B O N N E V I L L E   P O W E R   A D M I N I S T R A T I O N

Klickitat Hatchery Complex Program

Draft Environmental Impact Statement

July 2011

DOE/EA-0424

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Bonneville Power Administration

National Marine Fisheries Service

Bureau of Indian Affairs

Washington Department of Fish and Wildlife

Confederated Tribes and Bands of the Yakama Nation

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Abstract – Klickitat Hatchery Complex Program Draft Environmental Impact Statement

Responsible Agencies: Lead federal agency: U.S. Department of Energy, Bonneville Power Administration (BPA); cooperating federal agencies: National Marine Fisheries Service, Bureau of Indian Affairs; Lead state agency: Washington Department of Fish and Wildlife (WDFW); cooperating tribe: Confederated Tribes and Bands of the Yakama Nation (Yakama Nation).

Title of Proposed Project: Klickitat Hatchery Complex Program

State Involved: Washington

Abstract: The Draft Environmental Impact Statement (EIS) describes proposed changes to production programs for four anadromous fish species sponsored by the Yakama Nation and WDFW in the Klickitat river basin in south central Washington. BPA proposes to assist with funding the construction, operation, and maintenance of the programs to help mitigate for anadromous fish affected by the Federal Columbia River Power System dams. The Yakama Nation and WDFW want to produce harvestable numbers of spring and fall Chinook and coho salmon, and steelhead while achieving self-sustaining native fish populations and minimizing the effects of introduced species. The DEIS discloses the environmental effects expected from three alternatives: the No Action Alternative, the Full Master Plan Buildout Alternative, and the Klickitat Hatchery Buildout Alternative.

The proposed action is to implement changes to the existing fish production programs as outlined in the Klickitat Basin Anadromous Fishery Master Plan (Yakama Nation 2008b). This would include modifications to the Klickitat Hatchery, a new hatchery/acclimation facility in Wahkiacus, and an acclimation facility at McCreedy Creek, should it be deemed necessary.

Public review of and comment upon this Draft EIS will continue through September 6, 2011. Responses to comments will be made part of the Final EIS, which is scheduled for completion in January, 2012. BPA expects to issue a Record of Decision whether to implement the project in February, 2012.

For more information about the Draft EIS, please contact:

Nancy Weintraub, Environmental Protection Specialist
Bonneville Power Administration
P. O. Box 3621, KEC-4
Portland, OR 97208-3621
Telephone: (503) 230-5373
Email: nhweintraub@bpa.gov

For additional copies of this document, please call 1-800-622-4520 and ask for the document by name. The EIS is also on the Internet at: http://efw.bpa.gov/environmental_services/Document_Library/Klickitat_Hatchery_Program/.

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Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208
ATT: Public Information Center – CHDL-1

For additional information on DOE NEPA activities, please contact Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance, GC-54, U.S. Department of Energy, 1000 Independence Avenue S.W., Washington D.C. 20585-0103, phone: 1-800-472-2756 or visit the DOE NEPA Web site at http://nepa.energy.gov/.

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Executive Summary

Chapter 1: Purpose of and Need for Action

Bonneville Power Administration (BPA) proposes to fund changes to the existing anadromous fish production programs and facilities in the Klickitat River Subbasin in Klickitat and Yakima counties in Washington that would be implemented in partnership with the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation). The current programs are funded by the National Marine Fisheries Service (NMFS) under the Mitchell Act of 1938, 16 USC § 755,757 (Mitchell Act), and are co-managed by the Yakama Nation and the Washington Department of Fish and Wildlife (WDFW). The proposed changes would integrate the existing programs with the Yakima/Klickitat Fisheries Project (YKFP), which is funded by BPA through the Pacific Northwest Power Planning and Conservation Act of 1980, 16 USC § 839 et seq. (Northwest Power Act). The YKFP is co-managed by the Yakama Nation and WDFW, and it includes artificial propagation programs designed to reestablish, supplement, or increase natural production and harvest opportunities of salmonids while maintaining the long-term fitness of these target species and minimizing ecological and genetic impacts on nontarget species (e.g., bull trout, lamprey) in the Klickitat and Yakima Rivers.

Modifications to the existing Klickitat Hatchery Complex Program are proposed to better employ "state of the art" artificial propagation methods. The proposal includes construction at the existing Klickitat Hatchery, plans to develop new hatchery and acclimation facilities at Wahkiacus (approximately 26 river miles downstream of the existing hatchery), and possible construction of a steelhead acclimation facility on McCreedy Creek, which is a tributary to the Klickitat River upstream of the Klickitat Hatchery.

The proposed action would support BPA's efforts (pursuant to the Northwest Power Act) to further mitigate the adverse effects of the Federal Columbia River Power System (FCRPS) on salmonids generally and fish in the Klickitat River Subbasin particularly by increasing the abundance of native spring Chinook salmon and steelhead populations in the watershed. Also, by providing the funding, BPA would make continued progress toward meeting its obligations under the 2008 Columbia Basin Fish Accords Memorandum of Agreement and the Northwest Power Act. The proposed action would also result in increased numbers of harvestable fish in the subbasin for Yakama Nation tribal members and others who fish for salmon and steelhead. By reducing the numbers of smolts of introduced species (coho salmon) released into the subbasin and applying the most current findings regarding acclimation and integrated hatchery reform, the Klickitat Hatchery Complex Program is endeavoring to achieve self-sustaining native fish populations in the Klickitat River Subbasin.

The following purposes have been identified for the Klickitat Hatchery Complex Program:

- To comply with the Federal Columbia River Power System (FCRPS) Biological Opinion, which calls on the FCRPS Action Agencies to ensure that hatchery programs funded by them as mitigation for the FCRPS are not impeding recovery of listed anadromous fish.
- To aid in the conservation of mid-Columbia steelhead listed as threatened under the Endangered Species Act.

In addition to these objectives that BPA seeks to fulfill, the cooperating agencies and the Yakama Nation also seek a preferred alternative that:

- Supports the Yakama Nation's exercise of its treaty fishing rights by rebuilding native steelhead and spring Chinook anadromous fish stocks in the Klickitat River Subbasin using artificial production methods that have been tested by the tribe and that are supported by hatchery reform recommendations.
- Is consistent with production and harvest objectives as specified in the 2008-2017 *United States v. Oregon* Fish Management Agreement.

This Environmental Impact Statement (EIS) is intended to fulfill the requirements of the National Environmental Policy Act (NEPA) and the State of Washington Environmental Policy Act (SEPA) by examining the reasonably foreseeable environmental effects of the alternatives for the proposed action and a no action alternative. BPA is the lead federal agency for this EIS. The NMFS, WDFW, Bureau of Indian Affairs, and Yakama Nation are cooperating agencies. Each agency involved will consider the information in the EIS, public comments, and its own expertise related to the project in making decisions related to the EIS. BPA's decisions will be documented in a Record of Decision (ROD) following publication of the final EIS. WDFW's decisions will be documented through the SEPA process.

Chapter 2: Alternatives

The Yakama Nation developed the Klickitat River Anadromous Fisheries Master Plan (2008) to address fish production needs for the Klickitat River Subbasin. The Master Plan is the basis for the proposed action and was used in the development of alternatives. Three alternatives are fully evaluated in this EIS: the no action alternative and two action alternatives. The two action alternatives being fully evaluated are Full Master Plan Buildout and Klickitat Hatchery Buildout.

Alternative 1 – No Action Alternative: This alternative would involve the continuation of current management of the Klickitat Hatchery. Current management involves operation of a complex of hatchery buildings, raceways, storage sheds and residential buildings on approximately 83 developed acres at River Mile (RM) 42 of the Klickitat River. Currently, a segregated harvest fish program is implemented at the Klickitat Hatchery. Fish are propagated as genetically discrete or segregated populations relative to naturally spawning populations. The principal intent of a segregated program is to create a separate, hatchery-adapted population that is managed to meet harvest goals. In a segregated program, hatchery fish are maintained primarily or exclusively from adult fish returning to the hatchery. The Klickitat Hatchery propagates and releases 600,000 spring Chinook, rears and releases approximately four million fall Chinook smolts, and rears and releases 1 to 1.2 million coho into the Klickitat River annually. Approximately 120,000 out-of-basin summer steelhead smolts and 2.5 to 2.7 million out-of-basin coho smolts are released directly into the Klickitat River annually under the current program.

Alternative 2 – Full Master Plan Buildout: The Yakama Nation's 2008 Klickitat River Anadromous Fisheries Master Plan includes modifications to the Klickitat Hatchery, a new hatchery and acclimation facility at the Wahkiacus project site, and an acclimation facility at McCreedy Creek, should it be deemed necessary. Alternative 2 would result in an integrated hatchery/harvest program for spring Chinook, which would increase abundance while minimizing the genetic divergence of hatchery fish from the naturally spawning population. The intent is to produce hatchery fish more genetically similar to naturally-spawning fish. Alternative 2 would continue segregated harvest programs for fall Chinook, coho, and summer steelhead.

The Wahkiacus Hatchery and Acclimation Facility would include a new hatchery building, a maintenance building, a number of raceways, and other buildings and facilities related to fish production. The alternative also includes development of up to three residential buildings at one of two possible locations near the hatchery and acclimation facilities. At the Klickitat Hatchery, some existing buildings and structures would be remodeled, some would be demolished, some would be replaced, and a new steelhead hatchery would be built.

The integrated hatchery/harvest program for spring Chinook would involve replacement of existing broodstock with natural-origin adults collected at Lyle Falls Fishway and Castile Falls. At the Klickitat Hatchery, 800,000 spring Chinook would be incubated, reared, and volitionally released (i.e., voluntarily swimming out on their own) as smolts.

Summer steelhead production would initially be designed as a segregated harvest program. Approximately 130,000 juveniles would be volitionally released from the Klickitat Hatchery for the harvest component. Broodstock to support the program would be collected at the Lyle Falls Fishway and from fish returning to the Klickitat Hatchery. Releasing fish from the Klickitat Hatchery should encourage high site fidelity, allow for a terminal harvest, and could limit the percentage of returning hatchery adults spawning in the wild. If necessary, an upper river (above Castile Falls) conservation program would be developed for summer steelhead with acclimation at McCreedy Creek. In addition, the lower river segregated program may be changed to an integrated program if necessary in the future.

Under Alternative 2, a local broodstock segregated hatchery program for coho would be established. The production goal is to produce sufficient hatchery fish to establish a 14,000 combined (ocean, mainstem, and tributary) adult coho annual harvest. Under this alternative, hatchery production of coho would initially be reduced from 3.7 to 1 million juveniles. The eyed egg imports from the Lewis River Hatchery would be discontinued. Adult coho would be spawned at the Wahkiacus Hatchery and the eggs transferred to the

Washougal Hatchery for incubation and rearing. These fish would then be transported back to the Wahkiacus Hatchery for acclimation and volitional release. Additional (up to 2.5 million) Washougal River stock direct releases might be made in the lower Klickitat River if needed to meet the harvest goal.

Alternative 2 also would create a segregated hatchery/harvest program for fall Chinook. Little White Salmon National Fish Hatchery transfers would be eliminated. Adult fall Chinook (including jacks) returning to the Klickitat River would be used as broodstock for the program. The adults would be collected at the Lyle Falls Fishway and Wahkiacus and Klickitat hatcheries. Approximately 2,500 adults would be needed to produce the desired four million subyearling fall Chinook. Production, including incubation, rearing, acclimation, and volitional release, would be split between the Wahkiacus and Klickitat hatcheries.

Alternative 3 – Klickitat Hatchery Buildout: Hatchery production would be managed at a modified Klickitat Hatchery. No new facilities would be constructed at Wahkiacus. Fish production goals and hatchery/harvest management would be similar to Alternative 2. The use of the Washougal Hatchery would continue in order to achieve production goals. The Klickitat Hatchery modifications would be constructed as described for Alternative 2. In addition, a new 1,400-square-foot raceway would be constructed at the Klickitat Hatchery to accommodate some of the rearing that would have been done at Wahkiacus under Alternative 2.

Alternative 3 would implement an integrated hatchery program for spring Chinook, and segregated programs using locally derived broodstock for summer steelhead, fall Chinook, and coho as described for Alternative 2. However, due to hatchery capacity at the Klickitat Hatchery, additional fish might continue to be imported from or reared at out-of-basin hatcheries such as the Washougal Hatchery.

As with Alternative 2, an integrated hatchery/harvest program for spring Chinook would be implemented under Alternative 3. The goals and methods for production of spring Chinook at Klickitat Hatchery would be the same as for Alternative 2. If there are space limitations, spring Chinook production would have the highest priority at the Klickitat Hatchery.

Production goals and objectives for summer steelhead under Alternative 3 would be the same as described for Alternative 2; however, production could be reduced due to water limitations at the Klickitat Hatchery.

Similar to Alternative 2, Alternative 3 would implement a local broodstock segregated hatchery program for coho salmon, with a production goal sufficient to establish a 14,000 adult coho annual harvest. One million coho salmon pre-smolts would be incubated, reared and volitionally released at the Klickitat Hatchery. If the harvest goal is not met, up to an additional 2.5 million smolts would continue to be imported from the Washougal Hatchery and direct released in the lower Klickitat River.

Like Alternative 2, this alternative would create a segregated hatchery/harvest program for fall Chinook. Adult and jack fall Chinook returning to the Klickitat River would be used as broodstock. The adults would be collected at the Lyle Falls Fishway and Klickitat Hatchery. Approximately 2,500 adults would be needed to produce the desired four million subyearling fall Chinook. Production, including incubation, rearing, acclimation, and volitional release, would occur at the Klickitat Hatchery, although production may be reduced due to water limitations.

Both Alternatives 2 and 3 incorporate adaptive management strategies, remote and/or mobile acclimation facilities, and climate change adaptations. The primary adaptive management strategy considered in this EIS relates to summer steelhead conservation and the recolonization of upstream reaches. Use of mobile acclimation facilities could enhance fish production in the basin because the facilities allow the fish to imprint on the local water and return to the general area as adults. McCreedy Creek is examined in this EIS as a likely location for mobile acclimation facilities for steelhead. Other adaptive management is proposed for collection of natural origin broodstock for spring Chinook and meeting coho production goals. This EIS also considers adaptations for climate change for both action alternatives.

Chapter 3: Affected Environment, Environmental Consequences, and Mitigation Measures

The EIS characterizes the affected environment and evaluates the potential effects for the alternatives. Existing natural and social resource conditions are described, organized by resource area. The likely effects of implementing the three alternatives on each resource are described based on best available information and data. Mitigation is proposed where environmental effected are anticipated and where these measures could eliminate or reduce environmental impacts. A Mitigation Action Plan would be prepared and made available in the Record of Decision. The existing conditions and potential environmental effects at the Wahkiacus, Klickitat Hatchery, and McCreedy Creek sites are summarized below.

Air Resources

Air quality in the area of the three project sites is in attainment with National Ambient Air Quality Standards. Existing sources of air pollutants in the study area, including vehicle emissions, wood burning for residential home heating, agricultural activities, and resuspension of road dust from traffic on unmaintained roadways, do not impair air quality to a level that requires enforcement action.

Under Alternative 1, air quality would be unaffected as no new pollutant sources would be added. Alternative 1 would have no effect on climate change.

Construction associated with Alternative 2 would cause minor short-term increases in air emissions at the Wahkiacus, Klickitat Hatchery, and McCreedy Creek sites. The emergency use of generators at the Wahkiacus and Klickitat Hatchery sites, and temporary use of generators at the McCreedy Creek site would cause minor short-term adverse impacts on air quality. Some increase in greenhouse gas emissions would occur; however, the contribution to climate change would be minor.

Construction and operation effects of Alternative 3 would be the same as described above for Alternative 2; however, there would be no impact to air quality at the Wahkiacus site because no action would be taken at that site.

Geology and Soils

Geology of the Klickitat River Subbasin consists primarily of basalt flows up to several thousand feet thick. The mainstem of the Klickitat River flows through steep-walled canyons. Soils are formed in alluvium and landslide deposits and are generally well drained sandy loams. The Wahkiacus disturbance area encompasses approximately 12 acres, the Klickitat Hatchery approximately 20 acres, and the McCreedy Creek site less than 2 acres.

Alternative 1 would not involve construction or ground-disturbing activities; therefore, no disturbance to geologic resources is anticipated. Natural geologic processes would continue to be unaffected by Alternative 1.

Under Alternative 2, a total of 33.15 acres of soil would be disturbed at the Wahkiacus, Klickitat Hatchery, and McCreedy Creek sites. Ground disturbing activities would have short-term minor adverse effects of increased erosion and sediment run-off from construction. Best Management Practices would be employed to reduce the impact. Grading at all three sites would permanently alter the soil contours and could result in minor long-term site-specific adverse impacts.

Alternative 3 would alter 21.45 acres at the Klickitat Hatchery and McCreedy Creek sites. Construction and operation effects of Alternative 3 would be the same as described above for Alternative 2; however, there would ne no impact to geology and soils at the Wahkiacus site because no action would be taken there.

Water Quality and Quantity

Groundwater at the three project sites is contained in the Columbia River basalt; however, it is not a major source of water for the sites. The Klickitat River is the second longest free-flowing river in Washington and the water quality meets state standards. The Wahkiacus site is bordered by the Klickitat River and its tributary, Swale Creek. Swale Creek is water quality impaired in its lower portion due to high water temperature and low flow conditions. Effluent from the Klickitat Hatchery is within the acceptable ranges of the water quality parameters specified in its National Pollutant Discharge Elimination System permit and does not impair Klickitat River water quality in this reach. Water quality conditions for McCreedy Creek can exhibit increased turbidity and fine sediments as a result of streamside timber harvesting and grazing practices.

Under Alternative 1, the Wahkiacus and McCreedy sites would remain undeveloped and there would be no change to current groundwater, hydrology, water rights, or water quality conditions. At the Klickitat Hatchery site, the primary source of water for hatchery operations would continue to be local springs, which supply approximately 33 cubic feet per second (cfs), and flows of up to 30 cubic feet per second (cfs) would continue to be diverted from the river to make up the remaining water demand, which can be over 60 cfs.

Construction associated with Alternative 2 would increase the erosion potential for soils and increase sediment to the Klickitat River, Swale Creek, and McCreedy Creek during rain events, decreasing water quality. Short-term impacts to water quality would result from in-water work in the Klickitat River, Swale Creek, and McCreedy Creek. Water withdrawals associated with operation of the Klickitat Hatchery would be similar to existing conditions, resulting in a minor adverse effect on Klickitat River water quality and quantity. Water discharged for hatchery facilities would be treated to meet National Pollutant Discharge Elimination System requirements. It is anticipated that infrequent withdrawal from Swale Creek for the operations at the Wahkiacus site during high flow periods would have a minor adverse effect on stream temperature and flow in Swale Creek. Alternative 2 would also result in a minor reduction in flow in McCreedy Creek for a 150-foot reach between the intake and outfall. The short period of water diversion and limited use of acclimation waters should limit, in duration and intensity, any minor adverse effects to water quality in McCreedy Creek or downstream in the Klickitat River. Any change to water quality in McCreedy Creek from acclimation facility effluent would dissipate quickly as acclimation water mixes with McCreedy Creek flow and, further downstream, with the flow of the Klickitat River.

The environmental effects under Alternative 3 would be the same as described for Alternative 2; however, there would be no impact to the Klickitat River or Swale Creek at the Wahkiacus site because no action would be taken at that site. Additional fish production at Klickitat Hatchery under Alternative 3 would have similar impacts to water supply and water quality as Alternative 2. No additional water rights would be needed.

Fish and Fisheries

The Klickitat River Subbasin supports a variety of native and introduced fish species, including fall and spring/summer Chinook salmon, coho salmon, summer and winter steelhead, bull trout, rainbow/redband trout, Pacific lamprey, and mountain whitefish. Coho and fall Chinook never successfully exploited the Klickitat River Subbasin to any great degree, and for purposes of this EIS are considered an introduced stock. Critical Habitat for Middle Columbia River steelhead and Essential Fish Habitat designated by NMFS for Pacific salmonids (coho and Chinook salmon) are present in the Klickitat River Subbasin.

Under Alternative 1, the Klickitat Hatchery would be operating according to current management with no change in infrastructure, no cessation of out of basin rearing and direct release, no reduction in coho production, and no shift of coho and fall Chinook release to downstream areas. Direct releases of hatchery fish from outside the subbasin would continue. Naturally produced juvenile steelhead and spring Chinook present in the mainstem Klickitat River downstream of the Klickitat Hatchery would continue to be vulnerable to competition with hatchery coho and fall Chinook salmon. Releases of non-native Skamania stock hatchery steelhead in the Klickitat River may continue to affect the Klickitat native steelhead populations. There would be no construction effects to fishery resources. Operational effects from the existing program operations would continue at current levels.

Under Alternative 2, naturally-produced juvenile steelhead and spring Chinook present in the mainstem Klickitat River downstream of the Klickitat Hatchery would be less vulnerable to predation and competition effects from hatchery coho and fall Chinook salmon released downstream from the Klickitat Hatchery at the Wahkiacus facility. In-water construction associated with Alternative 2 would result in a minor short-term loss of instream habitat due to isolating and dewatering work areas. In-water work during approved instream work windows in the summer would also increase turbidity and sedimentation during installation and removal of cofferdams. Handling of fish may be necessary during salvage/rescue operations in the area to be dewatered for construction, with some associated mortality risk. Stress to handled fish would be moderate in the short term. Placement of instream structures (new intakes, fish ladders, etc.) would result in a minor permanent loss of instream and bank habitat. Operation of new facilities at Wahkiacus would introduce effluent into the Klickitat River, which could adversely affect fish near the outfall; however, all discharges would comply with National Pollution Discharge Elimination System (NPDES) permit requirements for fish rearing. The operation of the Swale Creek intake could result in an adverse effect to rearing and spawning salmonids due to reduction in flow (habitat) in the 1400-foot reach between the intake and the mouth; however, withdrawals would only occur during higher flow months that could support hatchery diversions as well as instream flows to provide for adequate spawning, migration, and rearing of anadromous salmonids. Operation of the fish ladder at the Wahkiacus facility would result in a minor short-term delay to upstream migration for non-target anadromous salmonids. The construction of the McCreedy Creek intake would result in minor short-term loss of available instream habitat. There would be a permanent benefit to fish passage in McCreedy Creek with the removal of a culvert. Overall, the operation of the Klickitat Hatchery would remain unchanged from current conditions.

Alternative 3 would have similar environmental effects as described above for Alternative 2; however, there would be no impact to fisheries resources in the Klickitat River or Swale Creek at the Wahkiacus site because no action would be taken at that site. Also, naturally-produced juvenile spring Chinook and steelhead present in the mainstem Klickitat River downstream of the Klickitat Hatchery would continue to be vulnerable to competition with hatchery coho and, to a lesser extent, fall Chinook salmon released from the Klickitat Hatchery.

Vegetation

The Klickitat River Subbasin is located in a transition zone between cool, moist forests of the Cascade Mountains and dry, warm sagebrush steppe and grasslands to the east. Typical vegetation consists of ponderosa pine and Oregon white oak habitat with shrubs scattered in the understory. Douglas fir is also common. Along the Klickitat River, riparian vegetation is present along narrow bands that follow the stream corridor. Dominant vegetation includes stands of mountain alder and willows.

Under Alternative 1, no new construction would occur in the study areas of the three project sites and, therefore, no vegetation would be removed. Natural succession, flood events, and fire suppression efforts could cause changes in vegetation composition over time at these locations. Noxious weeds, if not managed, might spread at the sites and lower overall diversity of plant species.

Under Alternative 2, construction would have a short-term moderate impact on 8.8 acres of vegetation at Wahkiacus, 15 acres at Klickitat Hatchery, and 0.7 acres at McCreedy Creek. Construction areas with no permanent new structures would be revegetated with appropriate native plants following construction. Permanent vegetation removal at the three sites would total 5.9 acres (i.e., 2.2 acres at Wahkiacus, 2.3 acres at Klickitat Hatchery, and 1.4 acres at McCreedy Creek). Routine maintenance of the hatchery facilities would have a minor long-term adverse effect from the removal of vegetation that would typically provide nutrients to the area. An increase in vehicle traffic at the Wahkiacus and McCreedy Creek sites could disperse non-native species to these areas.

Alternative 3 would have the same environmental effects as described above for Alternative 2; however, with no action taken at the Wahkiacus site, the area of construction impact would be lower, with a total of 15.7 acres of vegetation disturbed. Permanent vegetation removal would total 3.7 acres.

Wildlife

The Klickitat Subbasin Plan identified 365 wildlife species occurring in the Klickitat River Subbasin, including amphibians, birds, mammals, and reptiles. Yakama Nation staff familiar with the Wahkiacus site have observed wild turkey, double crested cormorant, bobcat, belted kingfisher, western gray squirrel, bald eagle, black tail deer, and numerous bird species. Tribal biologists at the Klickitat Hatchery site have documented rough skinned newt, coastal tailed frog, western toad, pacific tree frog, cascades frog, several bat species, black bear, coyote, bobcat, wolverine, striped skunk, river otter, mule deer, elk, mountain goat, Douglas squirrel, Northern flying squirrel, Townsend's chipmunk, porcupine, bushy tailed woodrat, snowshoe hare, pika, rubber boa, gopher snake, garter snakes, and numerous bird species. Common species that may occur in the McCreedy Creek study area are similar to those observed in the Wahkiacus and Klickitat Hatchery study areas.

Under Alternative 1, no new construction would occur in the study areas of the three project sites and habitats would not be altered. Existing human disturbance would continue but species that have adapted to these disturbances would continue to use the study area.

Alternative 2 would remove a total of 5.9 acres of habitat for local wildlife species during construction (2.2 acres from the Wahkiacus site, 2.3 acres from the Klickitat Hatchery site, and 1.4 acres from the McCreedy Creek site). Less mobile species such as amphibians and reptiles would experience adverse effects from construction. Construction noise from the Wahkiacus, Klickitat Hatchery, and McCreedy Creek sites would displace wildlife during construction; however, this moderate adverse effect would only occur in the short term. Operation of hatchery and acclimation facilities would have a minor long-term effect on species that are sensitive to human disturbance.

Alternative 3 would have similar environmental effects as described above for Alternative 2; however, the area of construction impact would be lower, with 3.7 acres of habitat loss, because there would be no construction at the Wahkiacus site.

Threatened and Endangered Species

Federally-listed fish species that may be present in the study areas include the Columbia River Distinct Population Segment (DPS) of bull trout and the Middle Columbia River DPS of steelhead. Bull trout use of the mainstem Klickitat River in the vicinity of the Klickitat Hatchery is likely limited to migration and foraging. No spawning is known to occur in the mainstem, and therefore juvenile rearing in the Klickitat River is unlikely. Steelhead spawning occurs in the vicinity of the existing Klickitat Hatchery, and juvenile rearing likely occurs throughout the mainstem and within Swale Creek. The Klickitat River is used as a migratory corridor for adult migration and juvenile outmigration.

The U.S. Fish and Wildlife Service has identified several terrestrial threatened and endangered species that may occur in Klickitat County. Of these, Utes ladies'-tresses could occur in the Wahkiacus study area, northern spotted owl and gray wolf could occur in the Klickitat Hatchery and McCreedy Creek study areas, and grizzly bear could occur in the McCreedy Creek study area.

Under Alternative 1, no new construction would occur in the study areas of the three project sites and habitats or vegetation supporting threatened and endangered species would not be altered. Existing human disturbance would continue but species that have adapted to these disturbances would continue to use the study area.

Under Alternative 1, naturally-produced juvenile steelhead present in the mainstem Klickitat River downstream of the Klickitat Hatchery would continue to be vulnerable to predation and competition effects from hatchery coho and fall Chinook salmon releases from the Klickitat Hatchery. Releases of non-native Skamania stock hatchery steelhead in the Klickitat River may be affecting and continue to affect the Klickitat native populations.

The effects of Alternative 2 on federally-listed bull trout and Middle Columbia River steelhead would be similar to those described above for fisheries. The emergency-only operation of the Swale Creek intake would result in direct effects to designated critical habitat for steelhead due to flow reduction; however, the intake would only operate during high flow periods and when there is sufficient instream flow to support hatchery withdrawals while maintaining adequate habitat for migration, spawning and rearing of federally-listed steelhead, resulting in a minor, short-term effect. Construction noise generated at the McCreedy Creek site could result in a direct, short-term moderate adverse effect on a Northern spotted owl nest 0.65 mile downstream of the site.

Alternative 3 effects would also be similar to those described above for fisheries under Alternative 3, including effects to listed steelhead from coho and fall Chinook releases from the Klickitat Hatchery. With no action taken at the Wahkiacus site, designated critical habitat for steelhead would be unaffected.

Wetlands

There is one wetland at the Wahkiacus site: a 0.29 acre palustrine emergent wetland. The wetland hydrology is supplied by an artesian well at the southeast end. The Klickitat Hatchery site has several springs on the hillside north of the main complex that create slope wetlands. The slope wetlands provide limited vegetation structure and plant species richness, and interspersion of habitats is low to moderate. At the McCreedy Creek site, an approximately 3-acre palustrine, forested, seasonally-inundated wetland (also classified as a riverine wetland) is located on the north side of McCreedy Creek (Sharp 2010a). The forested wetland is dominated by cottonwood, willow, red alder, and western red cedar and hydrology is supplied by both McCreedy Creek and the Klickitat River.

Under Alternative 1, no new construction would occur in the study area at any of the three project sites and therefore no wetlands would be affected. Wetlands would continue to undergo natural processes and succession over time due to flood events and changes in vegetation and hydrologic conditions.

Construction at the Wahkiacus site under Alternative 2 would eliminate 0.29-acre of Category 3 wetland. At the Klickitat Hatchery site, erosion and sedimentation from construction activities could result in minor short-term adverse effects by decreasing water quality and habitat availability to slope wetlands associated with Indian Ford and Wonder Springs. In the long term, these slope wetlands could be lost and converted to upland as site upgrades alter surface water patterns. Replacement of a culvert with a bridge at McCreedy Creek at the McCreedy Creek site could lead to erosion and sedimentation and cause a minor short-term decrease in water quality and habitat availability in the nearby wetland.

Alternative 3 would have the same environmental effects as described above for Alternative 2; however, because there would be no construction at the Wahkiacus site, the 0.29-acre Category 3 wetland would be unaffected.

Floodplains

The majority of the Wahkiacus site is outside of the designated floodway; however a portion of the site is within the designated floodway fringe of the Klickitat River. Swale Creek is capable of conveying its 100-year flood flow within its existing bank and levee system floodplains. The Klickitat River floodplain closely follows the river banks through the Klickitat Hatchery site. McCreedy Creek is semi-confined with available floodplain on the left bank, and steep slopes on the right bank that restrict the floodplain.

Under Alternative 1, no new construction would occur in the study area at any of the three project sites and therefore no floodplains would be affected.

Alternative 2 would involve new construction and there would be change in flow characteristics to affect floodplain hydrology at upstream or downstream locations near the Wahkiacus, Klickitat Hatchery, or McCreedy Creek sites.

Under Alternative 2, the intake and pump station for the Wahkiacus facility would be within the Klickitat River floodway as identified by the Federal Emergency Management Administration. Several facilities associated with the Wahkiacus site would be located in the floodway fringe portion of the floodplain, but the site would be designed to cause no rise in flood elevation. Impacts to floodplains are not anticipated at the Klickitat Hatchery site or McCreedy Creek site.

Alternative 3 is not anticipated to have impacts to floodplains at the Klickitat Hatchery or McCreedy Creek sites.

Cultural Resources

The three study areas are located within the homeland of the Klickitat band, *Ichi Skiin Sinwit*, which is now part of the Yakama Nation. The Wahkiacus study area is said to have been an important fishing area to Yakama Nation people and is culturally rich with resources. Additionally, the project area overlaps with a segment of the Columbia River – Northern Railroad. Both the railroad and the archaeological site have been determined eligible to the National Register of Historic Places. No archaeological resources or traditional cultural properties have been identified at the Klickitat Hatchery site; however, four historic structures, including the existing hatchery building and three residences, were identified as potentially eligible to the National Register of Historic Places. The McCreedy Creek site has not been surveyed for cultural resources.

Under Alternative 1, no new construction would occur in the study area at any of the three project sites and therefore no cultural resources would be affected. Cultural resources would remain undisturbed, and salmon production would not significantly increase and tribal ceremonial and subsistence use of this traditional cultural resource would likely be unchanged from current conditions.

