the same growing season as the disturbance. Temporary erosion and sediment control measures must be removed as soon as the area has established vegetation sufficient to control erosion and sediment.

NWP 27 (Aquatic Habitat Restoration, Enhancement, and Establishment Activities) Conditions

- Only native plant species should be planted at the site.

NWP 33 (Temporary Construction, Access, and Dewatering) Conditions

- Appropriate measures must be taken to maintain near normal downstream flows and to minimize flooding.
- Fill must consist of materials, and be placed in a manner, that will not be eroded by expected high flows.

- The use of dredged material may be allowed if the district engineer determines that it will not cause more than minimal adverse environmental effects. Following completion of construction, temporary fill must be entirely removed to an area that has no waters of the United States, dredged material must be returned to its original location, and the affected areas must be restored to pre-construction elevations. The affected areas must also be revegetated, as appropriate.

B.1.2 Ecology Section 401 Water Quality Certification

General Conditions

- Stormwater pollution prevention: All projects that involve land disturbance or impervious surfaces must implement stormwater pollution prevention or control measures to avoid discharge of pollutants in stormwater runoff to waters of the State.
  - For land disturbances during construction, the applicant must obtain and implement permits (e.g., Construction Stormwater General Permit) where required and follow Ecology's current stormwater manual.
  - Following construction, prevention or treatment of on-going stormwater runoff from impervious surfaces shall be provided.

B.3 Potential Contractor Plan Submittals

The list of plans that would need to be prepared before Project construction could begin may include, but are not limited to the following:

- Land Use and Landscape Rehabilitation Plan
- Traffic Control Plan
- Pollution Prevention Plan
- Spill Prevention, Control, and Countermeasure Plan
- Tree and Plant Protection Plan
- Waste Production and Disposal Plan
- Waste Handling and Disposal Plan
- Demolition Plan
- Concrete Removal and Disposal Plan
- Water Control Plan
- Cofferdam Construction Plan
- Seeding Plan
- Work Area Isolation Plan
- Temporary Erosion and Sediment Control Plan
- Inadvertent Discovery Plan

B.4 References

Anglin, D. R., J. J. Skalicky, D. Hines, and N. Jones. 2013. Icicle Creek Fish Passage Evaluation for The Leavenworth National Fish Hatchery. U.S. Fish and Wildlife Service, Columbia River Fisheries Program Office, Vancouver, Washington.

NMFS (National Marine Fisheries Service). 2015. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation; Leavenworth National Fish Hatchery spring Chinook Salmon Program. National Marine Fisheries Service, West Coast Region, Portland, Oregon.

_____. 2017a. Programmatic Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Seattle District Corps of Engineers Permitting of Fish Passage and Restoration Action in Washington State (FPRP III). West Coast Region, Portland, Oregon.

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NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 2008. Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic. NMFS Tracking No. 2008/03598, USFWS No. 13410-2008-FWS#F-0209. Lacey, Washington.

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Appendix C

Leavenworth National Fish Hatchery
Intake Planting Plan

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Leavenworth National Fish Hatchery Intake
Planting Plan

Installation Procedures

Riparian and Upland Zone Seeding

Riparian Seeding Zone		
Seeding Rate= 20lbs per acre		
Species	**Common Name**	**% of Mix**
Calamagrostis canadensis	Bluejoint Reedgrass	37%
Carex aquatilis	Water Sedge	19%
Deschampsia cespitosa	Tuffed Hair Grass	37%
Juncus balticus	Baltic Rush	7%

Upland Seeding Zone		
Seeding Rate = 20lbs per acre		
Species	**Common Name**	**% of Mix**
Elymus glaucus	Blue Wildrye	26%
Pseudoroegneria spicata	Bluebunch Wheatgrass	14%
Festuca idahoensis	Idaho Fescue	18%
Bromus marginatus	Mountain Brome	18%
Koeleria macrantha	Prairie Junegrass	14%
Poa secunda sandbergii	Sandberg Bluegrass	10%

Apply with hydro-seeding at 20 pounds per acre in the early Fall if possible. If not wait until snow is off the site.

Upland Planting Zone

Upland Planting Zones			
Upland Planting Zone potted plant spacing 10' center			
Species	**Common Name**	**Container Size**	**% of Mix**
Acer circinatum	Vine Maple	40 cu.in.	20%
Rosa woodsii	Woods' Rose	40 cu.in	9%
Symphoroicarpos albus	Common snowberry	40 cu.in	11%
Amelanchier alnifolia	Saskatoon Serviceberry	40 cu.in	20%
Philadelphus lewisii	Lewis' Mock-Orange	40 cu.in	20%
Prunus emarginata	Bitter Cherry	40 cu.in	20%

Potted plants must be protected from deer browse.

Plant in early fall.

1. Auger holes approximately 2’ deep on 10’ centers.
2. Protect hole with 3’x 3’ weed mat (VisPore Tree Mats) stapled into the ground.
3. Plant stem ensuring all roots properly covered.
4. Cover planting surface with 3-4” deep chip mulch.
5. Install Rigid Seedling Protectors (5” x48”) with bamboo supports.
6. Water as necessary.*

Riparian Planting Zone

Riparian Planting Zone		
Live Cuttings, lengths =6’; spacing =2’ center		
Species	**Common Name**	**% of Mix**
Salix lasiandra	Shinning Willow	16%
Salix exigua	Narrow Leaf Willow	36%
Salix scouleriana	Scouler’s Willow	12%
Cornus sericea	Redosier Dogwood	36%
Live Cutting, length 8’; Spacing =20 linear feet		
Populus trichocarpa	Black Cottonwood	

Plant in early Fall

1. Cuttings must be at least 6 feet long planted on a 2’ centers.
2. Dip planting end of the cutting in a root stimulator such as Root-Tone to promote faster rooting and prevent fungus.
3. Cutting must be reach the water table.
4. Water as needed.*

An alternate planting strategy is the create fascines out of the cuttings and bury them in trenches during the construction of the facility.

Black Cottonwood

1. Cuttings must be at least 8 feet long planted on a 10’ linear line.
2. Dip planting end of the cutting in a root stimulator such as Root-Tone to promote faster rooting and prevent fungus.
3. Cutting must be reach the water table.
4. Water as needed.*

**Manual watering may be needed once or twice a week during the dry period (July-September) for first two years after installation. This is dependent on the water year and air temperature. Watering can be accomplished with a portable pump and hose or setting up a temporary above ground watering system with timers.*