Under Alternative 2, the renovation of the existing historic Klickitat Hatchery and demolition of three existing historic residences would have an adverse effect. Due to their age and architectural style, these four structures are potentially eligible to the National Register. Removing elements of architectural importance or completely demolishing them would adversely affect the historical integrity of these structures. Additionally, under Alternative 2, the ground disturbance related to constructing the Wahkiacus Hatchery and Acclimation Facility could adversely affect the present subsurface cultural materials.

Further evaluation of the proposed project area is needed prior to determining the impacts of Alternative 2 at the McCreedy Creek study area. Surveys will be completed in summer of 2011, prior to the Final EIS. If cultural materials are identified within this study area, it is possible that the project could have an effect on them.

Under Alternative 3, hatchery and production actions would be focused at the modified Klickitat Hatchery. If necessary, an acclimation facility would be developed at McCreedy Creek as described in Alternative 2. Impacts would be the same as those under Alternative 2, except that no construction would occur at Wahkiacus and the subsurface cultural materials present there would not be affected.

Aesthetics

The three project sites are in rural and relatively undeveloped settings along the Klickitat River. The Wahkiacus site is adjacent to transportation corridors, including a state highway, a county road, and the Klickitat Trail, which is managed by the Washington State Parks and Recreation Commission. Views of the existing structures are generally limited by the presence of vegetation. At Klickitat Hatchery existing structures, mixed conifer forest, and riparian streamside vegetation frame the site. The McCreedy Creek site is a forested meadow with a gentle slope toward the Klickitat River. The surrounding area is primarily forest land with some active harvest occurring. The three sites are located in areas of low to no residential development or other sensitive noise receptors.

Alternative 1 would not involve any construction, ground-disturbing activities, or alteration of the Wahkiacus, Klickitat or McCreedy sites. Therefore, the viewshed would not change at the site. The sites would remain in their current state and aesthetic resources would be unaffected. Alternative 1 would also result in no new noise-generating activities at any of the three sites and normal ambient background noise would continue.

Construction associated with Alternative 2 would alter the rural setting at the Wahkiacus and Klickitat Hatchery sites and would result in short-term moderate adverse direct impacts. New structures at the Wahkiacus site would constitute a moderate long-term adverse impact. Partial removal of the concrete sill at the Klickitat Hatchery site would improve the aesthetic condition. There would be no sensitive viewers present at the McCreedy Creek site during the acclimation season (i.e., when the mobile facilities are in place) and, therefore, the viewers would not be affected by the seasonal change in conditions at the site.

Construction under Alternative 2 would result in moderate short-term noise impacts in areas directly adjacent to construction activity. Residents located approximately 0.25 mile from the Klickitat Hatchery site may experience some short-term minor impacts from elevated noise levels. Operation under Alternative 2 is not expected to exceed the Washington Administrative Code WAC maximum environmental noise level and would only constitute a minor effect to surrounding areas. Construction and operation of the McCreedy Creek site is not expected to result in noise impacts, as the nearest off-site residences are located well over 0.25 mile from the site.

Alternative 3 would have the same effects to the visual environment and soundscape as Alternative 2; however, there would be no impacts associated with the Wahkiacus site, as it would not be constructed under Alternative 3.

Socioeconomics

The three project sites are located in rural areas surrounded mostly by open space and undeveloped lands. The Yakama Nation Fisheries field station at Wahkiacus provides a base of operations for habitat enhancement projects and fish monitoring, among other activities. The Klickitat Hatchery is an operating hatchery complex. The McCreedy Creek site, the most remote of the three sites, is located in the closed area of the Yakama Nation Reservation and available for the exclusive use of tribal citizens as a primitive campground. Transportation networks provide access from state highways, county roads, and in the case of McCreedy Creek, reservation roads. Economic activities and primary industries in Klickitat County and on the reservation are diverse, including agriculture and food processing, forest products, transportation and warehousing, manufacturing, recreation and tourism, health care, and the service-sector industries. Subsistence fishing by the Yakama Nation occurs year round and targets all stocks of salmon and steelhead. Recreation activities occur on the Klickitat River and on the Klickitat Trail, adjacent to the Wahkiacus site.

Under Alternative 1, no new construction would occur in the study area at any of the three project sites. Current land use at the Wahkiacus site, the Klickitat Hatchery site, and the McCreedy Creek site would continue. No change in land use or access for local transportation corridors is expected. Economic conditions in the region would not change from the existing conditions as no new construction would be undertaken and no additional jobs would be created. Employment associated with the Klickitat Hatchery would be consistent with current operational levels. Also under Alternative 1, current recreational opportunities and access would continue at existing levels and locations.

Construction within and adjacent to the Klickitat River associated with Alternative 2 would have a minor direct impact to land use at the Wahkiacus and Klickitat Hatchery sites. These actions would require permits from the county and tribe. Short-term traffic delays would be anticipated at the three project sites due to construction trucks and construction worker vehicles accessing the sites. Construction and operation of Alternative 2 would result in a direct short-term beneficial impact on employment in the local and regional economy. Up to five new permanent jobs would be available at the Wahkiacus site and a temporary/seasonal job would be available at the McCreedy Creek site. Though there could be a short-term interruption of subsistence fishing during construction, there would be an overall benefit to subsistence fishing by improving the availability of fisheries resources.

Construction of the Wahkiacus Hatchery and Acclimation Facilities and residential sites would result in short-term interruptions for Klickitat Trail users and recreation on the Klickitat River at the Wahkiacus site. Vehicle access to residences south of the hatchery facilities would cross the Klickitat Trail and create a minor long-term risk to trail users. At the Klickitat Hatchery site, partial removal of the concrete sill would improve non-motorized boat use of the river. Construction and operation of the McCreedy Creek Acclimation Facility would result in discontinued tribal use of the site for recreation at this location.

The construction and operational effects associated with Alternative 3 would be similar to those described under Alternative 2; however, there would be no impacts associated with the Wahkiacus site because no action would be taken at that site under Alternative 3.

Public Health and Safety

A combination of tribal, state, and county agencies provide public health and safety resources for the Klickitat River basin area. Most of these resources can be accessed through the Klickitat County Sheriff's office or the Yakama Nation Tribal Police Department, depending on the location.

Implementing Alternative 1 would not result in elevated health or safety risks to the public or hatchery workers. Under this alternative, no new safety or security measures would be warranted. Klickitat County and tribal emergency services could be necessary at the same level as is currently experienced.

Alternative 2 would result in minor short-term adverse effects directly related to increased risk of injury from construction activities. Operational safety risks at the Wahkiacus, Klickitat Hatchery, and McCreedy sites would be the same as for similar hatchery facilities.

The construction and operational effects associated with Alternative 3 would be similar to those described under Alternative 2; however, there would be no impacts associated with the Wahkiacus site because no action would be taken at that site.

Chapter 4: Consultation, Review, and Permit Requirements

The proposed project is evaluated to ensure compliance with the following federal laws and requirements:

- National Environmental Policy Act of 1969, as amended (42 USC 4321 et seq.)
- Endangered Species Act of 1973, as amended (16 USC 1531 et seq.)
- Fish and Wildlife Coordination Act of 1934 (16 USC 661 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Act of 1976. (Public Law 104-297)
- Migratory Bird Treaty Act (16 USC sections 703-712, July 3, 1918, as amended)
- Bald and Golden Eagle Protection Act (16 USC 668-668d, June 8, 1940, as amended)
- National Historic Preservation Act of 1966 as amended (16 USC 470)
- Executive Order 1988 (Floodplain Management)
- Executive Order 11990 (Protection of Wetlands)
- Farmland Protection Policy Act
- State Environmental Policy Act

- Clean Water Act of 1977 (33 USC 1251 et seq.)
- Noise Control Act of 1972 (42 USC 490 et seq.)
- Clean Air Act of 1970 (42 USC 741 et seq.)
- Resource Conservation and Recovery Act (42 USC 692 et seq.)
- Toxic Substances Control Act (15 USC 2601)
- Insecticide, Fungicide and Rodenticide Act (7 USC 136 et seq.)
- Executive Order 12898 (Environmental Justice)

Various other tribal, state and county requirements to be met prior to initiating this project include land use and building permits and in-water work permits.

Chapter 1: Purpose of and Need for Action

1.1 Introduction

Bonneville Power Administration (BPA) proposes to fund changes to the existing anadromous fish production programs and facilities in the Klickitat River Subbasin in Klickitat and Yakima counties in Washington that would be implemented in partnership with the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation). The current programs are funded by the National Marine Fisheries Service (NMFS) under the Mitchell Act of 1938, 16 USC § 755,757 (Mitchell Act), and are co-managed by the Yakama Nation and the Washington Department of Fish and Wildlife (WDFW). The Mitchell Act programs provide fish production to meet the objectives of the 10-year (2008-2017) Columbia River Fish Management Plan, which was developed under federal district court supervision to resolve issues being litigated in *United States v. Oregon*. The proposed changes would integrate the existing programs with the Yakima/Klickitat Fisheries Project (YKFP), which is funded by BPA through the Pacific Northwest Power Planning and Conservation Act of 1980, 16 USC § 839 et seq. (Northwest Power Act). The YKFP is co-managed by the Yakama Nation and WDFW, and it includes artificial propagation programs designed to reestablish, supplement, or increase natural production and harvest opportunities of ***salmonids***[1] while maintaining the long-term fitness of these target species and minimizing ecological and genetic impacts on nontarget species (e.g., bull trout, lamprey, etc.) in the Klickitat and Yakima rivers.

Modifications to the existing Klickitat Hatchery Complex Program are proposed to better employ "state of the art" artificial propagation methods. The proposal includes construction at the existing Klickitat Hatchery, plans to develop new hatchery and acclimation facilities at Wahkiacus (approximately 26 river miles downstream of the existing hatchery), and possible construction of a steelhead ***acclimation facility*** on McCreedy Creek, which is a tributary to the Klickitat River upstream of the Klickitat Hatchery.

1.2 Purpose and Need

The National Environmental Policy Act (NEPA) implementing regulations require that the action agency "briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives, including the proposed action" (40 CFR. § 1502.13). The underlying need for action is typically a situation to address, a problem to remedy, or an opportunity to take advantage of.

1.2.1 Need for Project Action

BPA's underlying need for action is to assist with reducing the impacts of the current hatchery programs in the Klickitat River Subbasin on native steelhead and spring

[1] Words appearing in boldface print can be found in the glossary (Section 6.2).

Chinook as a way to fulfill its obligations under the Northwest Power Act section 4(h)(10)(A) and the 2008 Columbia Basin Fish Accords Memorandum of Agreement with the Yakama Nation and others.

Under the Northwest Power Act, BPA must protect, mitigate, and enhance fish and wildlife affected by the development, operation, and management of federal hydroelectric facilities on the Columbia River and its tributaries. BPA must fulfill this duty in a manner consistent with the Columbia River Basin Fish and Wildlife Program (program) developed by the Northwest Power and Conservation Council (NPCC). The NPCC and its Independent Science Review Panel reviewed drafts of the Klickitat River Anadromous Fish Master Plan, and the Yakama Nation refined it in response to their comments and suggestions (Yakama Nation 2008b). On August 13, 2008, the NPCC recommended that BPA implement the project as described in the plan, which provides the basis for the proposed action analyzed in Chapter 2 of this Environmental Impact Statement (EIS).

In addition, on May 2, 2008, BPA, Bureau of Reclamation, and U.S. Army Corps of Engineers signed the 2008 Columbia Basin Fish Accords Memorandum of Agreement with the three Treaty Tribes—the Yakama Nation, Warm Springs Tribes, and Umatilla Tribes—that provides funding for the Yakama Nation's Klickitat Hatchery Complex Program (http://www.salmonrecovery.gov/Files/BiologicalOpinions/3-tribe-AA-MOA-Final.pdf). BPA conditioned its funding commitment on compliance with Northwest Power Act requirements for NPCC project review and on other statutory and administrative mandates, including NEPA and the Endangered Species Act.

The intent of the proposed action is to further mitigate the adverse effects of the Federal Columbia River Power System (FCRPS) on salmonids generally and fish in the Klickitat River Subbasin particularly by increasing the abundance of naturally-occurring spring Chinook salmon and steelhead populations in the watershed. The increase in abundance would result in more ***harvestable fish*** throughout the Columbia River fishery, as well as increased numbers of harvestable fish in the subbasin for Yakama Nation tribal members and others who fish for salmon and steelhead. By reducing the numbers of ***smolts*** of introduced species (coho and fall Chinook) released into the subbasin and applying the most current findings regarding acclimation and integrated hatchery reform, the Klickitat Hatchery Complex Program is endeavoring to achieve self-sustaining native fish populations in the Klickitat River Subbasin. To that end, the Yakama Nation proposes to apply state-of-the art hatchery facility design and implement best available science on hatchery operations for production and acclimation in order to rebuild the native anadromous fish stocks.

1.2.2 Purposes (Objectives)

In meeting the underlying need, the alternatives considered in detail in this EIS should achieve the purposes listed below. BPA decision-makers will consider how well each alternative meets these purposes when selecting a preferred alternative. In addition, any proposed action BPA funds must follow the laws, regulations, and policies that guide the agency.

The following purposes have been identified for the Klickitat Hatchery Complex Program:

- To comply with the FCRPS Biological Opinion, which calls on the FCRPS Action Agencies to ensure that hatchery programs funded by them as mitigation for the FCRPS are not impeding recovery of listed anadromous fish.
- To aid in the conservation of mid-Columbia steelhead listed as threatened under the Endangered Species Act.

In addition to these objectives that BPA seeks to fulfill, the cooperating agencies and the Yakama Nation also seek a preferred alternative that:

- Supports the Yakama Nation's exercise of its treaty fishing rights by rebuilding native anadromous fish stocks in the Klickitat River Subbasin using artificial production methods that have been tested by the tribe and that are supported by hatchery reform recommendations.
- Is consistent with production and harvest objectives as specified in the 2008-2017 *United States v. Oregon* Fish Management Agreement.

1.2.2.1 FCRPS Biological Opinion and Endangered Species Act

In 2008, NMFS issued a 10-year Biological Opinion for the Federal Columbia River Power System (FCRPS) that recommended a reasonable and prudent alternative (RPA) sufficient to avoid jeopardy and adverse modification of critical habitat for 13 species of salmon and steelhead affected by FCRPS operation. The RPA outlined an adaptive management framework the Action Agencies will use to develop actions that will improve fish survival to meet Biological Opinion performance standards by 2018. The Action Agencies are the U.S. Army Corps of Engineers, Bureau of Reclamation, and BPA. Under RPA item 39, Hatchery Strategy 1 (stated in the second purpose), BPA must ensure that hatchery programs it funds do not impede recovery of listed anadromous fish covered by the opinion. BPA will therefore base its decision on the alternatives in this EIS on whether they would avoid jeopardizing mid-Columbia steelhead, the only anadromous stock covered in the Klickitat River Subbasin. In addition, BPA aids in the conservation and recovery of listed threatened and endangered species under the Endangered Species Act (ESA) of 1973, as amended, 16 U.S.C. § 1531 et seq. There are two stocks of steelhead in the Klickitat River, summer and winter; both are native and both are listed. Currently imported hatchery summer steelhead from the Skamania Hatchery are not listed under the ESA. However, the progeny of any naturally-spawning adult steelhead, whether the adult is of natural or hatchery origin and regardless of stock, are afforded protection under the ESA. This is known as the "progeny rule" and is derived from NMFS (2005).

1.2.2.2 Tribal Treaty Fishing Rights

The Yakama Nation has fishing rights under its Treaty of 1855. The treaty recognizes that salmon and steelhead are part of the spiritual and cultural identity of the tribes. Salmon also play an important role in the economic well-being of tribal members.

1.2.2.3 Hatchery Reform

The Hatchery Scientific Review Group (HSRG), a 14-member independent scientific review panel, was charged by Congress with reviewing all state, tribal, and federal hatchery programs in the Columbia River Basin as part of a comprehensive hatchery reform effort to:

- Conserve indigenous salmonid genetic resources.
- Assist with the recovery of naturally spawning salmonid populations.
- Provide sustainable fisheries.
- Improve the quality of hatchery programs.

In February 2009, the HSRG published its final system-wide report. The report recommends that hatchery programs rely on comprehensive monitoring and evaluation to determine how management changes can address factors influencing fisheries. The principles underlying hatchery reform for an integrated conservation approach direct the operation and management of hatchery facilities to achieve proper genetic integration with ***natural-origin fish***. Reform principles also state that efforts should be made to minimize the potential for adverse interactions between hatchery and natural-origin fish, while maximizing survival of hatchery fish. Finally, reform principles promote the local adaptation of natural and hatchery populations. Consistent with the principles of hatchery reform, hatchery programs should include adaptive management to evaluate whether and to what degree they result in a sustainable fishery, and, if needed, address subsequent actions to fully meet conservation and population goals. The alternatives in this EIS will be evaluated on how well they would support these recommendations.

1.2.2.4 U.S. v. Oregon

The federal district court's decision in *U.S. v. Oregon*, which guided the development of the Columbia River Fish Management Plan, shapes the fourth purpose. The Columbia River Fish Management Plan sets specific objectives for hatchery production of fish in the Klickitat River Subbasin to meet goals for a combined (ocean, mainstem, and tributary) annual harvest of 14,000 coho and 18,000 fall Chinook, and an in-basin harvest rate of 35 to 40 percent for spring Chinook salmon. Although BPA is not a party to the case, and has no obligations under it, several of the cooperating agencies for this EIS (NMFS, WDFW, and the Yakama Nation) are, and the alternatives will be evaluated on how well they assist these entities in meeting harvest and production objectives.

1.3 Background

1.3.1 Northwest Power and Conservation Council Process

Any new major production project funded through the NPCC's Columbia River Basin Fish and Wildlife Program receives thorough review to ensure its design, construction, and proposed operations are compatible with the environment and consistent with fish and wildlife protection and mitigation planning for the subbasin within which it is located. The NPCC has a three-step process for the review of artificial propagation projects proposed for funding by the BPA (www.nwcouncil.org/library/2001/2001-29.pdf). Step 1 is conceptual planning, represented primarily by master plan development and approval. Step 2 is preliminary design and cost estimation, and environmental review. Step 3 is final design review and construction. The NPCC's Independent Scientific Review Panel reviews the projects as they move from one stage of the process to the next.

1.3.2 Klickitat River Anadromous Fisheries Master Plan

In 2008, the Yakama Nation revised (as part of Step 1) the Klickitat River Anadromous Fisheries Master Plan in response to comments from the NPCC's Independent Scientific Review Panel. In general, the plan focuses anadromous fish production efforts in the Klickitat River Subbasin based on the recognition that:

- Spring Chinook are a priority species for the Yakama Nation and contribute to a Washington State priority for commercial and sport fisheries management.
- Steelhead listed under the Endangered Species Act are considered a priority for recovery.
- Harvest of spring Chinook, steelhead, fall Chinook, and coho is considered by the Yakama Nation to be of vital economic and cultural importance.
- Although not determined to be priorities for natural production, coho and fall Chinook production contributes to *U.S. v. Oregon* and regional mitigation obligations.
- Court decisions consequent of the *U.S. v. Oregon* litigation and YKFP policies guide supplementation actions in the Klickitat River Subbasin. The master plan tracks salmonid production and harvest agreements pursuant to the *U.S. v. Oregon* litigation, which was a landmark lawsuit over Indian treaty fishing rights. Through the ongoing *U.S. v. Oregon* process, the parties develop and update the Columbia River Fish Management Plan, which addresses management of spring Chinook, coho, fall Chinook, and steelhead in the Klickitat River Subbasin, including production at the Klickitat Hatchery.
- BPA and the Yakama Nation seek cost effective strategies for measuring project success through applying scientific findings from the Yakima River Subbasin anadromous fish programs (see Section 1.3.3, below) to the Klickitat River Subbasin when they are applicable, thereby reducing the need for monitoring and evaluation when appropriate.

With these issues in mind, the Klickitat River Anadromous Fisheries Master Plan (2008) focuses hatchery reform and natural production efforts on indigenous spring Chinook and summer steelhead, while maintaining focus on harvest augmentation for non-indigenous fall Chinook and coho. Master Plan-specific goals, objectives, and risks of species-specific management are summarized here.

- Add production of summer steelhead at Klickitat Hatchery.

- Transfer in-basin hatchery coho production activities and half of the in-basin hatchery fall Chinook production from the Klickitat Hatchery to a proposed new hatchery and acclimation facility at Wahkiacus on the lower Klickitat River (25 miles downstream).
- Increase spring Chinook population viability and abundance by upgrading the existing Klickitat Hatchery to implement hatchery reform principles.
- Collect and fertilize eggs from local Klickitat River coho broodstock, rear off-station during the early stages of the life cycle, then acclimate and release smolts at the proposed new Wahkiacus Hatchery and Acclimation Facility.
- When and if necessary, develop an acclimation facility at McCreedy Creek in the upper basin for the conservation of native summer steelhead.
- Develop a monitoring and evaluation plan for collecting and reporting the data and statistics critical to measuring overall Klickitat Hatchery Complex Program project success, and the success of proposed hatchery reform measures.
- Implement habitat improvements to provide benefits for steelhead, spring Chinook, Pacific lamprey, and bull trout (these actions are ongoing and not within the scope of this EIS).

This EIS will evaluate alternatives for meeting BPA's need and purposes, while furthering the goals and objectives of the Klickitat River Anadromous Fisheries Master Plan.

1.3.3 The Yakima/Klickitat Fisheries Project

The YKFP is a comprehensive adaptive management and research project designed to restore anadromous fish and the habitats that support them in the Yakima and Klickitat subbasins in south central Washington State. The YKFP is a joint project between the Yakama Nation (lead entity) and WDFW. Funding comes largely from BPA and the project receives oversight and guidance from the Hatchery Scientific Review Group (HSRG) and the NPCC. The Klickitat Hatchery Complex Program proposed in this EIS is part of the Klickitat River Subbasin portion of the YKFP.

The YKFP focuses on fishery data collection and management; physical facilities for fish production, screening, and passage; habitat enhancement and management; and experimental design and research on fisheries resources. The purposes of the activities under the YKFP are to:

- Conduct scientific research to inform fisheries enhancement and habitat restoration efforts.
- Preserve and restore habitats using a prioritized, ecosystem-based approach.
- Enhance existing stocks of anadromous fish in the Yakima and Klickitat subbasins while maintaining genetic resources.
- Provide additional harvestable fish to support the exercise of treaty fishing rights and recreational fisheries.

- Apply knowledge gained about integrated hatchery programs throughout the Columbia River Basin.
- Monitor fisheries and habitat conditions to gauge program effectiveness.

The following are YKFP facilities in the Klickitat River Subbasin:

Klickitat Hatchery: The existing Klickitat Hatchery was completed in 1954, and its operation and maintenance is currently funded through NMFS under the Mitchell Act to provide for conservation of anadromous (salmon and steelhead) fishery resources of the Columbia River. It was originally operated by WDFW. In May of 2006, the Yakama Nation officially assumed responsibility for the operation of the Klickitat Hatchery, and with the proposed implementation of the Klickitat Hatchery Complex Program it would be integrated with the YKFP. Knowledge gained from the Yakima River Subbasin YKFP fish production programs has been applied by the Yakama Nation in the development of the Klickitat River Subbasin programs.

Castile Falls Fishway: Castile Falls, a severe natural obstruction in the upper Klickitat River gorge consisting of multiple cascades and waterfalls, was an historic impediment to the upstream migration of the majority of anadromous fish into the upper Klickitat River Subbasin. In the late 1950s, Mitchell Act funding was used to construct fishways in order to provide upriver access to spring Chinook. Due to design flaws and improper maintenance, these improvements unfortunately failed.

More recently, the Castile Falls Fishway was renovated to bring it into compliance with NMFS fish passage standards and facilitate anadromous fish passage. From 2003 to 2005, work was completed on the two fishway tunnels within the Castile Falls complex. Over 50 miles of habitat in the upper Klickitat River Subbasin is now open to salmon and steelhead. BPA is currently funding the addition of a fish passage monitoring system at the upper end of the Castile Falls fishway under the YKFP and Master Plan. The monitoring system construction is expected to be completed in Summer of 2011 and will greatly enhance the adult fish passage above Castile Falls. An adult trap is planned to be added in the near future.

Lyle Falls Fishway and Adult Trap: Work funded by BPA under the YKFP and Master Plan is also currently underway and near completion (fall of 2011) on modifications to the Lyle Falls Fishway, which was originally constructed in 1949 and 1955. The fishway is on the right bank of Lyle Falls, which is approximately 150 feet in length and is located on the Klickitat River above the confluence with the Columbia River at RM 2.2.

Fish were reluctant to enter and exit the old fishway due to it passing minimal water at low flows, and because the exit channel was often shallow with exposed bedload. Upgraded fish passage technology will provide solutions to facilitate increased passage through a wider range of flows. Proper attraction flows will increase ladder usage and improve ***escapement*** estimates as fish pass transponder detectors. Increased passage through a properly functioning fishway will enable the collection of data and local ***broodstock*** for the YKFP integrated and segregated hatchery programs.

1.4 Decisions to be Made

When a project involves more than one federal agency and/or state agency, those entities often work together during the planning and decision-making process. As one of the proposed funding agencies, BPA is the lead federal agency for this action and is supervising the preparation of the EIS. The NMFS, WDFW, Bureau of Indian Affairs, and Yakama Nation are cooperating agencies and are assisting BPA with preparation of the EIS. This EIS is intended to fulfill the requirements of NEPA and the State of Washington Environmental Policy Act (SEPA) by examining the reasonably foreseeable environmental effects of the alternatives for the proposed action and a No Action alternative. Each of the agencies involved will consider the information in the EIS, public comments, and its own expertise related to the project in making a decision whether to approve or support the project or an alternative. Federal agency decisions following an EIS are documented in a Record of Decision (ROD).

1.4.1 Bonneville Power Administration Decisions

BPA must decide which alternative best meets the purposes and need for action with consideration given to the potential environmental effects of the alternatives presented in the EIS and public comments made during its development. BPA's decision must also be informed by the expertise and decisions of the cooperating and other agencies participating in the review of the EIS.

BPA will not issue a ROD until after publication of a Final EIS. If BPA chooses either of the action alternatives described in Sections 2.4 and 2.5, implementation would be based on the availability of sufficient funds. Under the 2008 Columbia Basin Fish Accords Memorandum of Agreement, BPA agreed to assist with funding the project, and the Yakama Nation agreed to pursue additional funding from other sources. Per the Fish Accords Memorandum of Agreement, the Yakama Nation actively sought congressional appropriations during fiscal years 2010 and 2011 for additional Mitchell Act funding for the new Wahkiacus facility, but no additional funds are currently forthcoming. They also applied for funds under the American Recovery and Reinvestment Act but were not successful. Due to the issue of funding availability, if at the end of this NEPA process BPA chooses an action alternative, it may be implemented in phases. In addition, BPA may choose an action alternative that only includes certain components or aspects deemed absolutely necessary in the short term to meet the underlying need and purposes described in this EIS.

1.4.2 National Marine Fisheries Service Decisions

NMFS is a cooperating agency and reviewed a preliminary copy of this Draft EIS. NMFS makes decisions on the allocation of Mitchell Act appropriations made by Congress for fish production facilities. NMFS currently allocates funds for operation and maintenance of the existing Klickitat Hatchery fish production programs. Accordingly, it must decide on whether to change this allocation to the Klickitat fisheries programs, given the proposal to fund improvements to the existing facilities using BPA funds. NMFS is also the agency that administers the Endangered Species Act for anadromous fish species and would issue a biological opinion on changes to the fish production programs under the Klickitat Hatchery Complex Program EIS.

NMFS is currently in the process of preparing a programmatic EIS on its funding of the Mitchell Act anadromous fish programs, including the Klickitat program. The Draft Environmental Impact Statement to Inform Columbia River Basin Hatchery Operations and the Funding of Mitchell Act Hatchery Programs (Mitchell Act EIS) was issued on August 6, 2010 (NMFS 2010). The Mitchell Act EIS addresses a proposal to develop a NMFS policy direction that will 1) guide NMFS' distribution of Mitchell Act hatchery funds and 2) inform NMFS' future review of individual Columbia River basin hatchery programs under the ESA.

The Mitchell Act EIS addresses funding issues and impacts on listed anadromous fish at a broad programmatic Columbia River Basin level. The Klickitat Hatchery Complex Program EIS addresses impacts specific to the Klickitat Hatchery Complex Program proposal, including site-specific impacts to fish and construction impacts in the Klickitat River Subbasin. NMFS will consider both EISs in making funding decisions for the Klickitat Hatchery Complex Program.

Under the Council on Environmental Quality regulations for implementing NEPA (40 CFR Parts 1500-1508), while work on a programmatic EIS such as the Mitchell Act EIS is in progress, federal agencies are precluded from taking any major action that requires its own EIS unless it is 1) justified independently of the program; and 2) will not prejudice the ultimate decision on the programmatic EIS. Since both EISs are being developed simultaneously, we address this issue.

The Klickitat Hatchery Complex Program EIS is independently justified because the actions being proposed could be funded by BPA regardless of the outcome of the Mitchell Act EIS. The Mitchell Act EIS does not address funding of hatchery construction or operations by BPA; BPA's Fish and Wildlife Implementation Plan EIS (and subsequent Records of Decision) is the programmatic-level document that addresses overall funding of the Fish and Wildlife Program.

Decisions on the Klickitat Hatchery Complex Program EIS will not prejudice the decision on the Mitchell Act EIS. The Mitchell Act EIS will not identify how Mitchell Act funding will be specifically allocated, but would not preclude future funding for Klickitat hatchery programs unless Alternative 2 of the Mitchell Act EIS, which proposes to eliminate all Mitchell Act funding, is selected. However, implementation of the proposed changes to the Klickitat Hatchery Complex Program is not necessarily dependent on future Mitchell Act funding. The Yakama Nation is currently seeking other funding options, and funding of portions of the proposed action by BPA could proceed independently from actions for which the Yakama Nation has requested Mitchell Act funding.

1.4.3 Washington Department of Fish and Wildlife Decisions

WDFW is a cooperating agency and reviewed a preliminary copy of this Draft EIS. As co-manager of the Klickitat Hatchery and other fishery resources in the Klickitat River Subbasin, WDFW must consider the proposed changes to the Klickitat anadromous fish production programs and the potential environmental effects of those changes. WDFW is the lead agency for the SEPA process for the proposed changes and will provide input to BPA in identifying a preferred alternative.

1.4.4 Yakama Nation Decisions

The Yakama Nation is a cooperating agency because of its special expertise in Klickitat fisheries management, and assisted with preparation of this EIS. The Yakama Nation must decide whether BPA's ROD for the Klickitat Hatchery Complex Program is consistent with the tribe's resource management objectives in the Klickitat River Subbasin and other treaty and trust obligations.

1.4.5 Bureau of Indian Affairs Decisions

The Bureau of Indian Affairs, Yakama Agency is a cooperating agency and reviewed a preliminary copy of this Draft EIS. In its role as cooperating agency, the Bureau of Indian Affairs Yakama Agency is providing assistance with review and comments on the Klickitat Hatchery Complex Program EIS and with determining the preferred alternative. If the steelhead acclimation facility at McCreedy Creek is developed, the Bureau of Indian Affairs may have a decisional role if the commitment of trust land resources to the project is needed.

1.5 Scope of this Environmental Analysis

1.5.1 Scoping Process

Scoping is the process that occurs very early during the NEPA process, in which parties interested in or affected by the Proposed Action are invited to identify relevant issues and alternatives they think should be considered in the environmental analysis. BPA published a Notice of Intent to prepare an EIS for this project in the Federal Register on July 17, 2009. That notice introduced the proposed action, invited public participation, provided contact information, and announced BPA's intent to prepare an EIS.

Agency and public scoping meetings were held on August 4, 2009, at the Lyle Community Center in Lyle, Washington. BPA invited resource agencies and government representatives having jurisdiction or a concerned interest in the project to the agency scoping meeting. The agency scoping meeting included a presentation by representatives from the Yakama Nation on the proposed new hatchery and acclimation facilities. BPA then led a roundtable discussion with attending agency representatives to discuss the scope of the EIS. The public was informed of the public scoping meeting through the

Notice of Intent, direct mail, a press release to the local media, paid notices in four local newspapers, and the project website located at http://www.efw.bpa.gov/environmental_services/Document_Library/Klickitat_Hatchery_Program/. Members of the public attending the scoping meeting were presented with an overview of the proposed project and a brief description of the EIS process. The presentation was followed by a question and answer session. Then the meeting resumed as an open house format. Ten individuals attended the public scoping meeting.

The scoping comment period extended from July 17 to August 30, 2009.

1.5.2 Issues Studied in Detail

This EIS examines the alternatives to and effects of the Klickitat Hatchery Complex Program based on best available information. Key issues that are examined in detail in this EIS were identified during scoping and from review of the proposed action and potentially affected resources by resource specialists. These issues are:

- Potential effects on air quality from emissions by new sources.
- Need for adaptive management to address climate change and implications for changes in water flow and fisheries.
- Project effects on water quality and quantity.
- Effects of artificial production on native stocks of fish.
- Effects of facilities construction on local plant communities, fish, and wildlife.
- Project effects on threatened, endangered, or sensitive wildlife species.
- Potential impacts on wetlands and ***floodplains***.
- Construction effects and long-term visual impacts on the Klickitat Trail.
- Project effects on recreational fishing and access to fishing sites.
- Effects on public health and safety, employment, and revenue.

1.5.3 Issues Beyond the Scope of this Environmental Impact Statement

Issues associated with fish restoration, harvest, hatchery programs in general, or the relative importance/priorities of other ongoing fish protection programs or projects are more appropriately addressed in other forums. Examples of such forums include the *U.S. v Oregon* committees; the NPCC's project proposal solicitation process; the processes by which WDFW and NMFS set harvest limits; or when a government agency proposes to adopt a policy relating to these broader, general programs. For BPA, the Fish and Wildlife Implementation Plan EIS (BPA 2003) covered the broad issue of funding hatcheries and fish production programs. A decision to fund the implementation of the Klickitat Hatchery Complex Program would tier to BPA's Fish and Wildlife Implementation Plan EIS.

Also outside the scope of this EIS are suggestions made during scoping for project elements that are outside BPA's and the Yakama Nation's responsibilities, are not necessary to implement the proposed project, do not contribute directly to meeting the purpose and need for action, or do not address any environmental consequences of the proposal. Examples of these suggestions and reasons why they are not addressed are:

- Sediment accumulation at the mouth of the Klickitat River: the sediment accumulation may be an issue for fish passage at times, but this issue is not the responsibility of BPA or the Yakama Nation.
- Increased trespass by anglers; i.e., if the project contributes to increased fishing opportunities, anglers may cross private property to access fishing spots: this is a State regulatory issue rather than an impact of implementing production program changes. Also, there is no basis for correlating more fishing opportunities with more trespass.
- Changes in streamflow at Lyle Falls fishing platforms: this project would not affect streamflows at the Lyle Falls fishing platforms.
- Project funding: this is addressed in the Fish Accords document and its Record of Decision.

Chapter 2: Alternatives

This chapter describes the alternatives being considered to meet the need for action and purposes described in Chapter 1. There are three alternatives being fully evaluated: no action and two action alternatives. The two action alternatives evaluated are Full Master Plan Buildout and Klickitat Hatchery Buildout. The alternatives are described below in terms of fisheries production, facility development and construction, and operations and maintenance. Adaptive management future actions are also addressed. Lastly, the chapter provides tables comparing the alternatives against the purposes and comparing the alternatives with their expected environmental impacts.

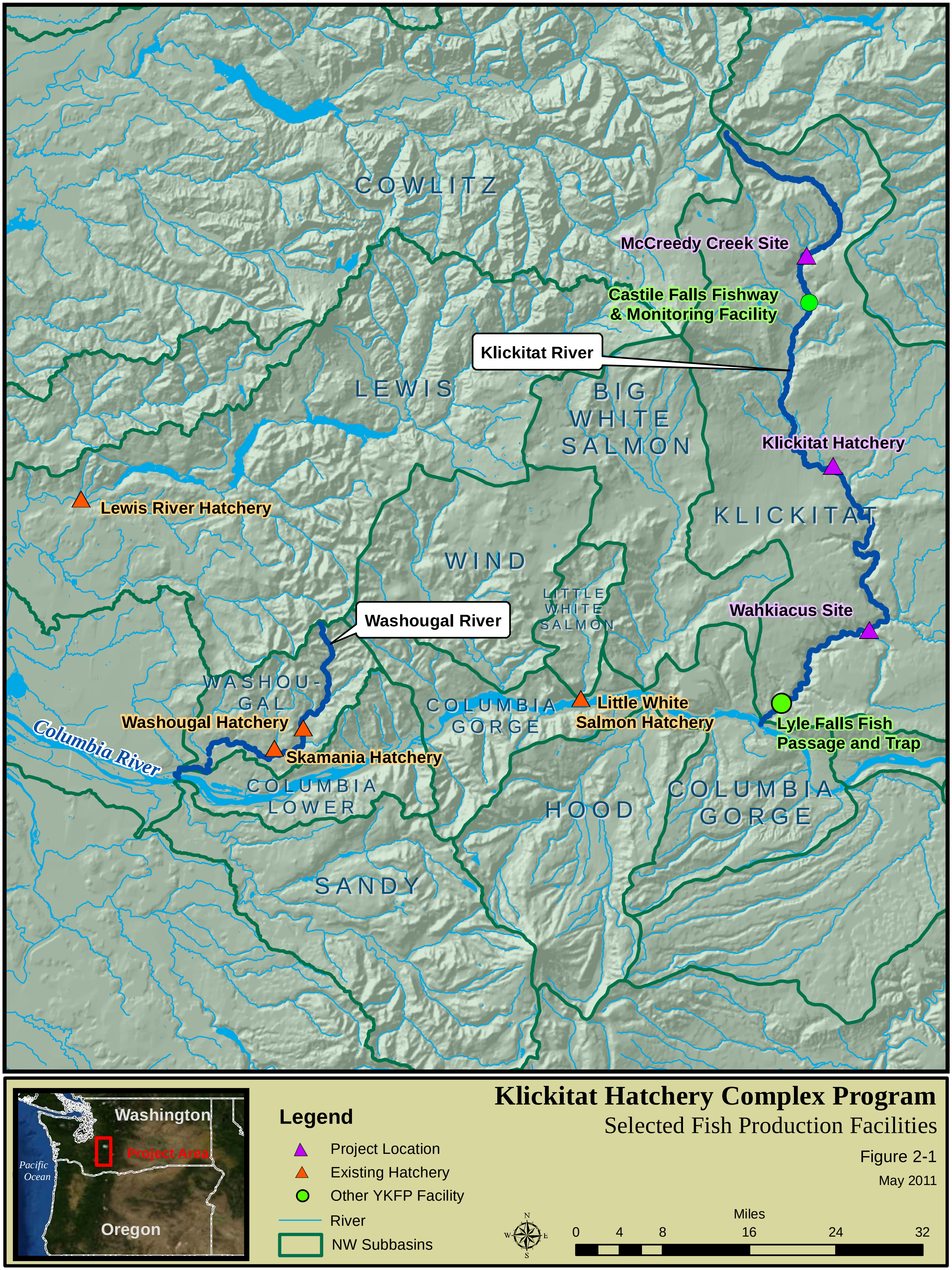
2.1 Alternative 1 — No Action Alternative

Consideration of the No Action Alternative is required by NEPA (40 CFR § 1502.14(d)). Typically, the No Action Alternative is defined as the continuation of current management. This section describes the existing fish program in the Klickitat River Subbasin, the Klickitat Hatchery facilities, and ongoing operations and maintenance practices. Under Alternative 1, the existing conditions and actions described in this section are assumed to continue for the foreseeable future (i.e., for at least the next 20 years). This discussion and the subsequent environmental analysis are intended to "provide a benchmark, enabling decision makers to compare the magnitude of the environmental effects of the action alternatives" (CEQ 1981).

2.1.1 Fish Production Program

Four ***segregated harvest*** fish programs are supported by operations at the Klickitat Hatchery. A segregated harvest program involves propagation of fish as genetically separate or segregated populations relative to naturally spawning populations (HSRG 2009). The intent of a segregated program is to create a hatchery-adapted population to meet goals for harvest. In a segregated program, hatchery fish populations are maintained primarily or exclusively from adults returning to the hatchery, with little to no interaction with the naturally spawning population. Figure 2-1 identifies fish production facilities included in this program.

Spring Chinook Salmon—Under Alternative 1, a total of 600,000 spring Chinook would continue to be propagated and released annually at the Klickitat Hatchery to provide fish for tribal and non-tribal fisheries. Currently those fish are ***volitionally released*** (i.e., voluntarily swimming out on their own) as smolts. Under this alternative, the program is considered segregated. Hatchery -origin broodstock would continue to be collected at the Klickitat Hatchery and, in the future, at the Lyle Falls trap when it becomes operational.



Klickitat Hatchery Complex Program

Selected Fish Production Facilities

Figure 2-1

May 2011

Summer Steelhead—The current program releases approximately 120,000 out-of-subbasin (Skamania-origin) steelhead smolts. Hatchery smolts are ***adipose-clipped*** and ***scatter-planted*** at different locations along the lower Klickitat River. Broodstock collection and juvenile rearing for steelhead occurs at the Skamania Hatchery on the North Fork Washougal River. Steelhead releases support the tribal and sport fisheries. There are currently no hatchery conservation programs for the Klickitat population of the Middle Columbia River Steelhead distinct population segment (DPS) that is listed as threatened under the Endangered Species Act. Under Alternative 1, this segregated hatchery program using out-of-subbasin summer steelhead would be maintained.

Coho Salmon—Coho salmon did not naturally colonize the Klickitat River Subbasin to any great degree. They were originally introduced in 1952 for harvest purposes. Based on *U.S. v. Oregon* objectives, 3.7 million hatchery coho salmon smolts are released in the Klickitat River annually. Approximately 1.35 million ***eyed eggs*** from Lewis River Hatchery are delivered to the Klickitat Hatchery from the Washougal Hatchery for rearing and release, while 2.5 to 2.7 million smolts are reared at the Washougal Hatchery using Washougal River broodstock and released directly into the lower Klickitat River between river mile (RM) 10 and RM 17.

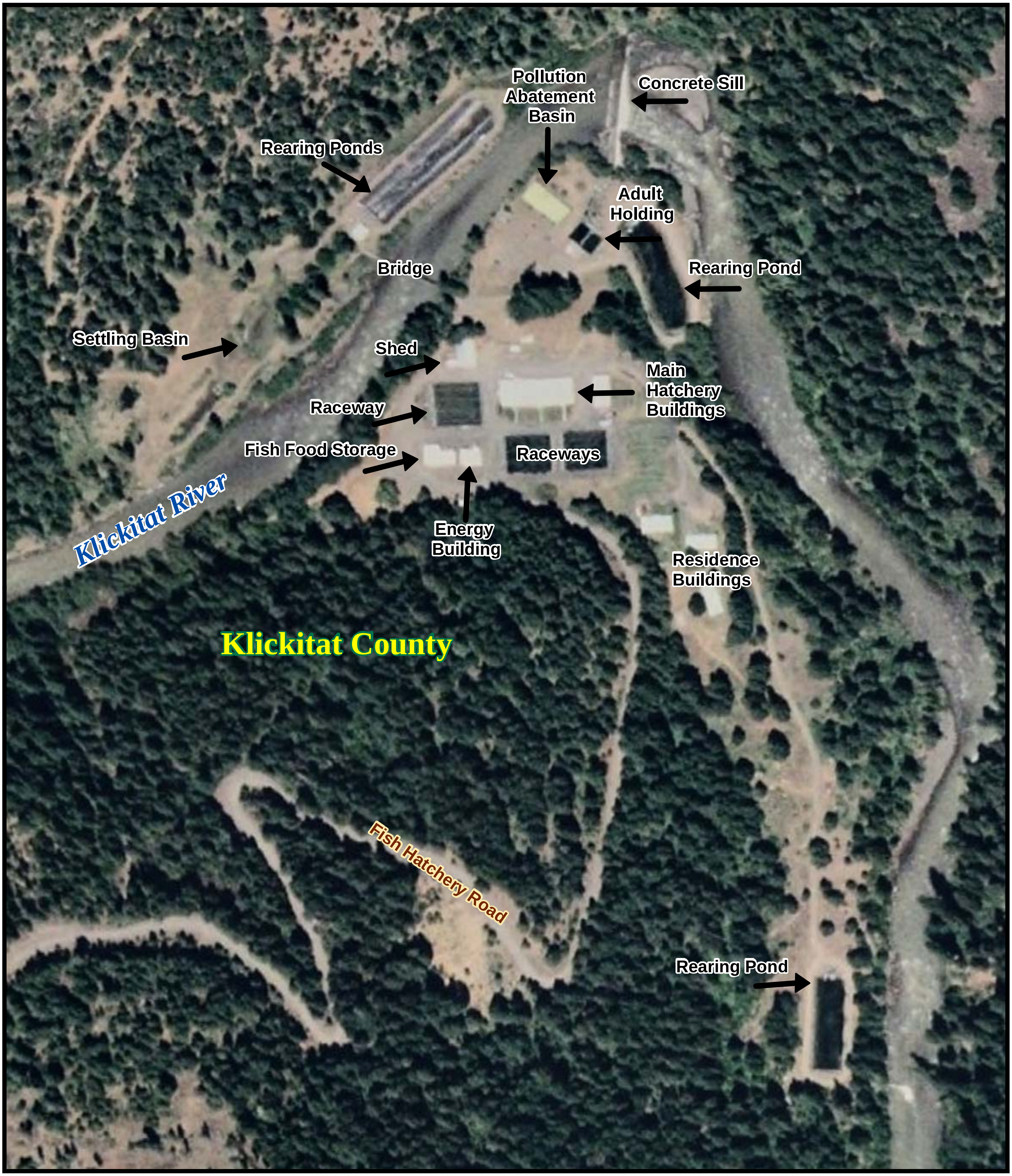
Fall Chinook Salmon—Fall Chinook salmon also did not naturally colonize the Klickitat River Subbasin above Lyle Falls to any great degree. Currently, fall Chinook salmon returning to the Klickitat River are hatchery-reared ***upriver brights*** imported as eyed eggs from the Little White Salmon National Fish Hatchery and reared at the Klickitat Hatchery. Approximately 4 million hatchery-reared fall Chinook smolts are released annually into the Klickitat River from the Klickitat Hatchery.

2.1.2 Facility Development and Construction

Under Alternative 1, no modifications would be made to the Klickitat Hatchery other than routine maintenance. In addition, there would be no facilities constructed at the Wahkiacus location.

2.1.2.1 Klickitat Hatchery

The Klickitat Hatchery (see Figure 2-2) is located 7 miles east of Glenwood, Washington, at RM 42 of the Klickitat River. The Klickitat Hatchery complex covers approximately half of a 167-acre parcel (approximately 83 acres of developed land). The existing facilities include a number of structures used for hatchery operations. The main hatchery building (6,853 square feet) is located near the center of the complex and houses the primary hatchery room, feed room, office and personnel space, and a storage loft. There are also three residence buildings located on the east side of the complex. These building are for hatchery personnel and their families. Averaging 1,054 square feet, each house is a one-story wood frame house with an attached one-car garage. Each house has three bedrooms and one bathroom. Other buildings on site include a generator building, freezer building, energy building, and various sheds. None of the existing facilities are accessible relative to the Americans with Disabilities Act, and most have not been renovated since the complex was originally developed in 1954.



Klickitat Hatchery Complex Program

Existing Site Conditions-Klickitat Hatchery Site

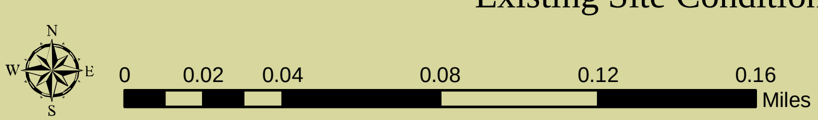


Figure 2-2

May 2011

Sewage for the complex is conveyed to one of four, 500-gallon septic tanks (one for each house and one for the office restrooms). Domestic water for the residences and office (Group B public water system) is supplied from a spring surface water source (Indian Ford A). Water is then chlorinated and filtered into a 1,000-gallon storage tank. This tank contains a pressurized system that supplies the three residences and office.

Twenty-two hatchery ***raceways***, each approximately 130 feet long, are located along the south side of the river to the north of the hatchery building. In addition, there are five rearing ponds, an adult pond, and a pollution abatement pond located throughout the complex and on either side of the river. These raceways and rearing ponds receive their water from a pumped river intake and several springs.

The complex has two points of access–one on either side of the river. A single lane bridge spans the Klickitat River. The bridge allows for servicing facilities on the north side of the river, access to the main complex, and emergency egress.

2.1.2.2 Wahkiacus Field Station

The field station at Wahkiacus, also known as the Yakama Nation Fisheries - Klickitat Field Office, provides a base of operations for habitat enhancement projects and fish monitoring, among other activities (see Figure 2-3). Currently the structures on the property include a house that serves as the main office building, a second office building (mobile trailer), a maintenance shop and storage area, and a small pump house.

2.1.3 Operations and Maintenance

The Klickitat Hatchery complex is operated year-round. Personnel include a hatchery manager and five fish culturists–three of whom reside on-site to ensure the facility is staffed 24 hours per day, 7 days per week. Annual operation is funded by NMFS under the Mitchell Act and currently totals approximately $521,000. Maintenance is performed annually or on an as-needed basis, at an average annual cost of approximately $26,000. Power costs are approximately $13,500 per year. The operations and maintenance budget for the Klickitat Hatchery, as with all Mitchell Act hatcheries, has not changed in the preceding 14 years, while operating costs continue to rise. At the Klickitat Hatchery, routine facility maintenance is continually deferred. As a result, there have been near catastrophic failures to water supplies, jeopardizing hatchery production.

Klickitat Hatchery Complex Program

Existing Site Conditions-Wahkiacus Hatchery Site

Figure 2-3

May 2011

Maintenance includes general upkeep of buildings/structures (e.g., painting, roof repair), machinery and vehicles (e.g., engine repair, oil changes), fish rearing units for each life stage, and electrical and plumbing systems. Maintenance also includes groundskeeping and landscaping around the residences, offices, and visitor areas; mowing and irrigating fields/open spaces and the hillside; and maintaining roads and access areas year-round. A backup power generator (diesel 250 kilowatt [kW]) that supplies emergency standby power to the facility (hatchery and residences) also requires routine maintenance to ensure reliability.

Hatchery operations include artificial propagation, e.g., rearing systems and fish handling, that require water. Hatchery water withdrawal rights allow for 6,000 to 8,000 gallons per minute (gpm) from three spring-fed gravity intakes with another 4,000 gpm from the Klickitat River. In addition, two river pumps provide backup (emergency) water supply to the adult ponds. The quantities of water described in water rights certificates for the hatchery facilities obtained by WDFW under the state water code are fully used. The existing state hatchery water-rights certificates indicate that water use for fish propagation is a non-consumptive use. Water supplied by the springs is of good quality, is between 48 and 52 degrees Fahrenheit, and is used for the incubation and early rearing of juveniles. River water is gravity fed between August and May, with temperatures ranging between 36 and 60 degrees Fahrenheit. River water quality is generally good, with occasional periods of high glacial sediment input during ***freshets***. River water is used for later stages of rearing and acclimation purposes. Water usage is reported monthly. All hatchery effluent discharges are in compliance with the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit pursuant to the Clean Water Act. Discharge is monitored monthly for total suspended solids, settleable solids, and water temperature.

2.2 Proposed Action

BPA proposes to fund changes to the existing anadromous fish production programs and facilities in the Klickitat River Subbasin that would be constructed and implemented by the Yakama Nation to implement hatchery reform principles and assure a sustainable fishery while minimizing ecological impacts to native fish populations. This would include upgrading and improving the Klickitat Hatchery, a Mitchell Act artificial production facility built and currently funded by NMFS. The proposed changes could also involve construction of a new Wahkiacus Hatchery and Acclimation Facility to support Mitchell Act production, at RM 17 on the Klickitat River in Wahkiacus, Washington, among other actions.

2.3 Elements Common to Both Action Alternatives

The elements described below would to some extent be common to both action alternatives. Under both alternatives, fish production would continue at levels consistent with the production and harvest goals in the Columbia River Fish Management Plan. The techniques used to manage the fisheries would incorporate adaptive management strategies and program success would be monitored and evaluated. Remote or mobile acclimation facilities may be considered based on the evaluation of monitoring data. For a complete discussion of adaptive management strategies see Appendix A.

2.3.1 Adaptive Management Strategies

Under both action alternatives, management of hatchery operations and the fish production program would be guided by principles of adaptive management strategies. The primary strategies considered in this EIS relate to the re-colonization of the upper Klickitat River by steelhead, and to native summer steelhead conservation. The initial phases of these strategies would be to determine 1) whether summer steelhead in the upper river are expressing a life history capable of producing anadromous offspring; and 2) the degree of introgression (interbreeding) of hatchery-origin and natural-origin steelhead in the lower Klickitat River.

Castile Falls (RM 64) is a series of natural falls that may have partially or fully blocked the passage of spring Chinook and steelhead into the upper Klickitat River. Fishways were constructed for passage in the mid 1960s but were poorly constructed to match river conditions and, as a result, generally became inoperable due to the accumulation of stream-borne rocks and sediments. Since restoration of passage in 2005, spring Chinook and steelhead populations have been slow to recolonize upstream reaches, although accurately estimating the number of adults spawning in the upper Klickitat River has been difficult, especially for steelhead, due to survey conditions. The new adult monitoring system that will be completed in Summer 2011 at the upstream end of Castile Falls will allow much more precise monitoring of the adult passage. The first adaptive management strategy would address the passage issue for steelhead. Adult spring Chinook outplantings above Castile Falls are proposed under Alternatives 2 and 3 to address the passage issue for spring Chinook.

Summer steelhead in the upper Klickitat River: If it is determined that summer steelhead are not adequately recolonizing areas above Castile Falls, then an integrated conservation hatchery program would be initiated to focus on conservation objectives for the upper river. The size and duration of the program would be based on the results of the initial phase (i.e., numbers of resident summer steelhead passing Castile Falls and spawning in the upper river). If fish are artificially produced, broodstock for the summer steelhead conservation program would be collected at Castile Falls Fishway, or at the Lyle Falls trap if not enough adults return to Castile Falls. The number collected would vary but not exceed 25 percent of total returns to the subbasin. The fish would be hatched and reared at the Klickitat Hatchery and acclimated at an acclimation facility on McCreedy Creek (described below in Section 2.3.2). Initially, the upper river conservation program would have a goal of releasing 70,000 summer steelhead. For the purposes of analyzing the impacts of the action alternatives it is assumed that this upper river steelhead conservation program would be necessary.

Lower River Summer Steelhead Integrated (Conservation) Program: If the rate of interbreeding between hatchery and wild fish (introgression) increases under the segregated hatchery program for lower river summer steelhead proposed under Alternatives 2 and 3, the Yakama Nation may convert to an integrated program. The program would use natural-origin adults returning to the Klickitat River for broodstock. The program smolt release goal would be 130,000 smolts, the same as for the proposed segregated program, reared and volitionally released from the Klickitat Hatchery. No additional facilities would be required to implement this strategy.

In addition to the proposed adaptive management for steelhead, the Yakama Nation is proposing adaptive management strategies for spring Chinook and coho salmon. For spring Chinook, one of the criteria to meet hatchery reform objectives is to eventually limit the percentage of natural-origin adults taken for broodstock to 25 percent. However, the proportion of the natural-origin run taken for broodstock may exceed 25 percent during early phases of the reformed program development. This may occur when the natural-origin run size is less than 400 returning adults. The program will need to collect about 125 natural-origin adults annually in the initial years of the broodstock transition period, which equates to approximately 200,000 juveniles, or 25 percent of the total program. By doing so, the program will produce an adequate number of adults to continue the transition of the remainder of the program in the future. In addition, first generation adult returns from the natural-origin crosses will be needed for the upper basin re-colonization. This will be implemented by using adult outplants on the spawning grounds. Once the program has fully transitioned to new hatchery stock and adult outplants in the upper basin are no longer necessary, the percentage of natural-origin adults taken for broodstock will be limited to 25 percent of the natural-origin run.

The Yakama Nation is also proposing to reduce the coho smolt releases from 3.7 million to one million under Alternatives 2 and 3. They believe that changing the program to local broodstock and acclimating coho in the Klickitat River Subbasin can maintain the combined (ocean, mainstem, and tributary) harvest goal of 14,000 fish with much lower releases. However, if the changes result in reduced adult returns and decreased harvest, they propose to reinitiate supplementation of the Klickitat River Subbasin releases with direct releases of Washougal stock smolts from the Washougal Hatchery in the lower Klickitat River. The harvest would be monitored and up to 2.5 million of the Washougal smolts would be released to meet the harvest goal. The actual number of additional smolts to be released would be determined by the performance of the new program and the differential between the observed harvest and actual harvest objectives.

2.3.2 Remote and/or Mobile Acclimation Facilities

Acclimation facilities that incorporate mobile fish raceways assist anadromous hatchery fish in becoming accustomed to a particular stream. Acclimation involves moving fish from a hatchery to a new location to allow them to imprint on a new water supply. The fish would then return to that general area as adults. Acclimation facilities can include ponds or raceways, or the use of mobile acclimation units.

Typical mobile acclimation facility

A potential site for using mobile units to acclimate steelhead for the upper river conservation program discussed above was identified near the confluence of McCreedy Creek and the Klickitat River (see Figure 2-1). The McCreedy Creek site would require substantial site preparation and, therefore, is described in this EIS to understand the impacts associated with that level of disturbance. If mobile units are proposed in the future to be used elsewhere (e.g., in the lower river under Alternative 3), additional site-specific environmental review would be necessary to determine the potential effects of those units on the environment.

Mobile acclimation units typically consist of metal raceways approximately 20 feet long, 5 feet wide, and 4 feet deep, situated parallel to the creek. A water intake hose or pipe is used to withdraw water from the creek for delivery to the acclimation units. A fish screen is attached to the water intake to prevent fish in the creek from entering the acclimation units. Fish screens are designed to meet NMFS requirements. A second pipe is used for water discharge from the units. A propane generator is used to power the water withdrawal pumps. A water right (for non-consumptive use) is typically needed to support operation of the acclimation units. Water is discharged back into the stream near the point of withdrawal, a maximum of 150 feet downstream. Water quality is monitored while acclimation units are in use. Typically, acclimation units are transported by truck and require placement on level ground.

Trailer used to transport mobile fish raceway

The McCreedy Creek mobile acclimation facility would utilize up to 20 mobile raceways that would be brought to the site by pickup truck and trailer during acclimation periods. If needed, it is anticipated that the McCreedy Creek location could be used to acclimate up to 70,000 steelhead smolts in the spring.[2]

There are no facilities in existence at this site. The site is currently accessible from Klickitat River Road and consists of a forested meadow that gently slopes toward the Klickitat River. A multiplate, corrugated metal culvert carries McCreedy Creek under the road. Figure 2-4 shows the generalized site plan of the facilities that could be developed at the McCreedy Creek site (more detailed design drawings have not yet been completed for this site because it is not yet known if it will be needed). At the downstream end of the culvert, there is a large scour hole with an excavated water drop of approximately 18 inches, which constitutes a barrier to fish passage. Above the road, McCreedy Creek's gradient becomes very steep.

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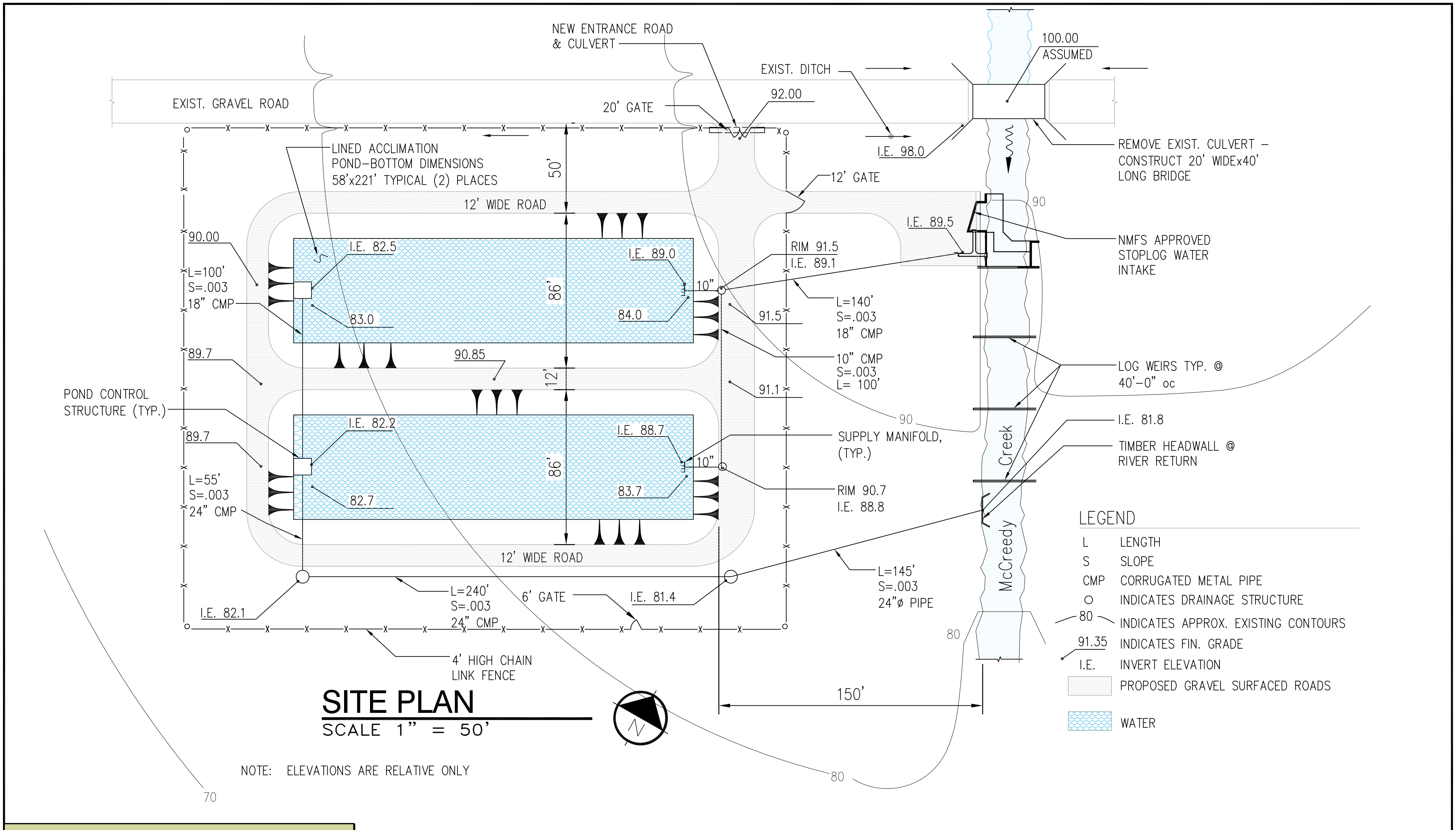
[2] A 14,400 square foot bank of raceways with an average water depth of 4 feet would be needed based on the recommended volume density of 0.40 pounds per cubic foot (lb/cf) and a low density of 8 pounds per gallon per minute.



Klickitat Hatchery Complex Program
McCreedy Creek Acclimation Site Plan
Alternative 2
Figure 2-4
May 2011

HARBOR CONSULTING ENGINEERS
ENGINEERS ˙ PLANNERS ˙ SURVEYORS
3006 FUHRMAN AVE. EAST
SEATTLE, WA 98102
(206) 709-2397

DRAWN: M. Campbell CHK: J. Hutchins

Yakama Nation
McCreedy Creek Acclimation Site
SITE PLAN

DATE June 14, 2011
JOB NUMBER
Not to scale

In developing the acclimation site at McCreedy Creek, the culvert at the Klickitat River Road crossing would be replaced with a bridge and a seasonal streamside water intake would be constructed. The natural stream gradient is expected to be restored through replacement of the culvert with the bridge. At the intake, seasonally placed stoplogs would be used during the general acclimation period (April - June). The stoplogs would be approximately 2 feet high and would create a water intake pool sufficient to screen 7 cfs, which is consistent with NMFS fish screening criteria. A screened water collection box would be installed along the right bank of the stream. Fish passage would be maintained through use of a ***Denil fish ladder***, a ramp with baffles that simulates a set of rapids. The structure would provide fish passage and reconnect upstream and downstream habitat, allowing resident fish to move freely up and down river. In addition, the design would allow the passage structure to handle a variety of stream and water conditions. All in-stream work would be completed during the in-stream work window.

From the Klickitat River Road, a 12-foot-wide gravel road would be constructed that would run along the perimeter of the raceways and provide access to other structures as necessary. A security fence would be installed around the perimeter of the acclimation site.

The 20 mobile raceways would be configured to facilitate cleaning and fish feeding. Covers would be placed over raceways to prevent predation on acclimating fish. Access to the raceways, drain boxes, and screens for maintenance would be provided by catwalks. The steelhead would be reared at 8 fish per pound. A water supply of 7 cubic feet per second (cfs) would be needed to operate the acclimation ponds. Preliminary flow measurement information shows that McCreedy Creek is capable of delivering this volume of water (Yakama Nation Water Program, unpublished data provided by Bill Sharp to BPA, March 3, 2011).[3]

Supply water would be discharged evenly across the raceways from horizontal headers. This arrangement would allow the water to flow freely and minimize the possibility of the system plugging up. The drains would be oversized to ensure safe passage of juvenile fish to McCreedy Creek and the Klickitat River. The drains would be screened and "stoplog" ***weir*** construction would be used to maintain pond depth and facilitate volitional migration of juveniles at release time. Water from the acclimation facilities would be discharged back into McCreedy Creek from one outfall located as close to the point of intake as possible (no more than 150 feet) to minimize in-stream impacts. A vacuum pump would be used to clean the raceways and cleaning water would be discharged to an earthen (unlined) pond located close to the raceways. This would allow the cleaning water to dissipate into the soil. Any remaining solid residue would be disposed as approved by the appropriate regulatory agencies. All water use at the acclimation facility would be considered non-consumptive in the water rights certificate.

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[3] There is no stream gage on McCreedy Creek; however, the Yakama Nation Water Program has instantaneous flow data taken between 1993 and 2009 between December and April when the stream could be waded. Flows measured range from 14 to 65 cfs. The sampling bias toward lower flows supports a conclusion that 7 cfs is likely available.

The McCreedy Creek acclimation site is proposed to be used only during the acclimation season, which involves setting up the site in late March and acclimating fish April through early June (targeted acclimation period prior to volitional release). A fish culturist would reside on-site during this period in a self-contained mobile residence. A cargo container would be used to store equipment and fish food. In-stream equipment and facilities would be removed after use each year. Mobile buildings and storage containers would be transported to a secured off-site storage location.

The aluminum raceways would be stacked and stored off-site until the following year. All of the seasonal facilities would be in compliance with Yakama Nation land use regulations for nonpermanent structures. During operation of the sites, any necessary power would be supplied by diesel and/or propane gas generators. These generators would run 24 hours per day during the acclimation period.

2.3.3 Climate Change Adaptations

In light of the potential effects of climate change, especially the effects that may be felt in the Pacific Northwest, climate change adaptations to ensure program longevity are addressed in this EIS. For example, Karl et al. (2009) suggests that approximately "one-third of the current habitat for the Northwest's salmon and other coldwater fish will no longer be suitable for them by the end of this century as key temperature thresholds are exceeded." It has also been suggested that up to 40 percent of Northwest salmon populations may be lost by 2050 (Battin et al. 2007). These projections could result in more emphasis on regional hatchery production. In light of these concerns, it is important to understand how climate change may affect the proposed action, how it can be monitored, and the types of actions that may be necessary in the future to respond to those changes. Appendix B describes potential climate change adaption strategies that could be pursued based on projected changes in conditions. If future response actions were taken, additional environmental review would likely be necessary.

2.4 Alternative 2 — Full Master Plan Buildout

Alternative 2 is the full implementation of the hatchery/production portion of the Klickitat River Anadromous Fisheries Master Plan developed jointly by the Yakama Nation and WDFW. In contrast to Alternative 1 (the No Action Alternative), Alternative 2 would result in an integrated hatchery/harvest program for spring Chinook. An integrated program is one designed to "increase abundance, while minimizing the genetic divergence of a hatchery broodstock from a naturally spawning population" (HSRG 2009). The intent is to produce hatchery fish more genetically similar to naturally-spawning fish. Alternative 2 would result in a segregated harvest program for fall Chinook, coho, and non-native summer steelhead. As discussed in Section 2.3.1 above, if necessary, an integrated upper river conservation program for summer steelhead would be added to the segregated harvest program for summer steelhead. This alternative includes modifications to the Klickitat Hatchery, a new hatchery and acclimation facility at the Wahkiacus project site, and an acclimation facility at the McCreedy Creek site, should it be deemed necessary (see description of actions proposed at the McCreedy site in Section 2.3.2).

2.4.1 Fish Production Program

Under Alternative 2, the Yakama Nation would implement a number of changes to the fish programs currently underway to implement hatchery reform while maintaining sustainable fisheries. As in Alternative 1 described above (Section 2.1), fish production would focus on spring and fall Chinook, and coho salmon and steelhead. However, Alternative 2 proposes an integrated hatchery program for spring Chinook, and segregated programs using locally derived broodstock for summer steelhead, fall Chinook, and coho.

Spring Chinook Salmon—Under Alternative 2, an integrated hatchery/harvest program for spring Chinook would be implemented. Hatchery- and natural-origin broodstock collected at the Klickitat Hatchery would be replaced with natural-origin adults collected at Lyle Falls Fishway and Castile Falls, as circumstances permit (i.e., depending on abundance of natural-origin adults). After the current hatchery stock has been replaced with the local natural-origin founder stock and the adult outplants are no longer necessary in the upper basin, no more than 25 percent of the natural-origin spring Chinook would be taken for broodstock in a given year. Until then, the proportion of the natural-origin return taken for broodstock may need to exceed the 25 percent criteria if the natural-origin adult return numbers drop below 400. The pace of replacement would be based on the annual number of returning adults, which would vary over time. Under this alternative, 800,000 spring Chinook would be incubated, reared, and volitionally released as smolts at the Klickitat Hatchery. Of that total, 200,000 smolts would be offspring of natural-origin broodstock and would be marked (eye elastomer tag) so they can be visually identified when they return as adults. These fish would not be adipose-clipped for the first few generations until natural-origin adults start returning in sufficient numbers for the integrated program. Fish would be released starting in May. All juveniles produced from the hatchery-origin broodstock, and eventually all hatchery-produced juveniles would be adipose-clipped, allowing them to be targeted in selective sport fisheries. Some of each group would also be marked to measure survival and harvest rates.

A portion of the adult fish captured at Lyle Falls Fishway would be released above Castile Falls and allowed to spawn naturally to supplement populations in the upper river. For the first five years of returns, the numbers of these fish would not be restricted, but as natural escapement increases, hatchery-origin adults would be limited to meet HSRG standards for the percentage of natural spawners (0.67).

Summer Steelhead—Under Alternative 2, the current out-of-subbasin smolt release program would be replaced with a local broodstock segregated harvest program. Approximately 130,000 juveniles released volitionally from the Klickitat Hatchery would comprise the harvest component. Collection of broodstock would occur at the Lyle Falls Fishway and from returns to the Klickitat Hatchery. Broodstock for the segregated harvest program would be distinguished by the absence of an adipose fin (i.e., they would be hatchery-origin). Incubating, rearing, and releasing fish from the Klickitat Hatchery should result in high numbers of adults returning to the hatchery, allowing for the creation of a terminal harvest and limiting the percentage of returning hatchery adults spawning in the wild. As discussed in Section 2.3.1 and Appendix A, this segregated program may be changed to an integrated (conservation) program if the genetic impacts of hatchery-origin fish on native fish increase.

Also as discussed above in Section 2.3.1 and Appendix A, if it is determined that summer steelhead are not adequately recolonizing areas above Castile Falls, then an integrated hatchery program would be initiated that focuses on conservation objectives for the upper river. Only natural-origin adults would be collected and used as broodstock for the upper basin conservation program, preferably from the Castile Falls trap. If adults are not available at Castile Falls, they would be collected at the Lyle Falls trap. Initially, the conservation program would have a goal of releasing 70,000 summer steelhead.

Coho Salmon—Under Alternative 2, a local broodstock segregated hatchery program would be established. This program would limit the numbers of coho spawning naturally in the Klickitat River and potentially impacting naturally spawning spring Chinook and steelhead by moving the releases of coho smolts from the Klickitat Hatchery down to the Wahkiacus Hatchery in the lower river. The production goal is to produce sufficient hatchery numbers to result in a 14,000 adult coho combined (ocean, mainstem, and tributary) annual harvest. Under this alternative, hatchery production of coho would potentially be reduced from 3.7 to 1 million juveniles.

In implementing this alternative, one million coho pre-smolts would be imported from the Washougal Hatchery and then reared and volitionally released at the Klickitat Hatchery in the near term. The delivery of 1.35 million eyed eggs (Lewis River stock via the Washougal Hatchery) to the Klickitat Hatchery would be discontinued. All hatchery-produced coho would be adipose-clipped for identification purposes. Once the Wahkiacus Hatchery complex is completed, the in-basin portion of the coho production would be relocated from the Klickitat Hatchery to the Wahkiacus Hatchery. Broodstock collection would shift to the Klickitat River Subbasin to develop a locally-adapted broodstock. The adult coho would be spawned at the Wahkiacus Hatchery and the eggs transferred to the Washougal Hatchery for incubation and rearing.[4] These fish would then be transported back to the Wahkiacus Hatchery for acclimation and volitional release in May. A minimum 750 coho adult escapement goal would be set for the subbasin, providing the necessary local broodstock for the program.

If the goal of the 14,000 adult coho annual harvest is not met with conversion to a one million smolt release originated from local broodstock, then the direct plants from Washougal Hatchery would be re-initiated in an amount suitable to consistently meet this harvest objective.

Studies on coho residence times and predation would be conducted under a separate BPA project being implemented by the Yakama Nation (*Klickitat River Monitoring and*

[4] The Wahkiacus facility would not have sufficient facilities or water available for rearing through the summer months; therefore, eggs would be shipped to the Washougal Hatchery for incubation and early rearing before being brought back to the Wahkiacus facility for final rearing and acclimation prior to release.

Evaluation-YKFP 1995-063-35) to evaluate the effect coho have on other fish species. Coho production objectives could change as a result of this research.

Fall Chinook Salmon—Similar to the coho program described above, this alternative would create a local broodstock segregated hatchery/harvest program for fall Chinook that would reduce impacts to spring Chinook and steelhead. All Little White Salmon National Fish Hatchery transfers would be eliminated. Adult and ***jack*** fall Chinook returning to the Klickitat River would be used as broodstock for the program. The adults would be collected at the Lyle Falls Fishway and Wahkiacus and Klickitat Hatcheries. Approximately 2,500 adults would be needed to produce the desired 4 million subyearling fall Chinook needed to meet the 18,000 combined (ocean, mainstem, and tributary) harvest goal. Production, including incubation, rearing, acclimation, and volitional release, would be split between the Wahkiacus and Klickitat hatcheries. All hatchery fish would be marked for harvest-related identification.

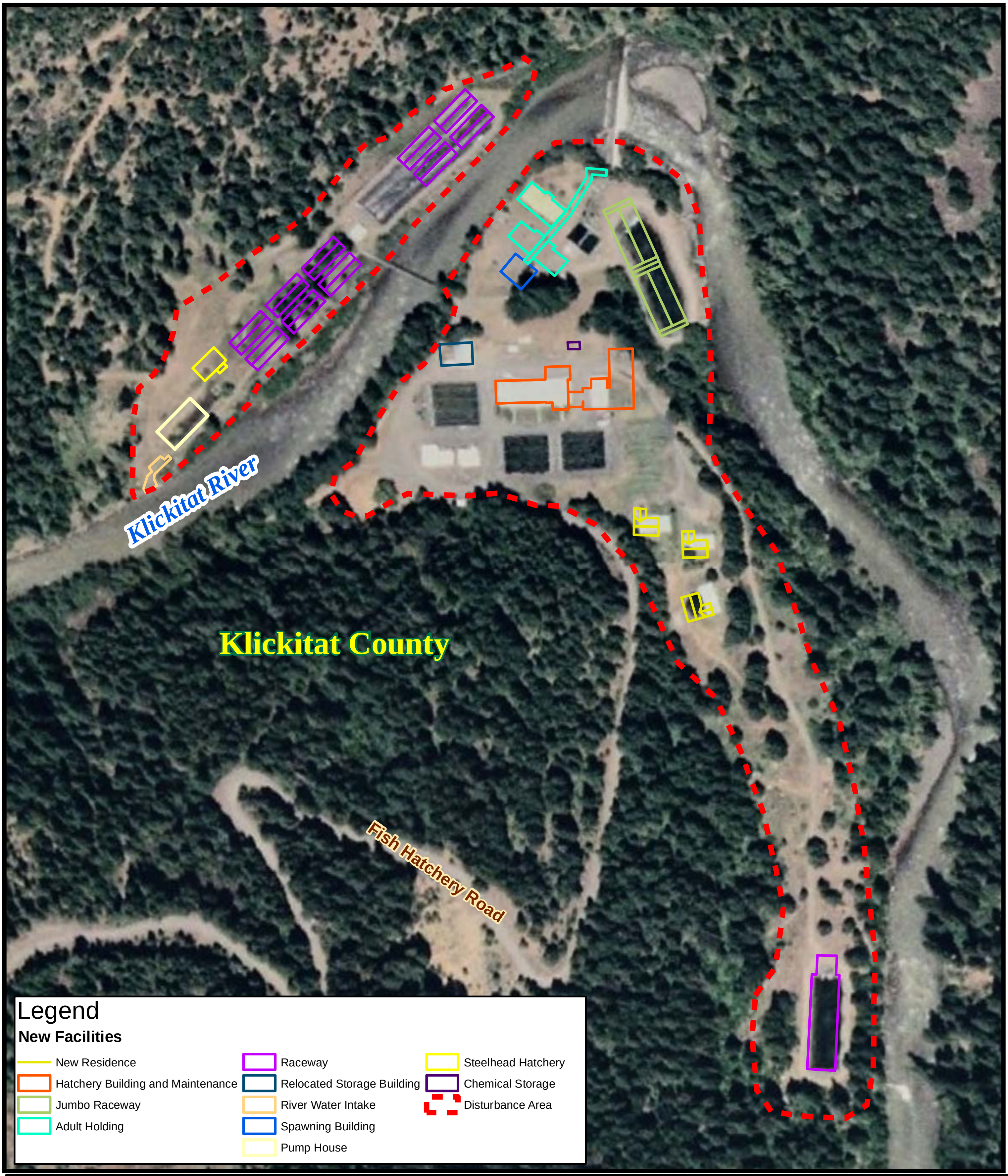
2.4.2 Facility Development and Construction

Facility development and construction would take place at the Klickitat Hatchery and Wahkiacus locations, and at the McCreedy Creek site should an acclimation facility for steelhead be deemed necessary (see discussion in Section 2.3.2). Construction would take place almost year-round until completion, though any in-water work would be restricted to previously established in-stream work windows. The proposed facility development and construction is described by location below.

Klickitat Hatchery— For impact analysis purposes, it is expected that the potential areas of disturbance include 16 acres located along the southeast side of the river and 4 acres along the northwest side. Under this alternative, some existing buildings and structures would be demolished or remodeled to meet current building codes and allow for better organization and use of space. Upgrades and modifications would be made to the electrical system, alarm systems, lighting, and plumbing. Upgrades would be made to improve the energy efficiency of the facility. In addition, areas open to the public would be made Americans with Disabilities Act accessible, including modifications to the restrooms and installation of ramps as necessary.

Construction on the northwest side of the river would include a new steelhead hatchery building covering approximately 2,300 square feet and up to 20 new raceways, each approximately 20 feet by 153 feet. The existing Pond No. 25 and associated shed would be demolished. In addition, a new pump house (approximately 4,750 square feet) and new screened river water intake structure (approximately 1,300 square feet) would also be constructed. Figure 2-5 shows the proposed site plan for the Klickitat Hatchery site.

Southeast of the river in the main hatchery complex, a number of buildings or structures would be demolished as part of the redevelopment. These include the existing hatchery pollution abatement basin, adult holding facility, rearing Pond No. 24, shed, and existing pond near Wonder Spring. In addition, the three residences currently located on the property would be demolished and replaced in the same general location.



Klickitat Hatchery Complex Program

Klickitat Hatchery Site Plan-Alternative 2

Figure 2-5

May 2011

0 0.02 0.04 0.08 0.12 0.16 Miles

New or modified structures on the southeast side of the river would include a 9,700 square-foot hatchery building and maintenance and vehicle shop addition located in the southwest corner of the existing hatchery building, a chemical storage building (approximately 300 square feet), and a new spawning building (approximately 2,600 square feet). In addition, four new jumbo raceways (covering an area of approximately 17,000 square feet. in total), an adult holding facility (approximately 4,800 square feet), new pollution abatement basin (approximately 4,100 square feet), and fishway (approximately 3,000 square feet) would be constructed. New steel roofs would be placed over two of the three existing raceways.

The three existing raceways would be modified to accommodate recent innovations in juvenile fish rearing. This would likely mean sandblasting and re-coating with epoxy to color the raceways. An abandoned adult capture in-river concrete weir, currently an impediment to fish passage, would be modified. Much of the 300-foot x 24-foot weir would be removed to eliminate the obstruction for salmon passage, while some structure would be left in place to protect the under river return pipe. The 90-degree edge/lip of the weir that affects lamprey passage would be eliminated.

Under this alternative, three new residence buildings would be constructed. Each new building would be a three-bedroom, two-bathroom, 2,400-square-foot house. See Figure 2-5 for the proposed placement of new residence buildings. The houses would be equipped with septic tanks and wells. Construction materials would be selected that would blend with the local environment.

The use of ***cofferdams*** would be necessary for the construction of the adult fish ladder, river water intake, juvenile exits, and a wing diversion. Cofferdams could be of various types, including cement blocks or sandbag cofferdams approximately 3 feet in diameter and 3 feet high. Sandbags would be filled with locally available sandy material mixed with approximately 5 percent cement by weight to increase the density. River water would be used to moisten the sand/cement mixture when the bags are placed in the river. Bags would be full or partially full, as needed to fit the existing rock bottom. Each construction area would be dewatered prior to construction activities taking place.

Cofferdams would be positioned in an arc to protect the area, while allowing for construction equipment and personnel to work unobstructed; approximately 10 feet is needed for working space between the cofferdam and the structure being constructed. Areas protected by cofferdams would be rotated from one location to another as construction element sequencing requires; i.e., a cofferdam would be established at one work site, the work completed, and the cofferdam removed before establishing a cofferdam at a new location. However, seasonal in-water work windows would ultimately determine the logistics of multiple in-channel work sites.

A variety of construction equipment would be used to develop the complex. On-site temporary staging areas would be created and used during the construction phase. Initial construction staging would be on the southwest side of Pond No. 25 in a previously disturbed area. The construction contractor’s headquarters would also be near Pond No. 25, as this is a good location that does not interfere with daily hatchery operation. Equipment would also be staged in previously disturbed areas of the main hatchery complex near each construction site, away from public parking. Heavy equipment would be brought in on trailers using the main access roads.

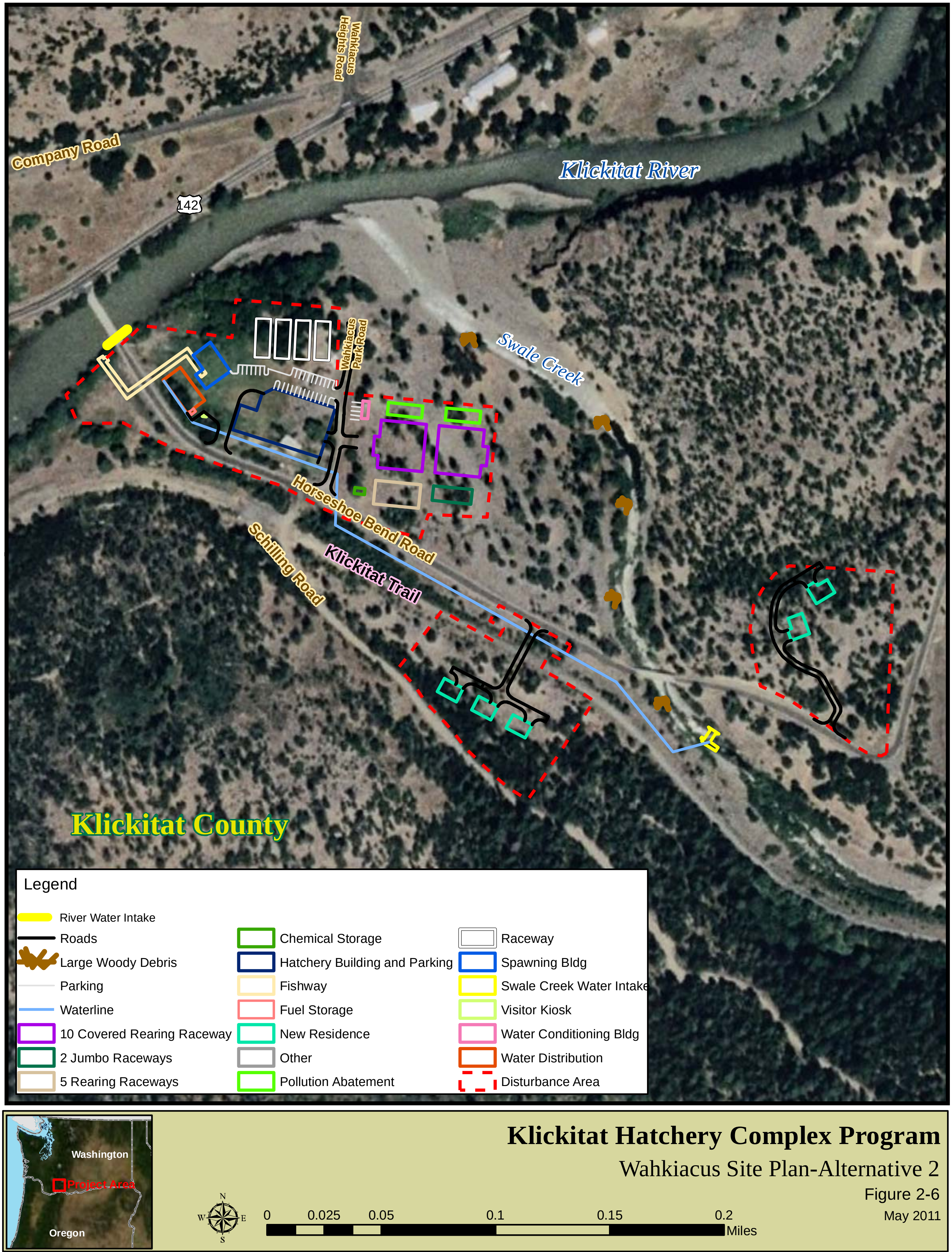
The Indian Ford Spring on the north side of the Klickitat River currently supplies water to the hatchery. It consists of three springs, which would be improved to replace aging components and improve the collection of water from the springs.

- ***Indian Ford Upper Spring A***. Intake and approximately 1,000 feet of pipeline would be replaced. An approximately 1000-foot-long permanent graveled road with a loop turnaround would be constructed from the existing road to access the spring for maintenance.
- ***Indian Ford Lower Spring A***. Approximately 275 feet of pipeline would be replaced.
- ***Indian Ford Spring B***. The intake would be moved approximately 150 feet uphill and approximately 650 feet of pipeline would be placed. A permanent gravel construction road 1,200 feet long would be constructed off the River Route Road to access the springs for construction and maintenance.

Wahkiacus Hatchery and Acclimation Facility—Under this alternative, a new hatchery and acclimation facility would be constructed at the Wahkiacus project site.

The Wahkiacus Hatchery and Acclimation Facility would be designed to acclimate up to 1,000,000 coho smolts as well as to rear and release up to 2,000,000 fall Chinook salmon. Ponds would occupy a large portion of the site; there would be approximately 254,000 cubic feet of rearing volume. The site would also continue to house the Yakama Nation's Klickitat regional fisheries office. The elevation of the proposed site is 512 to 525 feet and it is located primarily in the floodplain of both Swale Creek and the Klickitat River. The hatchery and its ancillary structures (excluding the proposed residence buildings) would be built within the 100-year floodplain. The facilities would be designed to withstand some amount of flooding each year. Hatchery power supply would be upgraded to three-phased power by Klickitat County Public Utilities District with emergency backup supplied by standby generators. A number of parking spaces would be created for employees and visitors and the current entrance to the facility would be realigned and redesigned. Figure 2-6 shows the proposed site plan for the Wahkiacus site.

All existing structures would be removed (i.e., mobile offices) or demolished (i.e., existing maintenance building and a house that serves as office space). The mobile offices would be re-used off-site, and all materials would be disposed of consistent with applicable regulations (e.g., asbestos removal in accordance with Washington's Southwest Clean Air Agency requirements and hazardous waste disposal in accordance with Department of Ecology regulations). For the purpose of this analysis it is expected that an area of approximately seven acres would be disturbed during the construction of hatchery and acclimation facilities.



Klickitat Hatchery Complex Program

Wahkiacus Site Plan-Alternative 2

Figure 2-6

May 2011

Proposed buildings for the hatchery complex include a new hatchery building (approximately 4,800 square feet) and a shop and maintenance building (approximately 3,500 square feet). A number of raceways would also be constructed:

- Two banks of juvenile raceways covering an area of approximately 12,000 square feet each with 10 individual raceways per bank
- One bank of five raceways covering an area of approximately 6,000 square feet
- Four banks of two raceways approximately 3,000 square feet per bank
- One bank of two large raceways approximately 3,000 square feet

Overhead netting would be used on a number of raceways to reduce predation and to provide cover for the juvenile fish. Pond outlet structures would have dam boards to control water levels and would be screened to prevent fish from escaping prematurely. The raceways would be above ground and jumbo-sized, and placed on imported fill material designed to withstand submersion during flood events. The raceways would be cleaned by vacuum pumping to the pollution abatement pond. Sediment would be removed by a vacuum truck and disposed of at a proper landfill.

Other buildings and facilities associated with this alternative include:

- A water conditioning building (approximately 2,200 square feet).
- A pollution abatement basin (approximately 2,200 square feet).
- A water distribution building (approximately 5,000 square feet).
- A spawning building/adult holding facility (approximately 4,800 square feet).
- Several small outbuildings for storage (approximately 500 square feet each).

An adult fish ladder (approximately 4,400 square feet) would be constructed in the Klickitat River, allowing returning adult salmon to enter the holding ponds. The fish ladder would be downstream of the Horseshoe Bend Bridge and would cross under Horseshoe Bend Road to reach the spawning building. This would require the addition of a culvert or small bridge for the road crossing. The fish ladder would be volitional in nature, and would not require a weir. Adults would be attracted to the fish ladder when water from the facility's ponds is discharged through the fish ladder. These adults would supply backup brood fish collection in conjunction with adult capture at the Lyle Falls facility.

Hatchery complex support components also include water distribution systems and a generator/electrical building. An alarm system would be installed to notify personnel of power and water interruptions. If electricity is lost, a transfer switch would automatically turn on the backup generators.

Water would be obtained from the Klickitat River through a large concrete intake structure. A water intake and primary pump station (approximately 1,200 square feet) would be constructed just north of the existing Horseshoe Bend Bridge. A boardwalk would be constructed over the intake pipes, allowing for pedestrian traffic along the shoreline. A secondary pump station would be constructed adjacent to the first.

The intake structure would be located on a stable channel segment of the Klickitat River, where the water depth is generally 4 to 6 feet deep. During severe low flow conditions it may be difficult to obtain water at this site. The programs proposed at this time involve only spring releases, which would not be affected by low flow conditions. The site's stability is dependent on the abutments of a bridge over the river. The abutments confine the channel and maintain its fixed position.[5]

In order to provide a short term emergency water supply, an intake structure would also be constructed on Swale Creek, just upstream of the Horseshoe Bend Road crossing. A waterline, approximately 1,650 feet long would deliver water from the creek to the water distribution facility adjacent to the Klickitat River. The water pipeline would be located on the south side of Horseshoe Bend Road, between the road and the Klickitat Trail, and run parallel with the road the majority of the way. The waterline would cross the road near the proposed hatchery building and then run along the north side of the road until it meets the water distribution facilities. A section of the existing Horseshoe Bend Road would be bored or would be removed so the waterline could be buried underneath it. The road would then be repaired.

The pre-fabricated metal screened intake structures would be installed below ground level to prevent flood scour damage. All components would be completely submersible. The intake design would incorporate in-channel rock chevron or barb structures to create a 4-foot deep pool from which to draw creek water. The rock chevron/barb will be designed with a low-flow notch to facilitate fish passage upstream and downstream of the structure during periods of low flow. The intake would require periodic removal of accumulated bedload to ensure proper pool depth. Pumps and pipelines would deliver water to the ponds. Three-phase power would run the pumps and generators would provide back-up.

Water may also be obtained from groundwater springs with artesian pressure, which exist at the site. Groundwater may be used for domestic water supply.

Site work would include extending existing gravel roads to the acclimation ponds as well as grading and landscaping. Three parking lots would be constructed. Two parking lots for hatchery staff totaling 3,000 square feet would be situated adjacent to the hatchery building, while a 1,200 square foot visitor parking lot would be located near the proposed location for the settling pond. A security fence would be installed around the perimeter of

[5] If the bridge were to be replaced and relocated at some point in the future, as being discussed by Klickitat County, the abutments would need to be retained for channel stability and protection of the intake structure.

the hatchery facility. An informational kiosk would be located adjacent to the public parking area.

Up to three new residences (each approximately 2,000 square feet) would be provided to allow hatchery workers and their families to live on-site. New residences (see Figure 2-6) would require site improvements in one of two locations for water supply, fire protection, and waste disposal (see Figure 2-6). The new residence buildings would be located outside the 100-year floodplain on newly acquired property either to the southeast (Residence Option A) or northeast (Residence Option B) of the proposed hatchery facilities. The potential disturbance area for either residence site is approximately 3 acres. The houses would have septic tanks for waste disposal and wells for water. A spur road would be constructed off of Horseshoe Bend Road in order to provide access to the residence buildings. The access road for Residence Option A would require constructing a crossing of the Klickitat trail. This road would disturb approximately 6,700 square feet; alternately the access road for Residence Option B would disturb approximately 6,200 square feet. In addition, excavation for Residence Option B would provide any necessary fill required for construction of the entire site.

The use of cofferdams would be necessary for the construction of the adult fish ladder and river water intakes. Cofferdams would most likely be made of sandbags as described for the Klickitat Hatchery.

Cofferdams would be positioned in an arc to protect the area, while allowing for construction equipment and personnel to work unobstructed; generally, a distance of approximately 10 feet is needed for in working space between the cofferdam and the structure being constructed. Areas protected by cofferdams would be rotated from one location to another as construction element sequencing requires; i.e., a cofferdam would be established at one work site, the work completed, and the cofferdam removed before establishing a cofferdam at a new location. However, seasonal in-water work windows would ultimately decide the logistics of multiple in-channel work sites.

A variety of construction equipment would be used to develop the complex. On-site temporary staging areas would be created and used during the construction phase. Construction staging would be located on approximately 0.5 acres at the site of Residence Option B and on approximately 0.4 acres immediately southeast of the location for the rearing raceways. It is anticipated that the contractor’s construction headquarters would also be located on-site within the anticipated disturbance area for the project.

Construction activities would occur year-round during all suitable months, with any in-stream work being performed during pre-established in-water work windows. After construction, disturbed riverbanks would be planted with native vegetation and restored.

Five large engineered woody debris (log) jams would be constructed and placed in Swale Creek to protect the streambank adjacent to the hatchery, and to enhance pool-forming processes and deepening of the channel adjacent to the Swale Creek intake. The log jams would also increase spawning habitat. Each log jam would also be constructed with a roughened rock toe along the base of the bank. The logs would be no smaller than

18 inches in diameter. Two to three anchors would be used per log to reduce the chance of the logs moving during high flow events. Mechanical anchors or rock ballasts would be used where appropriate. Galvanized cable would be used to attach all of the logs to each other. The placement of the log jams would be conducted during pre-established in-water work windows. Portions of the anchored logs could be buried in the streambank.

2.4.3 Operations and Maintenance

The Klickitat Hatchery would be operated year-round, and the Wahkiacus Hatchery would be operated from September through June. Personnel necessary to implement this alternative would include two fish culturists with oversight by a hatchery manager at each facility. Maintenance would be performed seasonally or on an as-needed basis. There would be a 0.25 full time employee dedicated to hatchery maintenance at each facility. Vehicles such as pickups and fish hauling trucks would be used for operations and maintenance, including moving fish between hatcheries and acclimation facilities.

Water for the Klickitat Hatchery would come from several sources. The Klickitat River would provide water at two locations; primarily from the intake located on the east side of the river at volumes of about 9,000 gpm (20 cfs), and secondarily from pumps located on the west side of the river at volumes of about 4,500 gpm (10 cfs). Average river water temperatures would range between 36 and 60 degrees Fahrenheit. The Indian Ford and Wonder Springs supplies would continue to provide 6,700 gpm (15 cfs) and 5,400 gpm (12 cfs), respectively, to Klickitat Hatchery. Average spring water temperature would range between 48 and 50 degrees Fahrenheit.

Water for the Wahkiacus facility would primarily come from the Klickitat River, though Swale Creek may also provide emergency backup water during high flow months only, and a well would likely be needed for nonfish-production purposes (i.e., potable water to supply office buildings and residences). The proposed Klickitat River intake is designed for 30 cfs and the proposed Swale Creek intake is designed for 20 cfs. The Yakama Nation has a water right for 20 cfs from the Klickitat River, and no water right for Swale Creek. The Swale Creek intake would be used as needed (e.g., if and when the intake on the Klickitat River freezes or needs repair) and only when adequate flows are available. The Yakama Nation would need to obtain additional water rights on the Klickitat River and new water rights on Swale Creek to operate the Wahkiacus Hatchery and Acclimation Facility.

Fish wastes would be settled in the acclimation ponds (which are low velocity) and would be periodically vacuumed off the pond bottom and diverted to an off-line aerated settling basin. There, the waste would be dried and removed from the site by truck. Table 2-1 provides the estimate of construction and operation and maintenance costs for the proposed improvements associated with Alternative 2.

Table 2-1: Expected Initial Construction and Annual Operations and Maintenance Costs

Facility	Construction[1]	Operation and Maintenance[2]
Klickitat Hatchery	$26,503,000	$316,700
Wahkiacus Hatchery	$21,393,000	$305,600
McCreedy Creek[3]	$2,120,000	$46,000
Fall Chinook Marking[4]	NA	$291,900

[1] *Estimate from Conceptual Design Study (Harbor 2010a and 2010b) in 2012 dollars for Klickitat Hatchery decreased by 11.7% due to some components not being needed if Wahkiacus is built, and in 2011 dollars for Wahkiacus Hatchery. Estimate for McCreedy Creek from the Master Plan (Yakama Nation 2004a) escalated to 2012 dollars.*

[2] *Estimates from the Master Plan (Yakama Nation 2004a) - average costs estimated over the 2011-17 time period based on 2008 dollars inflated using a 4% inflation rate. These funds would be needed in addition to the current annual Mitchell Act O&M funding of $521,379.*

[3] *The McCreedy Creek Acclimation Facility would be built only if necessary.*

[4] *Estimated additional O&M funds needed to meet mass marking requirements and to assist in hatchery reform efforts.*

2.5 Alternative 3 — Klickitat Hatchery Buildout

Under this alternative, fish production goals and hatchery/harvest approaches would be similar to Alternative 2, but hatchery and production actions would be focused entirely at a modified Klickitat Hatchery. There would be no new facilities constructed at the Wahkiacus location. The use of the Washougal Hatchery would continue for some stocks in order to achieve production goals.

2.5.1 Fish Production Program

Alternative 3 would implement an integrated hatchery program for spring Chinook, and segregated programs using locally derived broodstock for summer steelhead, fall Chinook, and coho as described for Alternative 2. However, due to limitations on hatchery capacity at the Klickitat Hatchery, some fish may need to continue to be reared at out-of-basin hatcheries such as the Washougal Hatchery.

Spring Chinook Salmon—As with Alternative 2, an integrated hatchery/harvest program for spring Chinook would be implemented under Alternative 3. The goals and methods for production of spring Chinook at Klickitat Hatchery would be the same as described for Alternative 2. Hatchery- and natural-origin broodstock collected at the Klickitat Hatchery would be replaced with natural-origin adults collected at Lyle Falls Fishway and Castile Falls as described for Alternative 2. Some of the adult fish captured at Lyle Falls Fishway would be released above Castile Falls to spawn naturally to supplement populations in the upper river.

Despite potential space limitations under this alternative, spring Chinook production at Klickitat Hatchery would take a higher priority than other stocks based on spring Chinook harvest goals. Therefore, rearing of other stocks at other hatcheries may be required to support spring Chinook production goals at the Klickitat Hatchery.

Summer Steelhead—Under this alternative, production goals and objectives and potential adaptive management actions for summer steelhead would be the same as described for Alternative 2; however, actual production for the segregated program could be lower based on capacity limitations at the Klickitat Hatchery.

Coho Salmon—Similar to Alternative 2, Alternative 3 would implement a local broodstock segregated hatchery program for coho salmon, with a production goal sufficient to establish a 14,000 combined (ocean, mainstem, and tributary) adult coho annual harvest.

Because there would be no coho production at Wahkiacus, one million coho salmon pre-smolts would be reared and volitionally released at the Klickitat Hatchery. This alternative would not spatially separate a large proportion of hatchery releases within the key 26-mile reach of the Klickitat River, which is a goal of the Master Plan. The adult coho would be collected and spawned at the Klickitat Hatchery, and eggs would be incubated, hatched and reared there for acclimation and volitional release in May. If the harvest goal cannot be met with this program, up to 2.5 million Washougal River stock smolts would be imported and direct released in the lower Klickitat River as needed to meet the goal.

Fall Chinook Salmon—Similar to Alternative 2, this alternative would create a local broodstock segregated hatchery/harvest program for fall Chinook. Adult and jack fall Chinook returning to the Klickitat River would be used as broodstock for the program. The adults would be collected at the Lyle Falls Fishway and Klickitat Hatchery. Approximately 2,500 adults would be needed to produce the desired 4 million subyearling fall Chinook needed to meet the 18,000 combined (ocean, mainstem, and tributary) harvest goal. Production, including incubation, rearing, acclimation, and volitional release, would occur at the Klickitat Hatchery. Production may need to be reduced due to water limitations at the Klickitat Hatchery. Similar to the coho program, this alternative would not accomplish the spatial separation of hatchery releases provided under Alternative 2 by moving half of the fall Chinook production to the Wahkiacus Hatchery. All hatchery fish would be marked for harvest-related identification. Based on hatchery capacity, actual production of fall Chinook would likely be lower under Alternative 3 than the 4 million smolts currently released annually.

2.5.2 Facility Development and Construction

The Klickitat Hatchery modifications would be constructed as described for Alternative 2 (see Section 2.3.1). In addition, this alternative would include construction of a new 1,400-square-foot raceway at the Klickitat Hatchery. Construction activities at the Klickitat Hatchery would be the same as those described in Alternative 2. There would be no construction at the Wahkiacus location. The McCreedy Creek site would be developed for a mobile acclimation facility for steelhead, should it be deemed necessary (see discussion in Section 2.3.2). Table 2-2 provides the estimate of construction and operation and maintenance costs for hatchery modifications.

Table 2-2: Expected Initial Construction and Annual Operations and Maintenance Costs

Facility	Construction[1]	Operation and Maintenance[2]
Klickitat Hatchery	$30,015,000	$466,700
McCreedy Creek[3]	$2,120,000	$46,000
Fall Chinook Marking[4]	NA	$291,900

[1] *Estimate from Conceptual Design Study (Harbor 2010a and 2010b) in 2012 dollars for Klickitat Hatchery. Estimate for McCreedy Creek from the Master Plan (Yakama Nation 2004a) escalated to 2012 dollars.*

[2] *Estimates from the Master Plan (Yakama Nation 2004a) - average costs estimated over the 2011-17 time period based on 2008 dollars inflated using a 4% inflation rate. These funds would be needed in addition to the current annual Mitchell Act O&M funding of $521,379.*

[3] *The McCreedy Creek Acclimation Facility would be built only if necessary.*

[4] *Estimated additional O&M funds needed to meet mass marking requirements and to assist in hatchery reform efforts.*

2.5.3 Operations and Maintenance

The Klickitat Hatchery would be operated year-round. Personnel necessary to implement this alternative would include five fish culturists with oversight by the hatchery manager. There would be a 0.25 full time employee dedicated to hatchery maintenance at the hatchery. Vehicles such as pickup and fish trucks would be used for operations and maintenance, including moving fish between hatcheries and acclimation facilities.

Water for the Klickitat Hatchery would come from several sources, as described in Alternative 2. The Klickitat River would provide water at two locations. Water would primarily come from the intake located on the east side of the river and measure about 9,000 gpm (20 cfs), while water could also come from pumps located on the west side of the river at 4,500 gpm (10 cfs). Average water temperatures from river water would range between 36 and 60 degrees Fahrenheit. The Indian Ford and Wonder Springs would continue to provide 6,700 gpm (15 cfs) and 5,400 gpm (12 cfs), respectively. Average spring water temperature would range between 48 and 50 degrees Fahrenheit. Table 2-2 provides the estimate of operations and maintenance costs for hatchery modifications.

2.6 Alternatives Considered But Eliminated from Detailed Analysis

Other than the alternatives described previously in this chapter, the planning process and comments raised during scoping for this EIS did not identify additional alternatives that would meet the purpose of and need for action. The Yakama Nation has considered the possibility of building the Wahkiacus facilities in phases. While such a phased approach is possible, the environmental impacts would not differ enough from Alternative 2 to make it a separate alternative.

2.7 Comparison of Alternatives

Table 2-3 compares the project alternatives to the project purposes identified in Chapter 1. Table 2-4 summarizes and compares the potential environmental consequences of the alternatives. See Chapter 3 for a full discussion of environmental consequences.

Table 2-3: Klickitat Hatchery Complex Program EIS–Alternatives Compared with Project Purposes

Project Purpose	Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
To comply with the Federal Columbia River Power System (FCRPS) Biological Opinion which calls on the FCRPS Action Agencies to ensure that hatchery programs funded by them as mitigation for the FCRPS are not impeding recovery of listed anadromous fish.	The program would not be funded by BPA under this alternative. Potentially negative interactions between native listed fish (steelhead and bull trout) and nonnative (coho and fall Chinook) salmonids would continue to occur.	Minimizes potentially negative interactions between native listed fish (steelhead and bull trout) and nonnative (coho and fall Chinook) salmonids by implementing acclimation and release for coho and fall Chinook lower in the basin and by reducing coho production.	Coho production would be reduced but no shift of coho and fall Chinook releases to downstream areas therefore continuing potential negative interactions.
To aid in the conservation of mid-Columbia steelhead listed as threatened under the Endangered Species Act.	Implementation of an upper river conservation program for summer steelhead recovery in the Subbasin would not occur.	In addition to reducing impacts to steelhead spawning above Wahkiacus, a conservation program would be developed if needed in the upper Klickitat River Subbasin above Castile Falls.	No shift of coho and fall Chinook releases to downstream areas therefore continuing potential negative interactions. A conservation program would be developed if needed in the upper Klickitat River Subbasin above Castile Falls.
To support the Yakama Nation's exercise of its treaty fishing rights by rebuilding native anadromous fish stocks in the Klickitat River Subbasin using artificial production methods that have been tested by the tribe and that are supported by hatchery reform recommendations.	The current program does not consistently meet harvest goals and does not reflect the Yakama Nation's or regional hatchery reform guidelines for artificial production.	Implements locally adapted, segregated hatchery population programs for fall Chinook and coho for harvest. Replaces the existing segregated spring Chinook broodstock with an integrated program using natural-origin fish returning to the Klickitat River Subbasin. Improves the segregated summer steelhead program with local broodstock and volitional release in-basin.	Same as Alternative 2 except potentially reduces the size of the fall Chinook and steelhead programs due to space limitations.
To be consistent with production and harvest objectives as specified in the 2008-2017 United States v. Oregon Fish Management Agreement	Fish production levels and harvest would not change from existing conditions.	Coho production would be reduced but harvest for fall Chinook and coho would be maintained at goals. Harvest of spring Chinook and steelhead would more consistently meet goals.	Coho production would be reduced but harvest for fall Chinook and coho would be maintained at goals. Harvest of spring Chinook and steelhead would more consistently meet goals.

Table 2-4: Klickitat Hatchery Complex Program EIS–Summary of Impacts for Each Alternative

Chapter	Resource Area	Anticipated Environmental Effects: Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
3.1.1	Air Quality (NonGHG Emissions)	Air quality would be unaffected as no new pollutant sources would be added.	Construction would cause minor short-term local increases in air pollutant emissions (adverse effect) at the Wahkiacus and Klickitat Hatcheries, and McCreedy Creek sites. Emergency use of generators at the Wahkiacus and Klickitat Hatchery sites, and seasonal use of generators at the McCreedy Creek site would cause minor short-term adverse impacts on air quality.	Construction would cause minor short-term local increases in air pollutant emissions (adverse effect) at the Klickitat Hatchery and McCreedy Creek sites. Emergency use of generators at the Klickitat Hatchery site and seasonal use of generators at the McCreedy Creek site would cause minor short-term adverse impacts on air quality.
3.1.2	Climate Change (GHG Emissions)	No effect on climate change.	Some increase in greenhouse gas emissions would occur; however, the contribution to climate change would be minor.	Some increase in greenhouse gas emissions would occur; however, the contribution to climate change would be minor.
3.2	Geology and Soils	No ground disturbing activities; geology and soils would be unaffected.	A total of 33.15 acres of soil/ground would be disturbed at the three project sites. Short-term minor adverse effects of erosion and sedimentation from construction would occur at the Wahkiacus, Klickitat Hatchery, and McCreedy Creek site, although Best Management Practices would be employed to reduce the impact. Minor long-term site-specific adverse impacts on soils and geology would result from site grading at the three sites, which would permanently alter the natural conditions of these resources.	A total of 21.45 acres of soil/ground would be disturbed at the Klickitat Hatchery and McCreedy Creek sites. Short-term minor adverse effects of erosion and sedimentation from construction would occur at the Klickitat Hatchery and McCreedy Creek site, although Best Management Practices would be employed to reduce the impact. Minor long-term site-specific adverse impacts on soils and geology would result from site grading at the two sites, which would permanently alter the natural conditions of these resources.

Table 2-4: Klickitat Hatchery Complex Program EIS–Summary of Impacts for Each Alternative

Chapter	Resource Area	Anticipated Environmental Effects Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
3.3	Water Quality and Quantity	Groundwater, hydrology, water rights, and water quality would remain unaffected. Water demand at the Klickitat Hatchery would remain unchanged.	Construction activities would increase the erosion potential for soils; sediment could enter the Klickitat River, Swale Creek, and McCreedy Creek during rain events. In-water work at the three sites would have a localized minor short-term adverse effect on water quality. Water withdrawal from the Klickitat River and Swale Creek for new facilities at the Wahkiacus site, and from McCreedy Creek for a mobile acclimation facility, would cause lower flows in these streams between the intakes and outfalls. Consumptive use of water at Klickitat Hatchery is expected to be minimal and similar to existing conditions. Withdrawals from Swale Creek would have an adverse effect on instream flows; however, the effect would be short term and minor because the intake would only be operated in emergencies and only during higher flow periods when adequate creek water is available for withdrawal while maintaining instream beneficial uses (fish spawning, rearing, migration). Long-term adverse effects to water quality due to effluent discharge at any of the proposed facilities are anticipated to be minor.	Construction activities would increase the erosion potential for soils; sediment could enter the Klickitat River and McCreedy Creek during rain events. In-water work at the Klickitat Hatchery and McCreedy Creek sites would have a localized minor short-term adverse effect on water quality. Water withdrawal from McCreedy Creek for a mobile acclimation facility would cause lower flows in this stream between the intake and outfall. Consumptive use of water at Klickitat Hatchery is expected to be minimal and similar to existing conditions. Long-term adverse effects to water quality due to effluent discharge at any of the proposed facilities are anticipated to be minor.
3.4	Fish and Fisheries	No new fish hatchery or acclimation facilities would be built and fish production programs conducted at the Klickitat Hatchery would continue. Direct releases of hatchery fish from outside the subbasin	Construction would result in minor short-term loss of instream habitat due to dewatering related to in-water work isolation.	Construction would result in minor short-term loss of instream habitat due to dewatering related to in-water work isolation.

Table 2-4: Klickitat Hatchery Complex Program EIS–Summary of Impacts for Each Alternative

Chapter	Resource Area	Anticipated Environmental Effects: Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
		would continue without the benefit of acclimation, which impacts native fish. Naturally-produced juvenile steelhead and spring Chinook present in the mainstem Klickitat River downstream of the Klickitat Hatchery would continue to be vulnerable to predation and competition effects from hatchery coho and fall Chinook salmon releases from the Klickitat Hatchery. Releases of nonnative Skamania stock hatchery fish in the Klickitat River may be affecting and continue to affect the Klickitat native populations.	Fish salvage during dewatering process would result in moderate short-term stress to handled fish. Effects to individuals could be adverse. Placement of instream structures (new intakes, fish ladders, etc.) would result in a minor permanent loss of instream and bank habitat. Operation of new facilities at Wahkiacus would introduce effluent into the Klickitat River, which could adversely affect fish near the outfall. All discharges would comply with NPDES permit requirements for fish rearing. Operation of Swale Creek intake could result in short term and minor adverse effects to rearing and spawning salmonids due to reduction in flow (habitat). However, the intake would only operate when flows are sufficient to support hatchery withdrawals while maintaining flows necessary for fish spawning, rearing and migration. Naturally-produced juvenile steelhead and spring Chinook present in the mainstem Klickitat River downstream of the Klickitat Hatchery would be less vulnerable to predation and competition effects from hatchery coho and fall Chinook salmon released downstream from the Klickitat Hatchery at the Wahkiacus facility. Operation of the fish ladder at the Wahkiacus facility would result in minor short-term delays to upstream migration	Fish salvage during dewatering process would result in moderate short-term stress to handled fish. Effects to individuals could be adverse. Placement of instream structures (new intakes, fish ladders, etc.) would result in a minor permanent loss of instream and bank habitat. Operation of McCreedy Creek intake would result in minor short-term loss of available instream habitat. Effluent from acclimation facilities into McCreedy Creek would have a limited effect on water quality and result in minor, low intensity direct effects to fish in McCreedy Creek and Klickitat River. Removal of a culvert at McCreedy Creek would improve passage, resulting in permanent beneficial effect. Operation of new intake at Klickitat Hatchery would result in minor delays to aquatic species that enter the bypass. Naturally-produced juvenile steelhead and spring Chinook present in the mainstem Klickitat River downstream of the Klickitat Hatchery would continue to be vulnerable to predation and competition effects from hatchery coho and fall Chinook salmon releases from the Klickitat Hatchery.

Table 2-4: Klickitat Hatchery Complex Program EIS–Summary of Impacts for Each Alternative

Chapter	Resource Area	Anticipated Environmental Effects Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
			for non-target anadromous salmonids. Operation of McCreedy Creek intake would result in minor short-term loss of available instream habitat. Effluent from acclimation facilities into McCreedy Creek would have a limited effect on water quality and result in minor, low intensity direct effects to fish in McCreedy Creek and Klickitat River. Removal of culvert at McCreedy Creek would improve passage, resulting in permanent beneficial effect. Operation of new intake at Klickitat Hatchery would result in minor delays to aquatic species that enter the bypass.	
3.5	Vegetation	No vegetation removal required; therefore, no impact to vegetation would occur.	Construction would have a short-term moderate impact on a total of 24.5 acres of vegetation. Permanent removal of a total of 5.9 acres of vegetation would occur. Routine maintenance of the hatchery facilities would include removal of woody debris, which would have a minor long-term adverse effect on vegetation and wildlife that rely on the woody debris for nutrients and habitat. Increased vehicle traffic at the Wahkiacus and McCreedy Creek sites may disperse nonnative species to these areas.	Construction would have a short-term moderate impact on a total of 15.7 acres of vegetation. Permanent removal of 3.7 acres of vegetation would occur. Routine maintenance of the hatchery facilities would include removal of woody debris, which would have a minor long-term adverse effect on vegetation and wildlife that rely on the woody debris for nutrients and habitat. Increased vehicle traffic at the McCreedy Creek site may disperse nonnative species to this area.

Table 2-4: Klickitat Hatchery Complex Program EIS–Summary of Impacts for Each Alternative

		Anticipated Environmental Effects		
Chapter	Resource Area	Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
3.6	Wildlife	The existing status of wildlife habitat and species at three project sites would not be affected.	Construction would remove 5.9 acres of habitat for local wildlife species, decreasing available habitat and having a minor impact on wildlife. Less mobile species at the construction sites, such as amphibians and reptiles, would experience major adverse effects from construction. Construction noise would have a moderate short-term effect on wildlife at the three project sites, displacing them during the construction period. Operation of hatchery and acclimation facilities would have a minor long-term effect on species that are sensitive to human disturbance.	Construction would remove 3.7 acres of habitat for local wildlife species, decreasing available habitat and having a minor impact on wildlife. Less mobile species at the construction sites, such as amphibians and reptiles, would experience major adverse effects from construction. Construction noise would have a moderate short-term effect on wildlife at Klickitat Hatchery and McCreedy Creek, displacing them during the construction period. Operation of hatchery and acclimation facilities would have a minor long-term effect on wildlife species that are sensitive to human disturbance.
3.7	Threatened and Endangered Species	Naturally-produced juvenile steelhead present in the mainstem Klickitat River downstream of the Klickitat Hatchery would continue to be vulnerable to predation and competition effects from hatchery coho and fall Chinook salmon releases from the Klickitat Hatchery. Releases of nonnative Skamania stock hatchery fish in the Klickitat River may be affecting and continue to affect the Klickitat native populations.	If present, effects to federally listed bull trout and Middle Columbia River steelhead would be similar to those described for Fisheries. Operation of the Swale Creek intake would result in minor adverse effects to designated critical habitat for steelhead due to flow reduction; however, the intake would only operate when flows are sufficient to support hatchery withdrawals while maintaining flows necessary for fish spawning, rearing and migration. Construction noise could result in a direct, short-term moderate adverse effect on a Northern spotted owl nest 0.65 mile downstream of the McCreedy Creek site.	If present, effects to federally listed bull trout and Middle Columbia River steelhead would be similar to those described for Fisheries. Construction noise could result in a direct, short-term moderate adverse effect on a Northern spotted owl nest 0.65 mile downstream of the McCreedy Creek site.

Table 2-4: Klickitat Hatchery Complex Program EIS–Summary of Impacts for Each Alternative

Chapter	Resource Area	Anticipated Environmental Effects		
		Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
3.8	Wetlands	Wetlands would be unaffected.	Construction of the Wahkiacus site would have a major long-term impact to wetlands with removal of the 0.29 acre of Category 3 wetland. Erosion and sedimentation from construction activities could result in minor short-term adverse effect by decreasing water quality and habitat availability to slope wetlands associated with Indian Ford and Wonder Springs (Klickitat Hatchery site). In the long-term, these slope wetlands could be lost and converted to upland as site upgrades could alter surface water patterns. Erosion and sedimentation from construction of the bridge over McCreedy Creek could have a minor decrease in water quality and habitat availability in the downstream wetland in the short-term. Construction of McCreedy Creek intake and outfall would be sited to avoid impacts to wetland spanning the creek.	Erosion and sedimentation from construction activities could result in minor short-term adverse effect by decreasing water quality and habitat availability to slope wetlands associated with Indian Ford and Wonder Springs (Klickitat Hatchery site). In the long-term these slope wetlands could be lost and converted to upland as site upgrades could alter surface water patterns. Erosion and sedimentation from construction of the bridge over McCreedy Creek could have a minor decrease in water quality and habitat availability in the downstream wetland in the short-term. Construction of McCreedy Creek intake and outfall would be sited to avoid impacts to wetland spanning the creek.
3.9	Floodplains	There would be no floodplain impacts.	The intake and pump station for the Wahkiacus facility would be within the *floodway* of the Klickitat River and several facilities associated with the Wahkiacus site would be located in the *floodway fringe*. The development of these facilities would have no direct long-term effect on the flood elevation. The new intake at Klickitat Hatchery would be designed to withstand high water events and is not expected to alter flood elevations. Impacts to floodplains are not anticipated at Klickitat Hatchery site or McCreedy Creek site.	The new intake at Klickitat Hatchery would be designed to withstand high water events and is not expected to alter flood elevations. Impacts to floodplains are not anticipated at Klickitat Hatchery site or McCreedy Creek site.

Table 2-4: Klickitat Hatchery Complex Program EIS–Summary of Impacts for Each Alternative

Chapter	Resource Area	Anticipated Environmental Effects Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
3.10	Cultural	There would be no impacts to cultural resources.	Ground-disturbance related to construction activities at the Wahkiacus study area would constitute a long-term adverse impact to cultural materials. The modification of the existing hatchery and demolition of the three residences at the Klickitat study area would constitute a long-term adverse impact to these historic properties. Further evaluation of the McCreedy Creek study area is being conducted to determine if cultural materials are present. It is possible that the project could have an effect on them.	There would be no impacts to cultural resources at the Wahkiacus study area. The modification of the existing hatchery and demolition of the three residences at the Klickitat study area would constitute a long-term adverse impact to these historic properties. Further evaluation of the McCreedy Creek study area is being conducted to determine if cultural materials are present. It is possible that the project could have an effect on them.
3.11.1	Visual Resources	There would be no change to the visual environment.	Construction activities would constitute a short-term moderate adverse direct impact to sensitive viewers at the Wahkiacus and Klickitat Hatchery sites. New structures at Wahkiacus site would constitute a moderate long-term adverse impact to sensitive viewers. Partial removal of the concrete sill at the Klickitat Hatchery site would create a long-term direct beneficial impact to sensitive viewers. Sensitive viewers would not be present at the McCreedy Creek site during the acclimation period; therefore, no visual resources impacts would occur.	Construction activities would constitute a short-term moderate adverse direct impact to sensitive viewers at the Klickitat Hatchery site. Partial removal of the concrete sill at the Klickitat Hatchery site would create a long-term direct beneficial impact to sensitive viewers. Sensitive viewers would not be present at the McCreedy Creek site during the acclimation period; therefore, no visual resources impacts would occur.
3.11.2	Soundscape	There would be no change to the soundscape.	Construction would cause moderate short-term noise impacts in areas directly adjacent to construction activity, including the residence located 0.17 miles from the Wahkiacus site.	Residents approximately 0.25 mile from the Klickitat Hatchery site may experience some temporary minor impacts from construction noise.

Table 2-4: Klickitat Hatchery Complex Program EIS–Summary of Impacts for Each Alternative

Chapter	Resource Area	Anticipated Environmental Effects Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
			Operational noise effects are not anticipated to exceed the Washington Administrative Code maximum environmental noise level and would only constitute a minor effect. Residents approximately 0.25 mile from the Klickitat Hatchery site may experience some temporary minor impacts from construction noise. The nearest off-site residences are located well over 0.25 mile from the McCreedy site and are not expected to experience impacts from construction or operation noise.	Operational noise effects are not anticipated to exceed the WAC maximum environmental noise level and would only constitute a minor effect. Residents approximately 0.25 mile from the Klickitat Hatchery site may experience some temporary minor impacts from construction noise. The nearest off-site residences are located well over 0.25 mile from the McCreedy site and are not expected to experience impacts from construction or operation noise.
3.12.1	Land Use and Transportation	Land use would not change.	Development of the Wahkiacus site would have a minor long-term direct beneficial impact on land use because the conservation and residential uses would conform to zoning. No changes in land use or zoning would occur at Klickitat Hatchery. Seasonal use of the McCreedy Creek for acclimation site would restrict access to tribal members, having a minor adverse effect on their use of the site.	No changes in land use or zoning would occur at Klickitat Hatchery. Seasonal use of the McCreedy Creek site for acclimation would restrict access to tribal members, having a minor adverse effect on their use of the site.
		Transportation facilities would not change.	Short-term traffic delays (minor adverse impact) would occur at the three project sites due to construction trucks and construction worker vehicles accessing the sites.	Short-term traffic delays (minor adverse impact) would occur at the two project sites due to construction trucks and construction worker vehicles accessing the sites.

Table 2-4: Klickitat Hatchery Complex Program EIS–Summary of Impacts for Each Alternative

Chapter	Resource Area	Anticipated Environmental Effects Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
3.12.2	Social and Economic Environment	The current conditions of the local and regional economy, and population would not change. Subsistence users may be adversely affected by the limited availability of fish for harvest.	Construction and operation would result in a direct short-term minor beneficial impact on employment in the local and regional economy. New permanent jobs would be available at the Wahkiacus site and a temporary/seasonal job would be available at the McCreedy Creek site. Subsistence fishing could be interrupted during construction, having a minor short term adverse impact on subsistence users. Alternative 2 would benefit subsistence fishing by improving the availability of fish for harvest.	Construction and operation would result in a direct short-term minor beneficial impact on employment in the local and regional economy. A seasonal job would be available at the McCreedy Creek site. Subsistence fishing could be interrupted during construction, having a minor short term adverse impact on subsistence users. Alternative 3 would benefit subsistence fishing by improving the availability of fish for harvest.
3.12.3	Recreation	Recreation resources and opportunities would continue at the present level.	Construction would cause short-term interruptions (moderate adverse impact) to use of the Klickitat Trail and the Klickitat River at the Wahkiacus site. Vehicle traffic associated with Residence Option A (Wahkiacus site) would pose a minor risk to trail users. Removal of the concrete sill at the Klickitat Hatchery site would improve non-motorized boat use of the river. Construction and operation of the McCreedy Creek site would result in seasonal interruption (minor adverse impact) of tribal use of the site for recreation.	Removal of the concrete sill at the Klickitat Hatchery site would improve non-motorized boat use of the river. Construction and operation of the McCreedy Creek site would result in seasonal interruption (minor adverse impact) of tribal use of the site for recreation.

Table 2-4: Klickitat Hatchery Complex Program EIS–Summary of Impacts for Each Alternative

Chapter	Resource Area	Anticipated Environmental Effects Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
3.13	Public Health and Safety	Public health and safety would be unaffected.	Minor short-term adverse effects would be directly related to potential for injury occurring during construction activities. Operational safety risks would be the same as for similar hatchery facilities. Partial removal of the sill at Klickitat Hatchery would improve safety for boaters in this section of the river.	Minor short-term adverse effects would be directly related to potential for injury occurring during construction activities. Operational safety risks would be the same as for similar hatchery facilities. Partial removal of the sill at Klickitat Hatchery would improve safety for boaters in this section of the river.

Chapter 3: Affected Environment, Environmental Consequences, and Mitigation Measures

This chapter describes the existing natural and human resources potentially affected by the project alternatives, and the effects, or impacts, each alternative could have on those resources. The potential effects are based on existing literature, field observations by environmental specialists, information provided by agency and public comments, and ancillary information that was gathered by the project team.

Impacts are typically described in terms of type, context, duration, and intensity. General definitions are as follows:

Type describes the classification of the impact as beneficial or adverse, direct or indirect.

- **Beneficial**: A positive change in the condition or appearance of the resource.
- **Adverse**: A change that moves the resource away from the existing condition or detracts from its appearance or condition.
- **Direct**: An effect that is caused by an action and occurs at the same time and in the same place as the action.
- **Indirect**: An effect that is caused by an action but is later in time or removed in distance from the action.

Context describes the area or location in which the impact will occur; explains whether the effects are site-specific, local, regional, or even broader.

Duration describes the length of time an impact is anticipated to last.

- **Short-term** impacts generally last only as long as the construction period, and the resources generally return to their preconstruction conditions following construction.
- **Long-term** impacts last beyond the construction period, and the resources may not return to their preconstruction conditions for a longer period following construction, if at all.

Intensity describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into minor, moderate, and major. Because definitions of intensity vary by resource topic, intensity definitions are provided separately for each impact topic under each Environmental Consequences section.

3.1 Air Resources

3.1.1 Air Quality

3.1.1.1 Affected Environment

The study area for air quality is the area within one mile of each proposed project site: Wahkiacus, Klickitat Hatchery, and McCreedy Creek. This area is defined based on the existing condition of air pollution at the sites, typical air quality impacts associated with construction activity, and the proposed facilities at each site.

The Environmental Protection Agency (EPA) and the Washington Department of Ecology (WDOE) both have responsibility for air quality in the State of Washington. The EPA has established National Ambient Air Quality Standards (NAAQS) to protect the public from air pollution. The NAAQS focus on “criteria pollutants,” which are pollutants of particular concern for human health. The criteria pollutants are: carbon monoxide, lead, ozone, nitrogen dioxide, sulfur dioxide, course particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$). In addition to the NAAQS, the WDOE has established State Ambient Air Quality Standards (SAAQS) that are at least as stringent as the NAAQS. The Yakama Nation has not yet established air quality standards; therefore the reservation is regulated by EPA.

The three sites under evaluation in this EIS are all in areas that are in attainment with the NAAQS (EPA 2010c). This means that the concentrations of criteria pollutants in the area are historically below (in attainment with) the thresholds described in the NAAQS. Attainment status is a federal designation determined by the EPA based on the NAAQS. WDOE does not determine or define attainment for areas based on the SAAQS. Sources of criteria pollutants in the vicinity of the project sites include vehicles on state and local highways, residential home heating (particularly wood burning), agricultural practices (particularly outdoor burning and resuspension of dust and fine particles), and resuspension of road dust from traffic on unmaintained roadways.

The nearest population center (and concentrated source of pollutants) to the three sites is the city of Goldendale, Washington, which has a population of 3,407 (U.S. Census Bureau 2010). Significant emission sources in the wider region include the Portland-Vancouver metropolitan area, approximately 90 miles west of Goldendale; Mount St. Helens, approximately 70 miles northwest of Goldendale; and the Boardman coal-fired power plant, approximately 65 miles east of Goldendale. While the Boardman plant has estimated sulfur dioxide emissions of approximately 16,600 tons/year, the largest sulfur dioxide source in the region is Mount St. Helens.

There is no specific information about air quality in the immediate vicinity of the three project sites. The closest air quality monitoring stations are in Yakima, Washington, and near Wishram, Washington. The stations in Yakima monitor for carbon monoxide and PM_{10}, and the station near Wishram monitors for ozone (O_3). No exceedance of the NAAQS or SAAQS for these pollutants were recorded at these stations during the most recent recording periods (EPA 2010a).

Existing sources of air pollutant emissions at the three project sites are as follows:

- The Wahkiacus project site: the existing facilities at Wahkiacus have electric water and space heating; therefore, there are no on-site air pollutant emissions from this site.
- Klickitat Hatchery: the existing hatchery facility is heated by a propane furnace when needed. Annual emissions from the furnace are relatively minor (would not exceed 100 tons per year of any criteria pollutant annually) and are not of sufficient magnitude for the facility to need an air pollutant discharge permit. All water and residential heating is electric, so there are no on-site emissions from these sources, although the residences are equipped with wood-burning fireplaces, which can be used when required. Wood fireplaces cause some criteria pollutant emissions but are minor and are not regulated. The hatchery also includes a 250 kilowatt (kW) Cummins diesel emergency generator which is tested weekly and required for backup power approximately two to three times a year.
- The McCreedy Creek site: the McCreedy Creek site is currently undeveloped and does not include any air pollutant emission sources.

3.1.1.2 Environmental Consequences

For purposes of this EIS, the intensity of air quality impacts are categorized as follows:

> ***Minor:*** Impacts would be noticeable, but localized and short term and would not result in emissions of more than 100 tons/year of individual criteria pollutants.
>
> ***Moderate:*** Impacts would be primarily localized with the potential to have regional impacts. Emissions of criteria pollutants would be at or exceed 100 tons/year but less than 250 tons/year.
>
> ***Major:*** Sustained impacts to local and regional ambient air quality. Emissions of criteria pollutants would be equal to or more than 250 tons/year.

Alternative 1 – No Action Alternative

Wahkiacus Study Area

The existing Wahkiacus field station site has electric water and space heating; there are no on-site air pollutant emissions from this site. No new pollutant sources would be added under Alternative 1; the alternative would have no impact on air quality in the Wahkiacus study area.

Klickitat Hatchery Study Area

The exiting Klickitat Hatchery facility would continue to be heated by a propane furnace, resulting in minor long-term air pollutant emissions.

No new pollutant sources would be added under this alternative.

McCreedy Creek Study Area

The McCreedy Creek site is currently undeveloped. There are no existing sources of air pollutants at this site. No new pollutant sources would be added under Alternative 1.

Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

Construction

Construction activities may cause minor short-term increases in criteria air pollutant emissions. Ground-disturbing activities at the Wahkiacus site would occur, potentially generating fugitive dust, a common pollutant introduced during clearing and grading. Dust particulates may be up to 10 microns in diameter and are associated with health effects to people from inhalation. State regulations require that reasonable precautions be taken to prevent fugitive dust from becoming airborne. Slash burning associated with clearing also would add particulates to the air. Construction activities would also be a source of exhaust emissions from heavy equipment engines. Emissions from vehicle exhaust would increase the amount of airborne particulates and other pollutants in the immediate vicinity of the construction activity.

The construction contractor would be required to comply with all local, state, and federal regulations concerning air pollution abatement related to construction activities. Construction effects on air quality are expected to be minor, short term, local, and would cease when construction is complete.

Operational

Residential space and water heating at the Wahkiacus Hatchery and Acclimation Facility would rely on an electric power source under Alternative 2 and, therefore, would not result in on-site air pollutant emissions. An emergency backup diesel generator would be located on site that would result in direct criteria air pollutant emissions when operated. The new generator would likely be rated at 500 brake horsepower or less, and exempt from WAC 173-400-110, *New Source Review*. Operational emissions from the Wahkiacus Hatchery would result in minor, direct, short-term (emergency use) adverse impacts to air quality in the immediate vicinity of the generator. No indirect impacts are anticipated.

Klickitat Hatchery Study Area

Construction

Air pollutant emissions from construction activities at the Klickitat Hatchery site would be similar to those described for the Wahkiacus Hatchery and Acclimation Facility.

The construction contractor would be required to comply with all local, state, and federal regulations concerning air pollution abatement related to construction activities. Construction effects on air quality are expected to be minor, short term, local, and would cease when construction is complete.

Operational

Residential space and water heating at the Klickitat Hatchery would continue to rely on an electric power source under Alternative 2 and so would not result in on-site air pollutant emissions. However, residences would also have wood-burning fireplaces, which could produce some air pollutant emissions from wood combustion.

Space heating in the operational hatchery buildings would continue to be provided by a propane furnace. The propane furnace would result in air pollutant emissions but would not be sufficiently large as to require an air pollutant discharge permit.

An emergency backup diesel generator located on site may be replaced and if so, like at Wahkiacus, the new generator would be rated such that it would be exempt from WAC review. Use of the new or existing generator would result in direct criteria air pollutant emissions. Operational emissions from the Klickitat Hatchery would result in minor, direct, short-term (emergency use) adverse impacts to air quality in the immediate vicinity of the generator. No indirect impacts are anticipated.

McCreedy Creek Study Area

The estimates of criteria pollutant emissions for the McCreedy Creek Acclimation Facility discussed below are provided as a representative estimate of the emissions from a mobile raceway acclimation site.

Construction

Air pollutant emissions from construction activities at the McCreedy Creek Acclimation Facility would be short term and would cease when construction is complete. Fugitive dust would be generated during construction as a result of grading, excavation, and construction traffic on unpaved roads. Emissions from vehicle exhaust and slash burning would increase the amount of airborne particulates and other pollutants in the immediate vicinity.

The construction contractor would be required to comply with all local, state, and federal regulations concerning air pollution abatement related to construction activities. Impacts on air quality from construction activities are expected to be minor.

Operational

Air pollutant emissions would be produced from a small recreational vehicle-sized propane generator used to provide temporary trailer housing heat and power for an on-site fish culturist. Water pumps associated with the acclimation activities at McCreedy Creek would be powered by small propane generators, which would also result in some air pollutant emissions. Both the residential and operational generators would be in use for between six and seven weeks of the year (late March through early May). No other air pollutant sources would be present during normal operation of the McCreedy Creek Acclimation Facility.

These temporary generators would be exempt from WAC 173-400-110, New Source Review. Operational emissions from the McCreedy Creek Acclimation Facility would result in direct, on-site, adverse, minor impacts to air quality during the annual period of operations. No indirect impacts are anticipated.

Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Alternative 3 would have no impact on air quality in the Wahkiacus study area because no new pollutant sources would be added to the site. The potential for criteria air pollutant emissions would be the same as those described under Alternative 1.

Klickitat Hatchery Study Area

Under Alternative 3, the Klickitat Hatchery site would be redeveloped in the same way as it would under Alternative 2 with the addition of a bank of raceways; therefore, the potential for criteria air pollutant emissions and air quality impacts would be the same as those described under Alternative 2.

McCreedy Creek Study Area

Under Alternative 3, the McCreedy Creek site would be developed in the same way as it would under Alternative 2; therefore, the potential for criteria air pollutant emissions and air quality impacts would be the same as those described under Alternative 2.

3.1.1.3 Mitigation Measures

Construction activities could cause emissions of fugitive dust and other criteria pollutants. The construction contractor would be required to comply with all local, state, and federal regulations concerning air pollution abatement related to construction activities.

Operation and maintenance activities under Alternatives 2 and 3 are expected to result in minor long-term increases in criteria air pollutant emissions. No air quality discharge permits or mitigation would be required.

3.1.2 Climate Change

3.1.2.1 Affected Environment

Greenhouse gases (GHG) are chemical compounds found in the earth's atmosphere that absorb and trap infrared radiation, or heat, re-radiated from the surface of the earth. The trapping and build-up of heat in the atmosphere increases the earth's temperature, warming the planet and creating a greenhouse-like effect (EIA 2009b). Anthropogenic activities (caused or produced by humans) are increasing atmospheric concentrations to levels that could increase the earth's temperature up to 7.2°Fahrenheit by the end of the twenty-first century (EPA 2010b). Emissions of GHG from any source can be a contributing factor with respect to the earth's temperature and climate change.

The U.S. Global Climate Research Program has found that, since the 1970s, average temperatures in the United States have risen, sea levels have risen, and precipitation patterns have changed (Global Climate Research Program 2009). These findings are supported by the Intergovernmental Panel on Climate Change for the global climate (IPCC 2007).

The principle GHGs emitted into the atmosphere through human activities are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (EPA 2010a). Of these four gases, CO_2 is the major GHG emitted (EPA 2010a, Houghton 2010). For example, CO_2 emissions from the combustion of coal, oil, and gas constitute 81 percent of all U.S. GHG emissions (EIA 2009a). Carbon dioxide enters the atmosphere primarily through the burning of fossil fuels such as coal, natural gas and oil, and wood products; and through the manufacturing of cement, among other industrial sources.

CH_4 is emitted during the production and transport of fossil fuels, through intensive animal farming, and by the decay of organic waste in landfills. N_2O is emitted during agricultural and industrial activities, and during the combustion of fossil fuels and solid waste.

Fluorinated gases, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, are synthetic compounds emitted through industrial processes and now are being used to replace ozone-depleting compounds such as chlorofluorocarbons in insulating foams, refrigeration, and air conditioning. Although they are emitted in small quantities, these gases have the ability to trap more heat than CO_2 and are considered high global-warming potential gases. These gases are not pertinent to this project.

Models predict atmospheric concentrations of all GHG will increase over the next century, but the extent and rate of change is difficult to predict, especially on a global scale.

The Washington Department of Community, Trade, and Economic Development (WCTED) and the WDOE published the current Washington GHG inventory in December 2007 (WDOE and WCTED 2007). Their data shows that, in 1990, industrial sources in Washington State emitted 88.4 million metric tons carbon dioxide equivalent. Between 1990 and 2000, emissions grew steadily to over 100 million metric tons carbon dioxide equivalent. Emissions then dropped significantly over the next 2 years (largely because of the permanent shutdown of much of Washington's aluminum manufacturing industry), before resuming a steady increase between 2003 and 2005 (WDOE and WCTED 2008).

During the 1990s and 2000s, Washington's GHG emissions were dominated by burning fossil fuels such as gasoline and natural gas. The main source of emissions in Washington is the transportation sector, which produces almost half of the state's GHG emissions. The next largest sector was emissions from electricity consumption, followed by combustion emissions in the industrial and residential/commercial sectors (WDOE and WCTED 2008).

To assess potential impacts of the proposed action on climate change, BPA first considered the GHG emissions associated with existing project facilities. Table 3-1 shows the estimated annual GHG emissions from current annual operation and maintenance of the Klickitat Hatchery.

Table 3-1: Estimated Annual Greenhouse Gas Emissions from the Klickitat Hatchery

Activity	CO_2 Emissions in Metric Tons	CH_4 Emissions in Metric Tons (CO_2e)	N_2O Emissions in Metric Tons (CO_2e)	Total CO_2e Emissions in Metric Tons
Operation and Maintenance	23.3	0.002	0.006	23.3

The estimated existing operational emissions of CO_2 (CO_2e) from the Klickitat Hatchery site (i.e., 23.3 metric tons/year) equate to roughly the annual CO_2 emissions of approximately four passenger vehicles (EPA 2005). To provide context for this emission rate, EPA's mandatory reporting threshold for annual CO_2 emissions is 25,000 metric tons of CO_2e, or 1000 times the emissions for the current operations. This threshold is roughly the annual amount of CO_2 generated by 4,545 passenger vehicles (EPA 2005). Emissions at or above this threshold requires federal reporting of GHG emissions, but does not require any other action (40 CFR Parts 86, 87, 89 et al.).

3.1.2.2 Environmental Consequences

In a general sense, any action for which fossil fuels have been or are being burned contributes to GHG concentrations. As GHG concentrations in the atmosphere increase they could contribute to long-term significant effects to climate change.

Estimation of GHG emissions that may occur from soil disturbance were not included in this analysis. Research has shown that emissions as a result of soil disturbance are short-lived and return to background levels within several hours (Kessavalou et al. 1998, Aalde et. al. 2006). Considering the method used to estimate vehicle emissions was conservative and likely overestimated the actual emissions, the low levels of GHG emissions related to temporary soil disruption during construction are accounted for in the overall construction emission rates discussed below.

Potential GHG emissions from land use changes (i.e., tree or plant removal), vegetation decay, or wood-burning may result in the release of carbon from biogenic origins (i.e., carbon that was recently contained in living organic matter) and the long term effects of such transformations is not well understood. The Intergovernmental Panel on Climate Change has yet to develop a consistent methodology to allow for quantification and reporting of biogenic emissions. At this time, biogenic emissions related to land management and forestry do not need to be reported, and any direct or indirect emissions from biomass combustion (i.e., biomass electrical generation facilities) should not be included with GHG emission calculations (The Climate Registry 2008). There were no known biomass combustion sources related to the project; therefore, no estimates of biogenic emissions were included in this analysis. A description of impacts from tree and vegetation removal can be found in Section 3.5.

Emissions from construction vehicles and equipment would impact atmospheric GHG concentrations because construction equipment and vehicles would be fueled by gasoline and diesel. Estimates of construction–related trips by different types of on-road vehicles and levels of on-site construction equipment for each alternative were developed in conjunction with reviewers from BPA (Mayer 2010).

To provide a conservative analysis and ensure that the proposed project's potential contributions to GHG concentrations are adequately considered, GHG emissions were calculated for the 18 month construction period using conservative estimates of construction and on-road activity and geographic sources of materials for delivery to the site. The GHG emission estimates are, therefore, artificially high to ensure that potential GHG emissions are fully described.

The thresholds used to describe the intensity of climate change impacts are as follows:

Minor: Impacts would result in the release of GHG below the annual level required for reporting. Contributions to regional GHG amounts may be difficult to determine. The contribution to national GHG emissions would be impossible to quantify.

Moderate: Impacts would result in the emission of 25,000 metric tons or more per year of GHG and require annual reporting to the EPA. Contributions to regional GHG amounts would be quantifiable. Contributions to the national GHG emissions would be substantial.

Major: Impacts would require annual reporting and be of an amount and nature that they would be a key component of national GHG emissions.

Alternative 1 – No Action Alternative

Wahkiacus Study Area

Alternative 1 would add no new pollutant sources to the Wahkiacus study area. No new GHG emissions would result under this alternative. The practice of importing out-of-basin fish eggs and smolts to the Klickitat River Subbasin, requiring seasonal truck trips between subbasins, would continue.

Klickitat Hatchery Study Area

Emissions of GHG associated with facility operations would continue at existing levels (see Section 3.1.2.1). No new pollutant sources would be added under Alternative 1.

McCreedy Creek Study Area

The McCreedy Creek site is currently undeveloped. There are no existing sources of air pollutants at this site. No new GHG emissions at the McCreedy Creek site would result under this alternative.

Overall, there would be no new impacts to climate change from Alternative 1.

Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

Construction

While all GHG emissions contribute to global GHG concentrations and climate change, the total CO_2 emissions from the proposed project would be very low compared to emissions from other sources.

As shown in Table 3-2, construction would result in an estimated 3,041 metric tons of CO_2e emissions per year, or 4,561 metric tons of CO_2e emissions for the entire 18-month construction period. The estimated CO_2e emissions from construction of the facilities at the Wahkiacus site equate to roughly the annual CO_2 emissions of approximately 550 passenger vehicles (EPA 2005), well below the EPA reporting threshold.

Table 3-2: Estimated Annual Greenhouse Gas Emissions from the Wahkiacus Hatchery and Acclimation Facility under Alternative 2

Activity	CO_2 Emissions in Metric Tons	CH_4 Emissions in Metric Tons (CO_2e)	N_2O Emissions in Metric Tons (CO_2e)	Total CO_2e Emissions in Metric Tons
Construction	3,024.6	0.048	1.04	3,040.6
Operation and Maintenance	11.9	0.00001	0.006	12.0

Given the relatively low amount of GHG contribution and the temporary nature of the impact (i.e., 4,561 metric tons of CO_2e emissions for the 18-month construction period), construction of the Wahkiacus Hatchery and Acclimation Facility would have a minor short-term adverse impact on climate change.

Operational

Direct GHG emissions would occur during operation and maintenance of the Wahkiacus Hatchery and Acclimation Facility. Operations and maintenance-related vehicles would be powered by gasoline and diesel combustion motors and therefore would contribute incrementally to atmospheric GHG concentrations. Use of the emergency backup diesel generator would also result in some GHG emissions during the time it is required for backup power or testing.

Table 3-3 shows the estimated annual GHG emissions that would be expected during annual operation and maintenance of the Wahkiacus Hatchery and Acclimation Facility, as well as during construction.

The estimated operational CO_2e emissions from the Wahkiacus Hatchery and Acclimation Facility equate to annual CO_2 emissions of approximately two passenger vehicles (EPA 2005), well below the EPA reporting threshold. Given these relatively minor overall contributions to GHG concentrations, the project's operational impact of the Wahkiacus site on climate change would be minor, adverse, and long term.

Klickitat Hatchery Study Area

Construction

Sources of GHG associated with construction activities at the Klickitat Hatchery are expected to be similar to those described for the Wahkiacus Hatchery and Acclimation Facility.

To provide a conservative analysis and ensure the proposed project's potential contributions to GHG concentrations are adequately considered, GHG emissions were calculated for the 12-month construction period using conservative estimates of construction and on-road activity and geographic sources of materials for delivery to the site.

As shown in Table 3-3, construction at the Klickitat Hatchery site would result in an estimated 1,588 metric tons of CO_2e emissions during the 12–month construction period. These CO_2e emissions equate to roughly annual CO_2 emissions of approximately 288 passenger vehicles (EPA 2005), below the EPA reporting threshold.

Table 3-3: Estimated Annual Greenhouse Gas Emissions from the Klickitat Hatchery under Alternative 2

Activity	CO_2 Emissions in Metric Tons	CH_4 Emissions in Metric Tons (CO_2e)	N_2O Emissions in Metric Tons (CO_2e)	Total CO_2e Emissions in Metric Tons
Construction	1,582	0.019	0.038	1,588
Operation and Maintenance	43	0.002	0.006	44

Given the relatively low amount of GHG contribution and the short duration of the construction-related emissions, construction at the Klickitat Hatchery under Alternative 2 would have a minor adverse short-term impact on climate change.

Operational

Klickitat Hatchery operations and maintenance would continue to cause GHG emissions under Alternative 2. Operational equipment (such as the propane furnace) and maintenance-related vehicles would be powered by gasoline and diesel combustion motors and therefore contribute incrementally to atmospheric GHG concentrations. Vehicle use would include fish transport activities from other hatchery locations when required. GHG emissions would also continue to result from on-site wood combustion at the residences.

Table 3-3 shows the estimated annual GHG emissions that would be expected during operation and maintenance of the Klickitat Hatchery, as well as during construction. The estimated operational CO_2e emissions from the Klickitat Hatchery equate to roughly annual CO_2 emissions of approximately eight passenger vehicles (EPA 2005), below EPA reporting threshold.

Given these relatively minor overall contributions to GHG concentrations, the project's operational impact of the Klickitat Hatchery under Alternative 2 on climate change would be minor, adverse, and long term.

The design of the Klickitat Hatchery facility would include measures to reduce energy consumption and incorporate elements of green energy design. One of the stated goals of the design engineering firm is to make the hatchery as 'green' as possible. Green design considerations include the use of surge tanks to provide water storage, and the use of gravity fed systems, to reduce the number of pumps required. The Klickitat Hatchery also has the potential to make use of a significant hydraulic head (166 feet) on the upper Indian Ford spring water intake to generate hydropower. Use of hydropower would further reduce GHG emissions.

McCreedy Creek Study Area

<u>Construction</u>

Sources of GHG associated with construction activities at the McCreedy Creek Acclimation Facility would be similar to those described for the Wahkiacus Hatchery and Acclimation Facility, although at a much smaller scale.

To provide a conservative analysis and ensure the proposed project's potential contributions to GHG concentrations are adequately considered, GHG emissions were calculated for the 2-month construction period using conservative estimates of construction and on-road activity and geographic sources of materials for delivery to the site.

As shown in Table 3-4, construction would result in an estimated 225 metric tons of CO_2e emissions. The estimated construction CO_2e emissions from the McCreedy Creek Acclimation Facility equate to roughly annual CO_2 emissions of approximately 100 passenger vehicles (EPA 2005), far below the EPA reporting threshold.

Table 3-4: Estimated Annual Greenhouse Gas Emissions from the McCreedy Creek Acclimation Facility under Alternative 2

Activity	CO_2 Emissions in Metric Tons	CH_4 Emissions in Metric Tons (CO_2e)	N_2O Emissions in Metric Tons (CO_2e)	Total CO_2e Emissions in Metric Tons
Construction (Total for 2 Month Period)	223.8	0.003	0.006	224.8
Operation and Maintenance (Annual Emissions)	18	0.001	0.0002	18

Given the relatively low amount of GHG contribution and the short duration of the construction-related emissions, construction at the McCreedy Creek site under Alternative 2 would have a minor adverse short-term impact on climate change.

<u>Operational</u>

GHG emissions would be produced from the generators used for heat and power at the temporary housing and to power water pumps. Vehicle trips to and from the site would also produce GHG.

Table 3-4 shows the estimated annual GHG emissions that would be expected during operation and maintenance of the McCreedy Creek Acclimation Facility. The estimated operational CO_2e emissions from the McCreedy Creek Acclimation Facility equate to roughly annual CO_2 emissions of approximately three passenger vehicles (EPA 2005), far below the EPA reporting threshold. The low amount of emissions predicted is a result of the relatively short period of operation (i.e., late March through early May).

Given these relatively minor overall contributions to GHG concentrations, the project's operational impact of the McCreedy site under Alternative 2 on climate change would be minor, adverse, and long term.

Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Under Alternative 3, the potential for GHG emissions for construction and operation would be the same as those described under Alternative 1. No new GHG emissions would result under this alternative. The practice of importing out-of-basin fish eggs and smolts to the Klickitat River Subbasin, requiring seasonal truck trips between subbasins, would continue to be a source of GHG emissions.

Klickitat Hatchery Study Area

Under Alternative 3, the Klickitat Hatchery site would be redeveloped similar to Alternative 2. Construction, operation, and maintenance would have the same potential for GHG emissions as described under Alternative 2 and, therefore, the effect on climate change would be minor, adverse, and long term.

McCreedy Creek Study Area

Under Alternative 3, the McCreedy Creek Acclimation Facility site would be developed in the same way as it would under Alternative 2; therefore, the potential for GHG emissions during construction and operation would be the same as those described under Alternative 2 and the effects on climate change would be minor, adverse, and long term.

3.1.2.3 Mitigation Measures

The following mitigation measures could be implemented to reduce or eliminate GHG emissions with implementation of Alternatives 2 or 3.

- Implement vehicle idling and equipment emission measures.
- Encourage carpooling and the use of shuttle vans among construction workers to minimize construction-related traffic and associated emissions.
- Locate staging areas in previously-disturbed or graveled areas to minimize soil and vegetation disturbance where practicable.
- Use the appropriate size of equipment for the job.
- Use alternative fuels for generators at construction sites such as propane or solar, or use electrical power where practicable.
- Reduce electricity use in the construction office by using compact fluorescent bulbs, and powering off computers every night.

- Install high efficiency wood-burning fireplace inserts for residential use.
- Submit a plan for approval to recycle or salvage nonhazardous construction and demolition debris.
- Use locally sourced rock for road construction.

3.2 Geology and Soils

3.2.1 Affected Environment

Geology of the Klickitat River Subbasin consists primarily of basalt flows up to several thousand feet thick (Cline 1976). Steep-walled canyons 700 to 1,500 feet deep have been formed by the numerous watercourses, allowing for limited floodplain development over most of the watershed (NPCC 2004).

Generally, the geologic processes that are recognized in the geologic record of the region include:

- Widespread extrusion of numerous lava flows (6 to 17 million years ago), known as the Columbia River Basalt Group, from vents east of the watershed with a thickness ranging from less than 1 to several thousand feet.
- Uplift of the Cascade Range immediately to the west, with resulting uplift and erosion of the lava flows (up to 7 million years ago).
- Localized extrusion of lavas and ash from Mount Adams and several smaller volcanic and cinder cones (1,000 to 100,000 years ago).
- Glaciation on the higher peaks, resulting in erosion of these peaks and deposition in downslope areas (ongoing).

The study area for each project site encompasses the area of soil disturbance during construction (i.e., the project footprint) and the surrounding geological landscape that may influence or indicate onsite conditions.

3.2.1.1 Wahkiacus Study Area

The Wahkiacus study area is located within the valley of the Klickitat River on a relatively broad terrace at the confluence of the Klickitat River and Swale Creek. Both sides of the valley rise to elevations more than 700 feet above the valley floor, with steep slopes to the north and more gentle slopes to the south. Geologic units mapped in the study area consist of:

- **Quaternary Alluvium**: Korosec (1987) mapped quaternary alluvium along the right bank of the Klickitat River. This geologic unit consists of well- to poorly- sorted and stratified clay, silt, sand, and gravel. It includes stream channel or fan deposits and may include some glacial deposits and postglacial terrace gravels.
- **Grande Ronde Basalt**: Korosec (1987) mapped Grande Ronde Basalt on the right and left banks of the Klickitat River, including most of the Wahkiacus Hatchery site.

These basalt layers are typically 20 to 30 meters thick, although they can be as thick as 60 meters (Bentley et al. 1980). This unit is likely up to 16.5 million years old (Korosec 1987).

- **Landslide Deposits**: This unit, mapped by Korosec (1987) along the north-facing slopes south of Horseshoe Bend Road, consists of poorly sorted blocks, boulders, gravel, and finer sediments produced by the slide of bedrock or unconsolidated sediments above the bedrock. Most areas associated with landslides are hummocky and can be as old as 10,000 years.

Erosion, earthquake and landslide hazard mapping is not available for the Wahkiacus site. Two soils (units 16 and 22; NRCS 2010) are mapped at the site. Characteristics of these soil types are provided in Table 3-5.

Table 3-5: Soil Types in the Wahkiacus Hatchery Study Area

Map Unit	Name	Surface Texture	Drainage Class	Parent Material	Erosion Hazard on Roads and Trails	Rutting Hazard	Excavation Hazard
16	Sauter gravelly loam, 30 to 75 percent slopes	Gravelly loam	Well drained	Colluvium derived from basalt mixed with loess	Severe	Moderate (low strength)	Too steep; cut banks cave
22	Fluventic Haploxerolls-Riverwash complex, 0 to 5 percent slopes	Sandy loam	Somewhat excessively drained	Alluvium	Moderate	Moderate (low strength)	Cut banks cave

Sauter gravelly loam occurs in the southern portion of the study area and is a highly erodible soil. The two mapped soils at the site are well-drained, reducing the risk of onsite landslide hazards; however, landslide deposits mapped by Korosec (1987) on the slopes in the southern portion of the study area may be prone to future landslides.

3.2.1.2 Klickitat Hatchery Study Area

The Klickitat Hatchery study area is in a steep-sided valley of the Klickitat River. The river is roughly 500 to 600 feet below the south rim of the valley in this area. To the northeast, moderately sloped, rolling hills rise to the Simcoe Mountains. Average stream gradient in the vicinity of the hatchery is on the order of 1 to 2 percent. Existing hatchery facilities are located on terraces on either side of the river. According to a geotechnical study of the area, the terrace to the north of the river where a rearing pond is located may have had fill placed on it during construction of the pond, raising the surface grade to the present elevation (PanGEO Inc. 2009). The following geologic units have been mapped in the study area (PanGEO Inc. 2009):

- **Older Alluvium**: Older alluvium was mapped by Hildreth and Fierstein (1995) upstream of the hatchery site in an area that is similar in morphology to the hatchery site. The older alluvium includes unconsolidated, river-transported cobbles and boulders, including exotic lithologies, with sand, gravel, and fines.

- **Landslide Deposits**: The entire left bank of the river (i.e., the area to the left of the river when facing downstream) has been mapped as being underlain by a large landslide (Bentley et al. 1980). The landslide deposits are composed of unstratified and unsorted material derived from both slumps and debris flows.
- **Camas Prairie Basalt**: The right bank of the river in this area is underlain by basalt and andesite of Mount Adams (Bentley et al. 1980). This unit can be up to 37 feet thick.
- **Simcoe Mountain Basalt**: In areas where the Camas Prairie Basalt is not present or the mapped landslide deposit does not obscure the underlying strata, the left bank is composed of rocks of the Simcoe Mountains. Bentley et al. (1980) suggests that the basalts may range in age from 900,000 to 4.5 million years old.

Erosion, earthquake and landslide hazard mapping is not available for the Klickitat Hatchery study area. Soil maps indicate the soils on-site are not highly susceptible to landslides and are well-drained (see Table 3-6). However, landslide debris on the left bank of the river may be vulnerable to future landslides given the relatively recent nature of the deposition, the proximity to the active river channel, and the topographic slope. Soils on the steep slopes on the right bank of the river may be susceptible to erosive forces.

Table 3-6: Soil Types at the Klickitat Hatchery

Map Unit	Name	Surface Texture	Drainage Class	Landslide Potential
1552	Fluventic Haploxerolls	Stony ashy loam	Well drained	Moderate
1906	Yedlick, 30 to 45 percent slopes	Sandy loam	Well drained	None

3.2.1.3 McCreedy Creek Study Area

The site of the proposed McCreedy Creek Acclimation Facility is situated in a moderately-sloped valley near McCreedy Creek's confluence with the Klickitat River. The area proposed for site development is located on a terrace along the right bank of McCreedy Creek. The following geologic units have been mapped in the study area:

- **Volcanic and Sedimentary Rocks**: Hildreth and Fierstein (1995) have mapped volcanic and sedimentary rocks in the vicinity of the McCreedy Creek site and in the area to the north and west. This unit consists primarily of basalts in the study area.
- **Surficial Deposits**: Although Hildreth and Fierstein (1995) did not map the precise location of the McCreedy Creek site, surficial deposits are mapped on similar landforms near fluvial features downstream of the site. This unit generally consists of debris flow and fluvial and glacial deposits.
- **Grande Ronde Basalt**: Grande Ronde Basalt is mapped along the banks of the Klickitat River and up most of the valley walls (Bentley et al. 1980). This unit is generally 20 to 30 meters thick (Bentley et al. 1980) and up to 16.5 million years old (Korosec 1987).

The McCreedy Creek site does not contain any documented earthquake or landslide hazards (Yakima County 2009). None of the soils mapped in the study area have high potential for landslide hazard (see Table 3-7). These soils are well-drained and on a gentle slope, conditions that are not indicative of an erosion hazard.

Table 3-7: Soil Types at the McCreedy Creek Site

Map Unit	Name	Surface Texture	Drainage Class	Landslide Potential
859	Cumulic Haploboralls, nearly level to gently sloping	Loam	Well drained	None
1291	Icksix, 2 to 20 percent slopes	Sandy loam	Well drained	None

3.2.2 Environmental Consequences

For purposes of this EIS, the intensity of impacts to geologic and soil resources are categorized as follows:

> ***Minor***: Impacts to topography and soils would be noticeable but localized and would not affect slope stability. No special topographic features or rare soil types would be affected. There would be no risk of erosion or landslide.
>
> ***Moderate***: Impacts to topography and soils would be would be readily apparent but localized and would require some mitigation. Special topographic features or rare soils could be affected but they would retain primary characteristics. There could be potential for erosion and isolated landslides.
>
> ***Major***: Impacts to topography and soils would be readily apparent, widespread, and would require substantial mitigation. Special topographic features or rare soils would be affected and would lose their primary characteristics. The risk of site erosion and landslides would be high.

3.2.2.1 Alternative 1 – No Action Alternative

Alternative 1 would not involve any construction or other ground-disturbing activities; therefore, no disturbance to geologic resources in the study area would occur. Natural geologic processes would continue unaffected by Alternative 1. No special topographic features or rare soil types would be affected and there would be no increased risk of erosion or landslide. No direct or indirect effects to soils or geologic resources would result from this alternative.

3.2.2.2 Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

Construction

Alternative 2 would involve the disturbance of approximately 12 acres to support the development of the new hatchery, acclimation, and residence facilities. All existing structures would be removed or demolished. Site preparation would require clearing and grubbing of existing vegetation and grading to create a level surface.

During the construction period, soils that would be exposed, disturbed, or stockpiled could erode and lead to sedimentation in adjacent waterbodies (Swale Creek and Klickitat River). Soils in the southern portion of the study area (Sauter gravelly loam) may be susceptible to erosion. Vibrations from construction equipment could also cause soil movement at the site, having a minor, short-term, adverse effect on soils. The duration of erosion and sedimentation impacts would be short term because exposed soils would be revegetated following the construction period but would result in a minor adverse impact. Some of these short-term effects would be minimized by implementation of the mitigation measures discussed in Section 3.2.3.

The proposed Wahkiacus facility intake and outfall (fish ladder) structures on the Klickitat River mainstem would be located on a stable reach of the river that is constrained and controlled by the presence of the Horseshoe Bend Bridge and armoring along Highway 142. The bridge footings provide river channel migration control. The construction of the intake and ladder structures would not alter this condition, though a minor loss of riverbed and erosion and sedimentation could result from facility construction. This effect would be localized and result in minor adverse impacts that would be minimized by implementation of mitigation measures (see Section 3.2.3).

Landslide deposits on the slopes in the southern portion of the study area may be at risk for future landslides. Proposed development in these areas may be affected by the soil conditions and a geotechnical study may be necessary to determine constructability options.

Long-term effects to soils and geology would result from soil and rock excavation and removal, placement and compaction of fill, and stockpiling rock and soils during construction. These activities would have site-specific minor adverse impacts on soils and geology by permanently altering the natural condition of these resources through human activity. The intensity of the effect would be minor because it would occur only within the construction disturbance area and would not directly affect geology and soils outside of that area.

Operation

No effects on geology and soils are expected during project operation. Landslide deposits on the slopes in the southern portion of the study area may be at risk for future landslides.

Klickitat Hatchery Study Area

Construction

Under Alternative 2, development of the Klickitat Hatchery site is anticipated to involve a total of approximately 20 acres of disturbance: 16 acres on the southeast side of the Klickitat River and 4 acres on the northwest side.

During the construction period, soils that would be exposed, disturbed, or stockpiled could erode, resulting in a minor short-term adverse impact that could lead to sedimentation in the Klickitat River. Vibrations from construction equipment can also cause soil movement at the site, having a minor, short-term, adverse effect on soils. The duration of erosion and sedimentation impacts would be short term because exposed soils would be revegetated following the construction period but would result in a minor adverse impact. Some of these short-term effects would be minimized by implementation of the mitigation measures discussed in Section 3.2.3.

In-water work for the intake, fish ladder, juvenile exits, and wing diversion could affect bank stabilization and lead to a temporary adverse effect of erosion and sedimentation. These effects would be localized and minor and could be prevented through application of mitigation measures (see Section 3.2.3). Partial removal of the weir would change flow in the river at that location, which could change channel morphology. The channel morphology would reach equilibrium shortly after weir removal. The change would be limited to the area immediately surrounding the weir site and, therefore, the intensity of the impact would be minor.

Potential geological hazards include the area of landslide deposits on the left side of the river that may be vulnerable to future landslides, and the steep slopes on the right bank of the river, which may be susceptible to erosive forces. Geotechnical studies may be required to assist with determining options for construction of raceways on the left bank and adult holding facility near the right bank. Improvements included in this alternative that would not disturb soils, such as minor building remodeling, would not affect soils or geological processes.

Long-term effects to soils and geology would result from soil and rock excavation and removal, placement and compaction of fill, and stockpiling rock and soils during construction. These activities would have site-specific adverse impacts on soils and geology by permanently altering the natural condition of these resources through human activity. The intensity of the effect would be minor because it would occur only within the construction disturbance area and would not directly affect geology and soils outside of that area.

Operational

Operation of the Klickitat Hatchery under Alternative 2 would not result in impacts to geological resources. After successful revegetation of exposed soils in the construction area, no long-term soil impacts would occur.

McCreedy Creek Study Area

Construction

Site preparation would require clearing and grubbing of existing vegetation and grading to create a level surface for the assembly of the mobile acclimation facility. A total of 1.4 acres of disturbance would occur at the site for the mobile raceways, gravel access road, surface water intakes and outfalls, and fencing. Soil removal and grading would have a long-term adverse impact on site topography and soils. The impact would be minor because it would be localized. The existing culvert beneath Klickitat River Road would be replaced with a bridge and a seasonal streamside water intake and outfall would be constructed. In-water work could affect bank stabilization and lead to a short-term adverse effect of erosion and sedimentation. This effect would be localized and minor and could be prevented through application of mitigation measures (see Section 3.2.3). Potential geologic hazards were not identified on this site and such hazards are not likely to be encountered.

Operational

No long-term operational effects on geology and soils would occur.

3.2.2.3 Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Alternative 3 would not involve any construction or other ground-disturbing activities at the Wahkiacus site. No disturbance to soils or other geologic resources in the study area would occur. Natural geologic processes would continue unaffected, and no direct or indirect effects to soils or geologic resources would result.

Klickitat Hatchery Study Area

Development at the Klickitat Hatchery site under Alternative 3 would be similar to the development described for Alternative 2. The increased square footage for the new 1,400-square-foot raceway would add slightly to the ground disturbance under Alternative 3. The overall effects on geology and soils would be the same as those described for Alternative 2.

McCreedy Creek Study Area

Development of the McCreedy Creek Acclimation Facility is common to both of the build alternatives. Effects to soils and geology resulting from Alternative 3 at this site would be identical to the effects previously discussed for Alternative 2.

3.2.3 Mitigation Measures

The following measures are recommended to avoid, minimize, or otherwise mitigate any potential adverse effects of the project on soils and geologic resources:

- Prepare and implement an erosion and sediment control plan to minimize erosion and transport eroded materials offsite or into receiving waters, such as the Klickitat River, Swale Creek, or McCreedy Creek. The erosion and sediment control plan would be developed as a component of contract documents and would include measures such as:
    - Using erosion and sedimentation control best management practices (BMPs) recommended in WDOE’s Stormwater Management Manual and the NPDES Construction Stormwater General Permit, such as sediment fencing, straw mulch, temporary matting, directing runoff away from unstabilized soils, or seeding to protect exposed or disturbed soils (e.g., stockpiles and excavations) from erosive forces.

- Dewatering excavated areas and providing treatment for water pumped from excavations.
- Inspecting and monitoring the BMPs in compliance with the NPDES requirements.
- Follow standard earthwork and construction site preparation techniques, such as using appropriate fill materials.
- Apply proper diligence during design and construction to identify areas with soils that are susceptible to landslides or liquefaction.

- Revegetate cleared areas with native plants to enhance soil stability.

3.3 Water Quality and Quantity

3.3.1 Affected Environment

This section provides general descriptions of groundwater, hydrology, water rights, and water quality for the Klickitat River Subbasin. These general descriptions are followed by site-specific information for the Wahkiacus, Klickitat and McCreedy Creek sites.

3.3.1.1 Groundwater

The Columbia River basalt is the largest source for groundwater supply, particularly for large irrigation and municipal withdrawals, across the Klickitat River Subbasin. The Columbia River basalt is the oldest geological unit that underlies the watershed and supplies limited groundwater for irrigation from deep wells in the southern portion of the watershed. However, groundwater is often unsuitable as potable water due to high concentrations of total dissolved solids and hydrogen sulfide (Watershed Professionals and Aspen Consulting 2005). There have been multiple detections of fecal coliform bacteria from the groundwater (Bloodgood and Simcoe Springs) in the past but current monitoring suggests that groundwater contamination from fecal coliforms does not appear to be a problem in the Klickitat River Subbasin.

3.3.1.2 Hydrology

The Klickitat River Subbasin, designated as Water Resources Inventory Area 30 by WDOE, drains an area of approximately 1,350 square miles to the Columbia River from the north. Elevations in the watershed range from 12,000 feet at the summit of Mount Adams to 74 feet at the Columbia River; a majority of the watershed is between 1,500 and 5,000 feet elevation (Lautz 1999).

The Klickitat River is the second longest free-flowing river in Washington and in the lower Columbia River subregion, flowing generally south for approximately 95 miles from the Cascade Mountains to the Bonneville Pool at RM 180.4 on the Columbia River. Six major tributaries contribute substantial flow to the river: Swale Creek, Little Klickitat River, Outlet Creek, Big Muddy Creek, West Fork Klickitat River, and Diamond Fork.

The Klickitat River has carved deep, steep-walled canyons into Columbia River basalt flows throughout most of its length (Lautz 1999).

No flow regulation occurs within the watershed; however, diversions for water supply and irrigation occur in portions of Outlet Creek, Hellroaring Creek, Swale Creek, and the Little Klickitat River (Lautz 1999). Bonneville Dam influences the hydrology of the lower reaches of the Klickitat River by slowing flow and creating slack water conditions below RM 1.0 (BPA 2008).

Information specific to the existing conditions of water resources at the three proposed project sites is presented below. The Yakama Nation provided information on water quality from current monitoring at the Klickitat Hatchery. Beyond this information, the characterization of water resources in the study areas described is based on interpretation of the best available data.

3.3.1.3 Water Rights

According to the Water Resources Inventory Area 30 Phase II Watershed Assessment, average annual recharge volume in the Klickitat River Basin is estimated at 841,000 acre-feet, and about 60,000 acre-feet per year of water in the watershed is allocated for consumption (Watershed Professionals and Aspen Consulting 2005). About 77 percent of allocated water in the basin is used for irrigation. The remainder of other beneficial uses of water rights include municipal, domestic, commercial/industrial, heat exchange, and railway uses. Water rights allocated for stock watering, fire protection, fish propagation, and wildlife propagation collectively make up less than 1 percent of the total. The majority of the water right certificates and permits are located in the Little Klickitat and Swale Creek Subbasins (Watershed Professionals and Aspen Consulting 2005).

3.3.1.4 Water Quality

Overall, water quality in the Klickitat River meets Washington's Department of Ecology's (WDOE) standards for clean water. Water quality sampling at WDOE's ambient monitoring station near Lyle (station ID 30B060) shows that fecal coliform and pH are within water quality standards. Although the Klickitat River is not listed in WDOE's 2008 303(d) list of water quality impaired streams, WDOE (2008) considers about a one-mile portion of the Klickitat River near the Klickitat Hatchery a "water of concern" for pentachlorophenol based on spring Chinook tissue sampling conducted there in 2000 that showed elevated levels of pentachlorophenol. The Water Resources Inventory Area 30 Phase II Watershed Assessment described water quality problems in the Lower Klickitat River Subbasin, as elevated stream temperatures, periodic high sediment loads, elevated fecal coliform bacteria, and nutrient loading (Watershed Professionals and Aspen Consulting 2005).

The Yakama Nation monitors streams in the Klickitat River watershed for turbidity to determine the loads associated with anthropogenic factors. In 2007, 12 sites throughout the basin (including 8 on the Klickitat River mainstem) were monitored. Monitoring of most sites began in 1998, 1999, or 2000 and general trends indicate that at most sites, the percentage of fines (particles < 1.7 millimeters [mm]) fluctuates over periods of several years. Fines percentages at most sites are 25 to 30 percent, although some of the sites appear to be fluctuating at lower levels, within the range of approximately 10 to 20 percent. These sites include Klickitat River at McCormick Meadows (RM 85), Klickitat River near Cow Camp (RM 78), and Diamond Fork near the mouth of the Klickitat River (RM 76.8). At one site (Klickitat River below White Creek–just downstream of the Klickitat Hatchery–RM 39.6, there is a suggestion of an increasing trend in fines from 1999 to 2007 (from 18 to 25 percent) (Yakama Nation 2009a).

Beyond anthropogenic effects, water quality in the Klickitat River watershed is greatly influenced by glacial silt from the eastern flanks of Mount Adams, which is delivered to the Klickitat River by snowmelt runoff via Big Muddy and Little Muddy Creeks. There are occasional natural glacial outburst floods that feed torrents of water and volcanic debris into Big Muddy Creek. Little Muddy Creek also carries a large volume of fine sediments due to the weathering of volcanic rocks and glacial action (Watershed Professionals and Aspen Consulting 2005). During the warmest months, a sediment plume from these tributaries colors the Klickitat River from the West Fork to the Columbia River 63 miles downstream (Lautz 1999).This source of natural sedimentation and turbidity limits habitat productivity in some portions of the Klickitat River watershed. Other sources of excess sediment, both natural and anthropogenic, are likely to be miniscule at the watershed scale compared to this source, though they may have adverse effects on fish and fish habitat at the local scale.

3.3.1.5 Wahkiacus Study Area

Groundwater

The Klickitat Field Office at Wahkiacus gets its water from an artesian well located on the Wahkiacus site. The well is 100 feet deep, with the top 24 feet in alluvium and the lower 76 feet drilled into the Grand Ronde aquifer. Average artesian flow is approximately 1.69 cubic feet per second (cfs) (Yakama Nation 2005a). Overflow water from this artesian well supplies a shallow pond and wetland before entering the Klickitat River. See Section 3.8 for a description of the wetland.

Hydrology

Surface water resources in the Wahkiacus study area include the Klickitat River from RM 17.0 to 17.25 and Swale Creek from the confluence with Klickitat River upstream to the proposed diversion point at RM 0.25. The closest flow monitoring station to the Wahkiacus project site on the Klickitat River is U.S. Geological Survey (USGS) Station 14113000 at RM 7.0 (see Table 3-8). This station is about 10 miles downstream of the Wahkiacus project site. The period of record for this monitoring station is 1910-1911 and 1929-2008. Flows are typically lowest in the river in the early fall and highest in May.

Table 3-8: Summary of Flow Data at Klickitat River USGS Monitoring Station 14113000

Monitoring Station ID and RM	Nearest Project Site	Mean Annual Flow–1998-2008 (cfs)	Mean Annual Flow–Period of Record (cfs)	Average Peak Flow[1] (cfs)	Average Low Flow[2] (cfs)	Max Flow on Record (cfs)	Min Flow on Record (cfs)
14113000 RM 7.0	Wahkiacus	1,508	1,575	2,560	716	40,000	360

[1] *Average peak flow represents the highest daily average flow for the period of record at each monitoring station.*

[2] *Average low flow represents the lowest daily average flow for the period of record at each monitoring station.*

Flow data for Swale Creek is not readily available to compare monthly streamflow and proposed withdrawal rates, but the Water Resources Inventory Area (WRIA) 30 Water Resource Planning and Advisory Committee reports that the mean annual flow (average of mean daily flows) for Swale Creek was 46 cfs based on short-term monitoring (June 2006 to April 2007) (Aspect Consulting 2007). This value averages a wide range of flow values. Flows in the lower portion of Swale Creek are supported principally by runoff from numerous small tributaries draining the surrounding uplands; these flows sustain Swale Creek flows into late springtime. Once the spring runoff is over, flows in Swale Creek quickly diminish, leaving only intermittent flow and discontinuous pools. Summer flows normally drop to less than 0.5 cfs (Lautz 1999).

Water Rights

Yakama Nation currently holds a surface water right on the Klickitat River for 20 cfs in the Wahkiacus study area, but this water right has not been used. The artesian well at the site is used for domestic supply for the Klickitat Field Office and is considered an exempt well; therefore, it does not have a corresponding water right. The Yakama Nation holds no water right on Swale Creek at the Wahkiacus site.

Water Quality

The lower portion of Swale Creek is listed on WDOE's 303(d) list as water quality impaired due to high water temperature and low flow conditions (WDOE 2008). A water quality study completed in 2003 found the water temperature in the lower portion of Swale Creek regularly exceeds 17.5°C and often approaches lethal temperatures for adult and juvenile salmonids (>22°C; Watershed Professionals and Aspen Consulting 2005).

According to Yakama Nation monitoring (Yakama Nation 2009a), water temperatures are generally higher in the lower Klickitat River watershed, from White Creek downstream. The Yakama Nation monitored in-stream temperatures of the Klickitat River at the Wahkiacus site from May 2007 through April 2008. Average daily maximum temperatures peaked during the month of July and often exceeded 18°C, but were less than 22°C. During the month of August, temperatures exceeded 17.5°C for half of the month. Temperatures from May through September exceeded 12°C on the majority of days, and were typically less than 4.4°C from November through February.

3.3.1.6 Klickitat Hatchery Study Area

Groundwater

Water from three springs is diverted for use in the hatchery facilities. These springs include Indian Ford Springs, Wonder Springs, and an unnamed spring. Harbor 2010a estimates the combined output of these springs is about 33 cfs. Water quality from these springs is sufficient for both domestic and hatchery use.

Hydrology

Surface water resources in the Klickitat Hatchery study area encompass the Klickitat River (RM 42) from the hatchery downstream to the confluence with Trout Creek (RM 41.2). USGS flow monitoring station 1411400 at RM 34.3 is about 8 miles downstream of the Klickitat Hatchery and is the best representation of expected hydrology at Klickitat Hatchery. Table 3-9 provides a summary of flow data from this monitoring station. The period of record for the 14111400 station presented in Table 3-9 is from 1997 to 2008 and for the 1411000 station (about 8 miles upstream of the hatchery) the period of record is from 1909 to 1971.

Table 3-9: Summary of Flow Data at Klickitat River USGS Monitoring Stations 14111400 and 1411000

Monitoring Station ID and RM	Nearest Project Site	Mean Annual Flow–1998-2008 (cfs)	Mean Annual Flow–Period of Record (cfs)	Average Peak Flow[1] (cfs)	Average Low Flow[2] (cfs)	Max Flow on Record (cfs)	Min Flow on Record (cfs)
14111400 RM 34.3	Klickitat Hatchery	1,298	1,355	2,610	692	7,310	484
1411000 RM 50.3	Klickitat Hatchery	N/A	841.5	1,750	422	8,790	236

[1] *Average peak flow represents the highest daily average flow for the period of record at each monitoring station*

[2] *Average low flow represents the lowest daily average flow for the period of record at each monitoring station*

Water Rights

The Klickitat Hatchery currently employs state-issued water rights to divert a total 43.07 cfs from the springs on the property via a gravity intake and 30 cfs pumped from Klickitat River (Table 3-10).

Table 3-10: Klickitat Hatchery Water Right Information

Reference Number	Prioritization Dated	Amount (cfs)	Location	Hatchery Use
S4-27554CWRIS	7/8/81	20	Klickitat River	Main supply Pond 25
S4-30084	11/6/89	10	Klickitat River	Acclimation
S4-07272CWRIS	6/19/46	15	Indian Ford Spring	"Upper" main hatchery supply
S4-28163CWRIS	2/22/83	0.07	Indian Ford Spring	Domestic supply
S3-22202CRIS	12/7/73	12	Indian Ford Spring No. 1	Indian Ford A "Lower" to Pond 24
S4-01258CWRIS	4/1/53	12	Wonder Springs Cr.	Year-round use Pond 26
S4-27553CWRIS	7/8/81	4	Unnamed spring	Indian Ford B, Pond 25

According to Harbor Engineering Consultants (2010a), the springs supply approximately 33 cfs to the Klickitat Hatchery and the remainder of the facility's water demand is met by river water. Table 3-11 shows the mean monthly streamflow at the Klickitat River near Glenwood (RM 50; USGS monitoring station 14110000) and the monthly water demand of the hatchery (RM 30). Assuming 33 cfs of the Klickitat Hatchery demand is supplied with spring water, the remainder of the demand must come from the Klickitat River. This surface water supply, also shown in Table 3-11, can be compared to flow data from the USGS monitoring station near Glenwood to characterize the amount of diverted river as a percentage of total flow in the river.

Table 3-11: Klickitat Hatchery Water Demand and Supply Sources

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Klickitat Hatchery total water demand[1]	47.2	54.7	61.3	60.5	57.1	49.0	37.5	35.1	43.9	52.8	53.6	80.8
Monthly surface water requirement[2]	14.2	21.7	28.3	27.5	24.1	16.0	4.5	2.1	10.9	19.8	20.6	18.8
Average flows near Glenwood[3]	637	656	694	1,180	1,850	1,550	859	542	441	453	578	658
Percent of Average River Flow Diverted	2.2	3.3	4.1	2.3	1.3	1.0	0.5	0.4	2.5	4.4	3.6	2.9

1 *Source: Harbor 2010a.*

2 *Monthly surface water requirement is calculated by subtracting maximum available spring water (assumed to be 33 cfs) from total water demand.*

3 *Source: USGS 2009; USGS Gage 1411000 – Klickitat River near Glenwood. Water years 1909-1971.*

As demonstrated in Table 3-12, the current hatchery withdrawal results in a minor reduction of streamflow for the diversion reach of about 0.25 mile. This water is utilized in a variety of rearing units and then discharged to the Klickitat River. The existing state hatchery water rights certificates state that water use for fish propagation is a non-consumptive use.

Water Quality

The Klickitat River at the hatchery site is not listed as water quality limited on WDOE's 303d list (WDOE 2008). Yakama Nation monitored in-stream temperatures at the existing Klickitat Hatchery trap from 2006 through 2008. According to these data, water temperatures typically peak in July, with 18 days recorded between 16° and 17.5°C during the 2-year monitoring period; however, from May through September temperatures did not exceed 16°C.

The Klickitat Hatchery operates under Upland Fin Fish Hatching and Rearing General NPDES permit WAG 130021, effective August 1, 2009, through July 31, 2014. Monitoring of hatchery effluent in accordance with the NPDES permit has shown that effluent is within the acceptable ranges of the water quality parameters specified in the permit (Yakama Nation Quarterly Monitoring Reports filed under NPDES Permit No. WAG-130021 effective August 1, 2009, through July 31, 2014, with Region 10, EPA, Seattle, Washington).

3.3.1.7 McCreedy Creek Study Area

Groundwater

There are no known groundwater supply wells or springs at the McCreedy Creek project site or the immediately surrounding area.

Hydrology

Surface water resources in the McCreedy Creek study area encompass the lower portion of McCreedy Creek from the gravel road, crossing just upstream of the proposed facility, to the confluence with the Klickitat River. There is no stream gage located on McCreedy Creek; however, the Yakama Nation Water Program collected instantaneous flow data on McCreedy Creek between 1993 and 2009 (unpublished data provided by Bill Sharp to BPA, March 3, 2011). The flow measurements reported in Table 3-14, were taken only under conditions wherein the sampling team could access the site and wade in the creek: therefore, few measurements were taken December through April and the data is biased toward lower flow conditions.

Table 3-12: Instantaneous Discharge Measurements of McCreedy Creek 1993-2009 (in cfs)

Data Set	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	26		32	24		65	41	21	25	34	17	28
2				62		32	18	18	25	18	14	
3				35			36	29	26	15	26	
4							35	30	30	24	24	
5							61	25	25	19		
6							32			22		
7							25			25		
Mean	26		32	40		48	35	25	26	22	20	28

Yakama Nation Water Program, unpublished data provided by Scott Ladd, Yakama Nation Water Resources Program Hydrologist, to BPA, March 3, 2011.

Water Rights

There are currently no water rights associated with the McCreedy Creek Acclimation Facility property. There are no other water rights in the study area.

Water Quality

McCreedy Creek is not currently listed as water quality limited on WDOE’s 303d list (WDOE 2008). McCreedy Creek is not influenced by glacier sedimentation like other streams lower in the Klickitat River watershed. The Klickitat River Subbasin Plan indicates streamside timber harvesting and grazing practices may contribute to slight increases in turbidity and moderate increase in fine sediment for water quality conditions for McCreedy Creek (Yakama Nation 2004b).

According to 11 years of monitoring data provided from the Yakama Nation, as cited in the Recovery Plan for the Klickitat Population of the Middle Columbia River Steelhead Distinct Population Segment (NMFS 2009), water temperatures at the McCreedy Creek site did not exceed 13°C even during July, and were typically less than 4.4°C during the winter months.

3.3.2 Environmental Consequences

For purposes of this EIS, the intensity of impacts to water quality and quantity are categorized as follows:

> ***Minor***: Impacts to water quality and quantity would be noticeable but localized. Water quality and stream flow impacts would be within historical or baseline conditions. Water quality standards would not be exceeded. Water flows may be diverted over short distances, but base flows in the bypassed reach would not be below typical fluctuations under baseline conditions. Local springs and aquifers would remain unaffected.
>
> ***Moderate***: Impacts to water quality and quantity would be readily apparent but localized. Water quality standards may be exceeded, although mitigation would reduce the intensity of impacts. Water flows may be diverted and returned back to the stream. Flows in the bypassed reach could be reduced below baseline conditions at certain times during the year. Impacts to local springs and aquifers would be detectable, but they would recharge to allow for sufficient quantities.
>
> ***Major***: Impacts to water quality and quantity would be noticeable and widespread. Water quality would be reduced in the long term. State water quality standards could be exceeded during certain periods. Water flows would be diverted permanently and reduce base flows in a measurable way. Impacts to local springs and aquifers would be measurable and require additional drilling or water sources in the future as recharge would not be able to keep up with withdrawals.

Alternative 1 – No Action Alternative

Under Alternative 1, the Wahkiacus and McCreedy sites would remain undeveloped and there would be no change to current groundwater, hydrology, water rights, or water quality conditions.

At the Klickitat Hatchery site the primary source of water for hatchery operations would continue to be the springs; water would continue to be diverted from the river to make up the remaining water demand. Water demand is not expected to change from existing conditions (see Table 3-11).

Spring and creek water rights utilized at the hatchery would continue at current levels. No change to water quality is anticipated under Alternative 1.

Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

Construction

Use of groundwater for construction is not anticipated. Groundwater could be affected in the unlikely event of a spill of hazardous material during construction. Construction contractors would develop a spill control and prevention plan as part of the NPDES construction general permit that would identify materials and methods to quickly address spills of hazardous material should they occur during construction.

Construction of the proposed Wahkiacus facilities would require work in the Klickitat River and Swale Creek to install the fish ladder, pump stations and intakes, outfalls, and large woody debris placements. This work would require dewatering a portion of the river to isolate work areas. Water inside the area to be dewatered would be isolated, pumped out to sediment settling ponds where the water could be filtered, and returned to the river. Placement of the cofferdams and water pumping would result in a minor adverse impact on water flow at the site of construction; however, no water would be consumed and the overall river flow patterns and volume would not be affected.

All water used for construction (e.g., for dust abatement or for curing concrete) would be provided by existing municipal sources and trucked to the site. If no water source is readily available, then the contractor would obtain a limited use water right to divert water from the Klickitat River for construction use. No adverse impacts on existing water rights are anticipated from construction.

Construction activities would result in ground disturbance that could cause the erosion of sediment into the river during rain events. There would also be a risk of leakage of petroleum products and other toxic substances from construction equipment used near the river. Construction activities would result in temporary direct minor adverse impacts to water quality. Site-specific erosion and pollution control measures would be developed for construction of the Wahkiacus Hatchery and Acclimation Facilities as part of the NPDES construction general permit. Implementation of these measures would minimize or reduce these potential impacts.

Operational

Water from the artesian well described in Section 3.3.1.5 would be used for domestic uses. Given the few number of people that would reside at the facility, the potential impact to groundwater supplies is expected to be minor.

Facilities would use water for incubation, rearing and acclimation of juvenile fish, and adult holding. Rearing and acclimation ponds use the most water. The Klickitat River would be the primary source of hatchery water. Withdrawals from Swale Creek would occur in during high flow months as emergency backup to Klickitat River withdrawals.

The Swale Creek intake would be used during times of poor water quality in the Klickitat River due to sediment or temperature, and during maintenance downtime of the Klickitat River intake.

For year-round rearing and acclimation activities, the Wahkiacus facility would require up to 25 cfs of surface water. The amount of water needed to be diverted would be minimized by recycling. Water would pass between different juvenile rearing units for the same species and from juveniles to adults of the same species. Water use would vary throughout the year with the maximum diversion (25 cfs) occurring in March and the lowest (10 cfs) occurring in August (Harbor 2010b). As shown in Table 3-13, maximum withdrawal of 25 cfs from the Klickitat River would equate to 0.8 to 2.8 percent of average monthly flows in this section of the river. Considering average monthly flows, facility water use would not likely result in a measurable change in surface water elevation within the diversion reach between the intake and the outfall (fish ladder). Diverted water would spend a relatively short amount of time within the facility and then be discharged approximately 100 feet downstream from intake. The facilities would result in direct minor adverse impacts to water quantity in the Klickitat River.

Table 3-13: Estimated Annual Water Diversions at Wahkiacus Hatchery[1]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Flows Near Pitt[2]	1,870	2,210	2,250	2,310	2,470	1,920	1,150	823	737	757	977	1,450
100 percent of Monthly Surface Water Requirement	17.7	20.5	24.1	23.8	21.6	16.0	10.7	9.4	16.7	21.2	21.8	20.9
Percent of Average River Flow Diverted	0.9	0.9	1.1	1.0	0.9	0.8	0.9	1.1	2.3	2.8	2.2	1.4

[1] *Values based on Harbor 2010b – net surface water use with reuse.*

[2] *Source: USGS 2010; USGS 14113000 Klickitat River Near Pitt, WA. Water Years 1909-2009* http://waterdata.usgs.gov/nwis/monthly/?format=sites_selection_links&search_site_no=14110000&referred_module=sw *(accessed December 1, 2010); assuming 100 percent of water supplied from the Klickitat River.*

Water withdrawal from Swale Creek would occur during emergencies and only when flows in Swale Creek are relatively high. The Swale Creek intake has been designed to operate within NMFS criteria for diversion of up to 20 cfs; however, the average diversion from Swale Creek would be approximately 12 cfs. During Swale Creek withdrawals, hatchery operations would be scaled back to reduce water demand. Water diverted from Swale Creek would flow through the hatchery facilities and then discharge into the Klickitat River via the fish ladder. Therefore, when the Swale Creek diversion is in use, there would be a reduction of in-stream flow for the lower 1,400-foot reach of Swale Creek and the Klickitat River reach from Swale Creek to the fish ladder (approximately 700 feet). This would result in a minor direct adverse impact to the flows in Swale Creek during diversions.

The Yakama Nation would develop operational criteria during final design to assure that sufficient flows for fish passage are maintained downstream of the intake when water is diverted from Swale Creek (see Section 3.4.2.2).

There are no known water rights in the study area that would be affected by operation of the Wahkiacus Hatchery and Acclimation Facility. The Yakama Nation would need to obtain additional water rights on the Klickitat River and new water rights on Swale Creek to operate the Wahkiacus Hatchery and Acclimation Facility.

Wahkiacus facility operations would comply with all applicable federal, state, and tribal water quality standards for effluent discharges and federal and state regulations on use of chemicals and fish food. All necessary permits and approvals would be obtained prior to operations. The Wahkiacus Hatchery and Acclimation Facility has been designed to comply with the Upland Fin Fish Hatching and Rearing General NPDES permit, which regulates acceptable levels of pH, total suspended sediments, total phosphorus, dissolved oxygen, and water temperature for hatchery effluent. A water quality monitoring plan, in accordance with applicable NPDES permitting, would be put into place. Samples from the surface water at the intake and outfall of the Wahkiacus facility would be taken 1 to 2 times a month to detect and remedy any problems in water quality.

The types and amounts of chemicals used at a hatchery or rearing facility depend on site-specific conditions, fish culture practices, species of fish, and types of parasites or disease organisms being treated. Discharge of residual amounts of chemicals would likely occur at the Wahkiacus facility and the Klickitat Hatchery. Commonly used chemicals include formalin and erythromycin. Formalin could be used to control fungal infections that, if left untreated, can result in pre-spawning loss. Formalin is a form of formaldehyde and breaks down quickly in water to form carbon dioxide and water molecules. Formaldehyde does not persist, bioaccumulate or biomagnify in the environment. Parasite-S™[6] , the U.S. Food and Drug Administration approved formalin product for aquaculture activities, requires a 10-fold dilution of discharge from finfish treatments prior to entry into natural waters. In completing the labeling requirements for Parasite-S, the Center for Veterinary Medicine analyzed environmental safety and concluded that no environmental impacts are expected provided that treatment water is diluted 10-fold prior to discharge (100-fold dilution for egg treatments) (Western Chemical NADA 140-989, 1998).

It is unlikely that any formalin or prophylactic will be used at the McCreedy acclimation site. Juveniles reared at the Klickitat Hatchery or the Wahkiacus facility could be fed prophylactic treatments of erythromycin for the prevention of Bacterial Kidney Disease. Discharge of erythromycin is anticipated to be non-detectable. Erythromycin could be administered by injection to adult salmon. Some amount of antibiotic is excreted by the fish, but the majority is absorbed into tissue. All therapeutants used would be administered according to label directions, under an Investigational New Animal Drug

[6] Parasite-S is a registered trademark. Product names mentioned does not imply endorsement by the Bonneville Power Administration or any other organization of the U.S. Government; or the Yakama Nation.

(INAD) permit or by veterinary prescription. The discharge of drugs is assumed to be non-detectable and drugs would be administered under coverage of an INAD. All chemical handling, application, and disposal would adhere to U.S. Department of Agriculture (USDA), state, and other federal regulations to protect human and environmental health.

Vacuumed fish pond sediments would be pumped to pollution abatement facilities. A two-part settling basin, coupled with aeration, is anticipated to reduce dissolved and settle-able solid discharge (Harbor 2010b). Aeration is utilized in effluent treatment to reduce the biochemical oxygen demand.

Table 3-14 presents the projected volumes of Wahkiacus Hatchery and Acclimation Facility byproducts expected in the untreated hatchery flow-through water. Because pollution abatement ponds would be constructed, these projections are conservative and represent worst-case scenario estimates. All of the estimates presented in Table 3-14 are within the WAC criteria, and within limits established in NPDES permitting requirements. As such, adverse effects to water resources are anticipated to be minor, and would likely dissipate within a few hundred feet of the outfall location.

Table 3-14: Projected Effluent Characteristics at the Wahkiacus Hatchery and Acclimation Facility

Month	Feed (kg/day)	Flow (cfs)	Phosphorus		Nitrogen		Ammonia		Total Suspended Solids*	
			kg/day	mg/L	kg/day	mg/L	kg/day	mg/L	kg/day	mg/L
January	2,520	21	0.45	0.009	0.6	0.012	3.2	0.063	24.8	0.492
February	2,520	21	0.45	0.009	0.6	0.012	3.2	0.063	24.8	0.492
March	2,520	21	0.45	0.009	0.6	0.012	3.2	0.063	24.8	0.492
April	2,520	21	0.45	0.009	0.6	0.012	3.2	0.063	24.8	0.492
May	8,190	14	1.45	0.043	2.0	0.060	10.2	0.307	80.6	2.413
June	5,670	14	1.00	0.030	1.4	0.041	7.1	0.212	55.8	1.671
July	0	0	0	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0	0	0	0
September	2,520	21	0.45	0.009	0.6	0.012	3.2	0.063	24.8	0.492
October	2,520	21	0.45	0.009	0.6	0.012	3.2	0.063	24.8	0.492
November	2,520	21	0.45	0.009	0.6	0.012	3.2	0.063	24.8	0.492
December	2,520	21	0.45	0.009	0.6	0.012	3.2	0.063	24.8	0.492

** Total suspended solids*

Note: Calculations were based on several assumptions regarding growth rates, pounds on station per month per species, and flow rates based on preliminary information obtained from Harbor 2010b. No fish will be present during July and August; therefore no effluent will be produced.

Calculations presented in Table 3-14 were based on methods described by the Idaho Department of Environmental Quality (IDEQ 1997) for estimating phosphorus (P) and nitrogen (N) produced at fish hatcheries. These methods rely on the fact that nearly all input occurs through fish feed. For every 1,000 pounds of fish feed fed in a facility, there will be an associated 300 pounds of total suspended solids and settleable solids produced. For Total P, a waste production of approximately 7.6 pounds would be generated for every 1,000 pounds of fish feed fed. This conversion factor is based on a P content of

0.8 percent found in low P fish feed. Of this amount, an estimated 2.2 pounds is contained in dissolved compounds, while an estimated 5.4 pounds (71 percent) is contained in waste solids. For every 1,000 pounds of fish feed used, an associated 38.3 pounds of ammonia, 31.7 pounds of dissolved N, and 6.4 pounds of settleable and suspended N waste would be produced (IDEQ 1997).

The volume of flow of the receiving water (see Table 3-14, above) compared to the maximum amount of water proposed to be used indicates that thermal effects would be minor and confined near the outfall (in this case, the fish ladder). Plus, water utilized in the hatchery is withdrawn from the river and passed through the fish rearing units at a rate that provides for rapid turnover (complete replacement of the water volume) within each rearing unit. The rapid turnover rate minimizes any temperature increase due to solar heating. According to the EPA (2003), “the temperature effects from point source discharges generally diminish downstream quickly as heat is added and removed from a waterbody through natural equilibrium processes.” Impacts to water quality in the Klickitat River would be minor due to effluent discharge at the Wahkiacus facility.

Swale Creek is 303d-listed for flow in the lower 0.3 mile of the creek, and for temperatures from about RM 2.5 to RM 3.3 (over 2 river miles upstream of the proposed intake location). The period of minimal to no flow in Swale Creek generally occurs from July through October. The withdrawal of water from Swale Creek, and subsequent discharge of that water into the Klickitat River, could further impair Swale Creek flows and temperatures from the point of diversion (above the 303-d listed reach) to the confluence with the Klickitat River; however, withdrawals would occur only during high flow months (November though May). Flow gauges would be installed and low flow thresholds would be identified to minimize adverse effects to Swale Creek during operation of the Swale Creek intake. Effects on Swale Creek water quality and quantity would be of short duration, minor, and adverse.

Klickitat Hatchery Study Area

<u>Construction</u>

As stated at the Wahkiacus site, groundwater could be affected in the unlikely event of a spill. A spill control and prevention plan would be developed as part of the NPDES permit, lessening the potential impact of a spill if one were to occur.

Construction to modify the fish ladder, reconstruction of the intake, and partial removal of the concrete weir would require in-water work. This work would require dewatering a portion of the river to isolate work areas. Dewatering at the Klickitat site would be performed as described at the Wahkiacus site and impacts to water usage would be similar.

All water used for construction (e.g., for dust abatement or for curing concrete) would be provided by existing artesian ground water supplies (domestic well). No impacts on existing water rights are anticipated from construction.

Construction activities would result in ground disturbance that could cause the erosion sediment into the river during rain events. There is also a risk of leakage of petroleum products and other toxic substances from construction equipment used near the river. Site-specific erosion and pollution control measures would be developed for construction of the Klickitat Hatchery as part of the NPDES construction general permit.

Impacts to water quality and quantity during construction would be minor and short term.

<u>Operational</u>

The primary source of water for the Klickitat Hatchery under Alternative 2 would continue to be the Indian Ford and Wonder springs. Improvements to the intakes at the Indian Ford Springs and pipelines would not affect withdrawal volumes; groundwater use at the hatchery would remain the same as existing conditions.

The existing surface water intake in the Klickitat River would be reconstructed to provide water to supplement the spring water as needed. The reconstructed intake would be located in roughly the same location as the existing surface water intake, and, therefore, the diversion reach between the intake and existing outfall structures would not measurably change.

Impacts to water resources are not anticipated to occur under this alternative as the quantity of water would not increase compared to existing water requirements for the facility. This alternative would not have a need to increase existing water rights for the facility. Consumptive use of diverted water is expected to be minimal and similar to existing conditions.

Modification to the Klickitat Hatchery would include a water recycling system to minimize water consumption for the facility. Withdrawn water would first pass from juvenile raceways to adult holding areas. This recycling is expected to result in reducing the existing peak water flow requirements that are in excess of 80 cfs to a peak of 60 cfs.

Water used in the Klickitat Hatchery facilities would be treated in existing pollution abatement ponds prior to discharge to the Klickitat River. These ponds allow for the settling of solids and cleaning waste from the rearing units. The solids and waste removed in the ponds would be disposed of in an approved upland location.[7] According to NMFS (1999), although "the level of impact [of hatchery effluent] or the exact effect on fish survival is unknown, it is assumed to be very small and is probably localized at outfall areas as effluent is rapidly diluted in the receiving streams and rivers."

The Yakama Nation would monitor surface water at the intake and outfall of the Klickitat Hatchery to determine if the use results in any impacts to water quality parameters,

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[7] There are four sites at the Klickitat Hatchery where suspended and settleable solids from the pollution abatement ponds are interned: three of them are located near the hatchery release ponds and the fourth is located at a barrow pit on the hatchery grade road. None of the sites are affected by erosion or sediment transport as they are bordered by vegetation and situated away from direct drainage pathways.

including flow, temperature, and suspended and settleable solids. Total suspended solids and settleable solids samples would be collected 1 to 2 times per month.

As stated for the Wahkiacus facility, the rapid turnover of water through the fish rearing units minimizes any temperature increases due to solar heating and any temperature effects would generally diminish quickly downstream. Information about the types and amounts of chemicals that would be used at the Klickitat Hatchery under Alternative 2 is not currently available, but would be the same or very similar to existing usage. All chemical handling, application, and disposal would adhere to USDA, state, and other federal regulations to protect human and environmental health.

Overall, the water use at the upgraded and expanded Klickitat Hatchery is not anticipated to create a measureable change within the Klickitat River. The impact of effluent on receiving water quality is expected to be minor, local, and long term.

McCreedy Creek Study Area

<u>Construction</u>

Use of groundwater for construction is not anticipated. Groundwater could be affected in the unlikely event of a spill of hazardous material during construction. Construction contractors would develop a spill control and prevention plan as part of the NPDES construction general permit that would identify materials and methods to quickly address spills of hazardous material should they occur during construction.

Construction of the new water intake and outfall for the acclimation pond may require in-water work, which could include dewatering a portion of the stream to isolate the work areas. Placement of the cofferdams and water pumping are not expected to affect river flow patterns or volume because no water would be consumed.

All water used for construction (e.g., for dust abatement or for curing concrete) would be provided by existing sources at the Yakama Nation facility at Camp Chaparral and trucked to the site. If water from Camp Chaparral is not readily available, then the contractor would obtain a limited use water right to divert water from the Klickitat River near McCreedy Creek for construction use. No impacts on existing water rights are anticipated from construction.

Construction activities would result in ground disturbance that could cause the erosion of sediment into the river during rain events. There is also a risk of leakage of petroleum products and other toxic substances from construction equipment used near the river. Site-specific erosion and pollution control measures would be developed for preparation of the McCreedy Creek site for acclimation facilities as part of the NPDES construction general permit.

<u>Operational</u>

There would be no effect to groundwater as the only water source for the acclimation facility would be surface water diverted from McCreedy Creek. A water supply of 7 cfs would be required for the acclimation program at McCreedy Creek. According to the Yakama Draft Klickitat River Anadromous Fisheries Master Plan (Yakama Nation

2008b), studies indicate that McCreedy Creek is capable of delivering this volume of water (Table 3-15). Acclimation pond water would be discharged as close to the point of withdrawal as possible to minimize the diversion reach, though a minor decrease in flow would occur in the reach between the intake and outfall. As with the other hatchery facilities, the diverted water would pass through the acclimation facility and discharge immediately downstream. The consumption of diverted water is expected to minor.

Table 3-15: Estimated Surface Water Diversion at McCreedy Creek Acclimation Facility

	March	April	May	June	July
Average Flows	31.8	40.2	No data	48.2	35.3
Monthly Surface Water Requirement		7	7	7	
Percent of Average Creek Flow Diverted		17.4	No data	14.5	

Source: Yakama Nation stream gauge (Sharp 2010b). Note that this station lacks the infrastructure to measure higher flows, so these are generally low flow measurements.

There are no existing water rights near the acclimation site; therefore, no impacts are expected.

The outfall would be approximately 150 feet downstream of the intake on McCreedy Creek. The short period of water diversion and limited use of acclimation waters should limit, in duration and intensity, any minor adverse effects to water quality in McCreedy Creek or downstream in the Klickitat River. Any change to water quality in McCreedy Creek from acclimation facility effluent would dissipate quickly as acclimation water mixes with McCreedy Creek flow and, further downstream, with the flow of the Klickitat River.

An increase in water temperature from the use of McCreedy Creek water is not anticipated. According to 2009 data from the Yakama Nation (2010), average monthly in-stream temperatures during the proposed rearing period are relatively cold (i.e., 30 days below 4.4°C in April, 16 days below 4.4°C in May). Temperatures do not typically exceed 12°C even during July (NMFS 2008b). Any potential increase in discharge temperature due to solar gain of surface waters flowing through the mobile raceways is anticipated to be minor given the rapid turnover of water in the mobile rearing system. Cleaning water would be discharged to an earthen pond to dissipate into the soil. Any remaining solid residue would be disposed of in upland locations.

No impacts to water quantity are expected and impacts to water quality would be minor and adverse while the facility would be in operation.

Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Wahkiacus Hatchery would not be constructed under this alternative; therefore, effects to water resources would be the same as those described for Alternative 1.

Klickitat Hatchery Study Area

Construction

The effects of construction on water resources at the Klickitat Hatchery under Alternative 3 would be the same as described for Alternative 2. The construction of a few additional facilities under Alternative 3 would have no additional impact on groundwater, hydrology, water rights, or water quality compared with Alternative 2.

Operations

Under Alternative 3, less water would be withdrawn from the subbasin (including the Klickitat River and Swale Creek) for use in hatcheries because the Wahkiacus facility would not be constructed. The effects of operations on water resources at the Klickitat Hatchery under Alternative 3 would be similar to those described under Alternative 2. Groundwater and surface water hydrology would be the same as described for Alternative 2. No additional water rights would be needed under Alternative 3; water requirements would be within the limits of existing water rights certificates.

Additional fish (2,000,000 fall Chinook) would be reared on-station under this alternative. Therefore, minor increased pollutant loadings to the Klickitat River would occur due to increased effluent associated with more fish on-station. However, Table 3-16 presents the projected volumes of byproducts expected in the hatchery flow-through water conservatively assuming no wastewater treatment. The actual effluent numbers would be lower because pollution abatement ponds would be constructed. These figures were derived by application of the methods described by the Idaho Department of Environmental Quality (1997). The pollution abatement facilities provided under Alternative 2 would be sufficient to handle the additional production and the facility discharge would meet the conditions of the existing NPDES permit. It is expected that effluent discharged from the renovated Klickitat Hatchery under Alternative 3 would comply with WAC pollutant limits. As such, adverse effects to water quality would be minor and limited to the waters in the immediate vicinity of the hatchery outfall structure.

Table 3-16: Estimated Effluent Characteristics at the Renovated Klickitat Hatchery under Alternative 3

Month	Feed (kg/day)	Flow (cfs)	Phosphorus		Nitrogen		Ammonia		Total Suspended Solids	
			kg/day	mg/L	kg/day	mg/L	kg/day	mg/L	kg/day	mg/L
January	4,788	47	0.85	0.007	1.2	0.010	6.0	0.052	47.1	0.407
February	4,788	55	0.85	0.006	1.2	0.009	6.0	0.045	47.1	0.352
March	4,788	61	0.85	0.006	1.2	0.008	6.0	0.040	47.1	0.314
April	4,788	60	0.85	0.006	1.2	0.008	6.0	0.040	47.1	0.318
May	16,127	57	2.86	0.020	3.9	0.028	20.2	0.144	158.6	1.135
June	13,607	49	2.41	0.020	3.3	0.028	17.0	0.142	133.8	1.116
July	2,268	37	0.40	0.004	0.6	0.006	2.8	0.031	22.3	0.243
August	2,268	35	0.40	0.005	0.6	0.006	2.8	0.033	22.3	0.260
September	4,788	44	0.85	0.008	1.2	0.011	6.0	0.056	47.1	0.438
October	4,788	53	0.85	0.007	1.2	0.009	6.0	0.046	47.1	0.365
November	4,788	54	0.85	0.006	1.2	0.009	6.0	0.046	47.1	0.359
December	4,788	52	0.85	0.007	1.2	0.009	6.0	0.047	47.1	0.371

Note: Calculations were based on several assumptions regarding growth rates, pounds on station per month per species, and flow rates based on preliminary information obtained from Harbor 2010a.

McCreedy Creek Study Area

The effects of Alternative 3 on water resources would be same as described for Alternative 2.

3.3.3 Mitigation Measures

Based on the current hydrology and water quality conditions in the Klickitat River watershed, it is unlikely that proposed alternatives would result in significant water quality impacts. Monitoring in accordance with NPDES permits would continually evaluate the project's compliance with water quality regulations. At this time, no mitigation is proposed or required.

As discussed in Section 4.6.3, Yakama Nation would develop an erosion and sediment control plan and pollution control plan according NPDES 1200C permit. Disturbed soils would be immediately stabilized and perimeter sediment controls would be installed to prevent sediment-laden water from leaving the construction area. Spill response equipment would be stored onsite during construction to immediately clean up spills of hazardous material should they occur.

3.4 Fisheries

3.4.1 Affected Environment

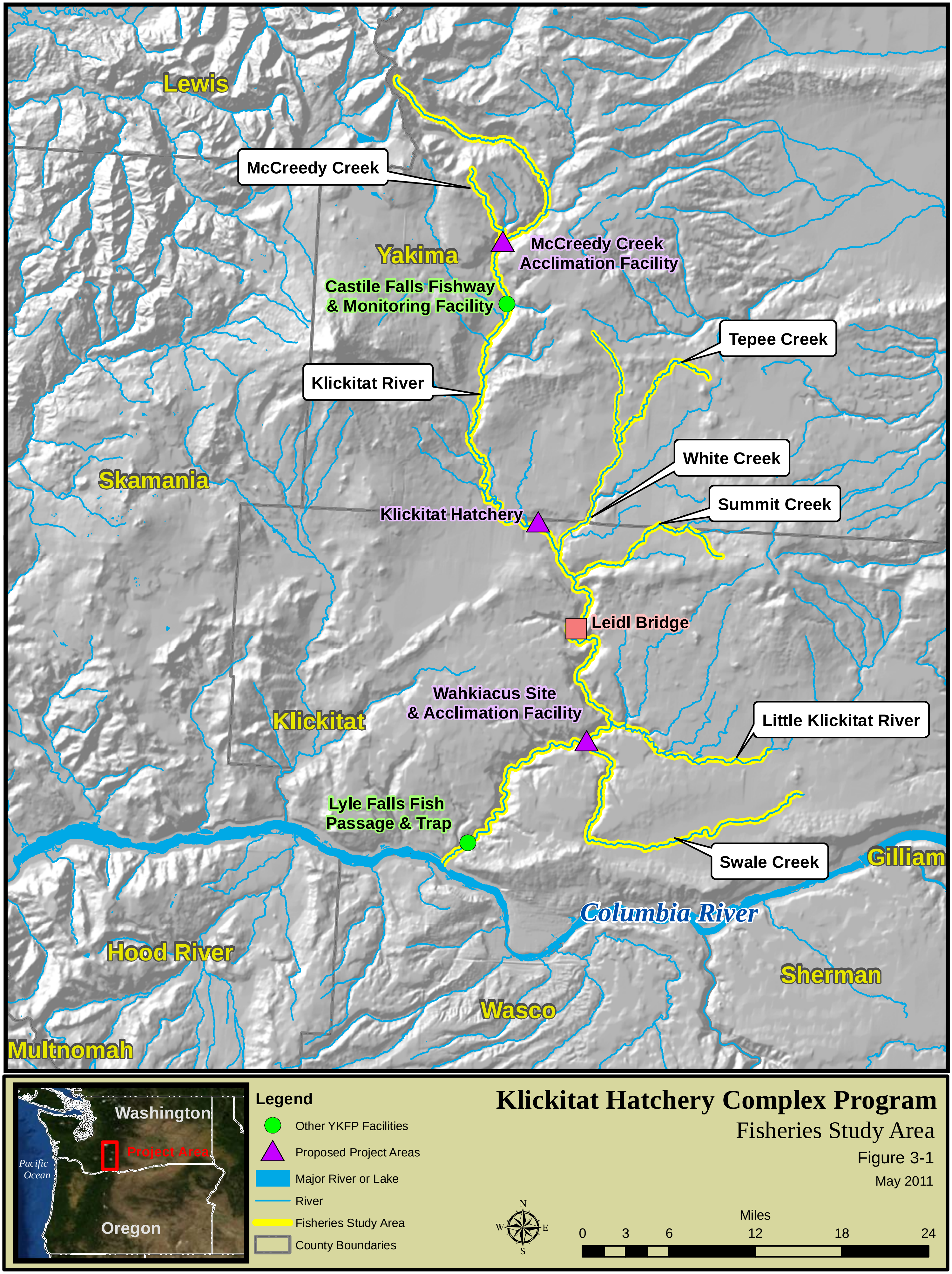
The study area for fisheries resources includes the mainstem Klickitat River from McCreedy Creek (RM 70) downstream to the confluence with the Columbia River, as well as two tributaries, the lower 0.5 RM of Swale Creek and the lower 1,000 feet of McCreedy Creek (Figure 3-1). Waterbodies located in the Klickitat River subbasin support anadromous and resident fish populations. The anadromous fishery is considered important due to the presence of diverse runs of salmon and steelhead, and high quality river habitat that supports a traditional Native American fishery as well as recreational fisheries (USFS 1991).

The Columbia River and estuary were not included in the study area since construction would be limited to the Klickitat River Subbasin, in reaches well upstream (RM 17) of the confluence with the Columbia River. Ecological interactions between fish produced in the Klickitat River Subbasin and those in the Columbia River and estuary, and harvest impacts in the Columbia River fishery have been addressed in the HGMPs prepared in support of the *Klickitat River Anadromous Fisheries Master Plan* (Yakama Nation 2008b).

For site-specific habitat analyses, the Wahkiacus Hatchery and Acclimation Facility study area includes the mainstem Klickitat River from approximately 500 feet downstream of the Horseshoe Bend bridge to the confluence with Swale Creek. The study area also includes Swale Creek from the confluence with the Klickitat River upstream to approximately RM 0.5.

The Klickitat Hatchery study area includes the mainstem Klickitat River from approximately 100 feet upstream of the existing gravity river water intake to approximately 300 feet downstream of the outfall for the Wonder Springs Pond.

The McCreedy Creek Acclimation Facility study area includes McCreedy Creek from the confluence with the Klickitat River to approximately 1,000 feet upstream.


Lewis
McCreedy Creek
Yakima
McCreedy Creek Acclimation Facility
Castile Falls Fishway & Monitoring Facility
Tepee Creek
Klickitat River
White Creek
Skamania
Summit Creek
Klickitat Hatchery
Leidl Bridge
Wahkiacus Site & Acclimation Facility
Klickitat
Little Klickitat River
Lyle Falls Fish Passage & Trap
Swale Creek
Gilliam
Columbia River
Hood River
Sherman
Wasco
Multnomah
Washington
Project Area
Pacific Ocean
Oregon
Legend
Other YKFP Facilities
Proposed Project Areas
Major River or Lake
River
Fisheries Study Area
County Boundaries
Klickitat Hatchery Complex Program
Fisheries Study Area
Figure 3-1
May 2011
N
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Miles
0 3 6 12 18 24

3.4.1.1 Fish Habitat

Most streams in the Klickitat River subbasin display natural runoff patterns because there is little flow regulation in the subbasin. Although the lower reaches of the subbasin are altered as a result of inundation due to the creation of the Bonneville Pool on the Columbia River, hydrology of the Klickitat River is primarily attributed to snowmelt in spring and early summer, and glacial melt in late spring and summer (NPCC 2004). Portions of some tributaries have insufficient flows to support anadromous and resident fish populations and are 303(d) listed as water quality impaired for in-stream flows (Yakama Nation 2004a) due to natural conditions and/or anthropogenic sources such as irrigation withdrawals.

Lyle Falls (RM 2.2) and Castile Falls (RM 64) are partial natural barriers to fish migration on the mainstem Klickitat River. Fish passage at these locations is facilitated through constructed fishways. A concrete weir at the Klickitat Hatchery acts as a partial barrier to upstream passage during low flow conditions.

Side channels and meandering stream reaches are naturally limited in the mainstem Klickitat River, much of which flows through deeply incised canyons with narrow valley floors. Roads constructed within and adjacent to the floodplain have further reduced the presence of side channels and channel sinuosity (Sharp 2000 in Yakama Nation 2004a). Habitat in the lower and middle basin tributaries has been severely degraded due to intensive logging and road construction, livestock grazing, and water diversions (Sharp 2000 in Yakama Nation 2004a). Active debris flows and glacial outwash originating from Mount Adams enter the Klickitat River and contribute to high levels of suspended sediment that limits production of all fish that spawn in the mainstem river below the confluence with Muddy Creek (RM 53.8). Salmonid production within the Klickitat River subbasin is limited by natural barriers, road culvert barriers, high water temperatures, high sediment and turbidity, riparian degradation, diminished base flows, and decreased habitat diversity.

Critical Habitat for middle Columbia River steelhead and Essential Fish Habitat designated by NMFS for Pacific salmonids (coho and Chinook salmon) are present in the Klickitat River subbasin. An assessment of existing conditions and anticipated effects to the Critical Habitat and Essential Fish Habitat will be developed for the ESA consultation document prepared for this project. Effects to Critical Habitat and Essential Fish Habitat would be similar to those presented herein with respect to habitat for steelhead, coho and Chinook salmon.

Wahkiacus Study Area

The Klickitat River at the proposed Wahkiacus facility location (RM 17) is low gradient both upstream and downstream of the Horseshoe Bend Bridge (up to 1 percent) and is constrained by the bridge footings, creating a hydraulic control point on the river. The left bank (project area) is unarmored and connected to the floodplain. The right bank of the river upstream of the bridge is constrained by Highway 142 and is steep, nearly vertical, approximately 15-20 feet high, disconnected from the floodplain, and armored in places.

Substrate in the study area ranges from silt to large cobble and small boulders. Silts and sands dominate the substrate in the river reach immediately upstream of the Horseshoe Bend Bridge. Cobble substrate begins approximately halfway between the bridge and the confluence with Swale Creek.

Portions of the Klickitat River riparian area on the project site are characterized by a 6- to 7-foot-deep flood deposit from 1996. The Yakama Nation recently planted this area with Scouler's and coyote willows, and dogwoods. Riparian vegetation on the right bank (upstream of the bridge and across from the site) is composed of larger mature trees and understory vegetation that overhangs the river. A few gaps in vegetation occur due to the steep slope of the road prism and the presence of a derelict bridge footing across from the mouth of Swale Creek. Vegetation that is present does not provide shading benefit to the river beyond the riverbank.

The Wahkiacus site is located on the alluvial fan of Swale Creek at its confluence with the Klickitat River. The prevailing surficial substrate is composed of large gravel to small boulder. Surface substrate in the vicinity of the existing house and the Klickitat River is predominantly sand. The Swale Creek gradient ranges from 1 to 2 percent at the mouth, through a steeper section of 2 to 4 percent slope to back to 1 to 2 percent slope within the project study area. The head of the alluvial fan is approximately 650 feet upstream from the confluence. Above the alluvial fan, Swale Creek is moderately confined to highly confined for much of its length through a 13-mile long canyon.

Swale Creek is intermittent through the canyon reach upstream of the project study area. In the lower reaches including the project study area, Swale Creek is intermittent to perennial. There are also several perennial pools and extended reaches immediately upstream of the project study area.

On Swale Creek, near the proposed intake location, alders and willows line the banks of the creek, but shade input is reported to be low (Watershed Professionals Network and Aspect Consulting 2004). The depositional area near the mouth of the creek is subject to disturbance by flood events and, therefore, the riparian vegetation in this area tends to be dynamic; maturing between flood events and then reducing in density during floods.

According to SalmonScape (WDFW 2010b) and StreamNet (2010), the Klickitat River in this location supports coho salmon throughout the reach, spawning/rearing habitat for summer and winter steelhead, rearing habitat for spring Chinook, and spawning/rearing habitat for fall Chinook. Bull trout are also documented to be present, though this reach of the river functions primarily as a migratory corridor for adults and subadults.

Swale Creek is reported to support coho and winter/summer steelhead spawning (StreamNet 2010, SalmonScape, WDFW 2010b), and spring and fall Chinook are documented to be present in the lower reaches of Swale Creek (SalmonScape, WDFW 2010b). However, any use of the lower reaches of the creek is limited to higher flow periods, and summer use of the portion of Swale Creek proposed for development of an intake structure is unlikely, considering the extreme low flows.

Klickitat Hatchery Study Area

The Klickitat Hatchery is located within the Klickitat River subbasin (~RM 42), at an elevation ranging from approximately 1,220-1,280 feet. The hatchery is sited within the river canyon on a floodplain bench, and an upland terrace approximately 550 feet lower than the surrounding plateau. The site has been developed since the 1950s and has facilities on both banks of the river. Disturbed areas include the upland bench for hatchery buildings, ponds, raceways and residences; and the riparian area for the ladder, bridge, intake, and rearing unit outfalls. The river bed itself has been altered due to the installation of a full-channel spanning concrete weir and for buried spring water pipelines.

The site topography of the two distinct terraces, the lower floodplain bench, and the upland terrace, is relatively flat, changing about 50 feet over the developed area. Hillside springs are located on a steep slope (~20 percent slope) to the north of Pond 25. Portions of the river channel are constrained with armoring (at intake, bridge, ladder entrance, and Pond 24) to protect hatchery infrastructure.

Riparian vegetation along the river corridor is variable in depth and composition. The left bank project area, from the intake to Pond 25, has a narrow willow-based riparian fringe in most areas. The right bank project area, from ladder entrance to Pond 24, has a narrow willow fringe near the ladder to no vegetation adjacent to the access road around Pond 24. Vegetation within the upland areas proposed for clearing (new residence and raceways near Pond 26) includes willows, grasses and Ponderosa pine. Vegetation that functions to reduce in-stream temperatures is very limited; such vegetation does not provide shading benefit to the river beyond the immediate river margin.

Hatchery infrastructure on the Klickitat River includes a surface water intake on the left bank, the fish ladder, and a full-channel spanning concrete weir at the fish ladder entrance. In-stream habitat from the existing surface water intake downstream to the hatchery facility is characterized by a riffle/run section composed of pebbles to large cobble with some boulders. The river meanders and forms a 90 degree bend from near the intake, past the hatchery and downstream from the Wonder Springs pond. The gradient of the river in this reach is reported to be 1 to 2 percent (SalmonScape 2010b), with the steeper reach occurring through the bend. Some pools occur along the left bank. Sections of the banks are armored (at the existing intake, near Pond 24, near the steelhead rearing units, and other locations). The concrete weir that spans the full channel is approximately 18 inches high and can be a partial migratory barrier, depending on river flows. During low flows, gravel bars can be present upstream of the bridge.

According to SalmonScape (WDFW 2010b), the Klickitat River in the Klickitat Hatchery study area supports spawning habitat for coho salmon downstream of the weir. Coho are also present upstream of this location. SalmonScape (WDFW 2010b) reports that spawning and rearing habitat for winter and summer steelhead, as well as spring Chinook, occurs in the reach. Bull trout (migratory and foraging adults/subadults) are also documented to be present (WDFW 2010b, StreamNet 2010).

McCreedy Creek Study Area

The McCreedy Creek site is located in the upper Klickitat subbasin at RM 70 of the Klickitat River, elevation 3,000 feet (see Figure 2-1). The surrounding area is primarily forest lands in the closed area of the Yakama Nation. Currently, there are no facilities at the proposed acclimation location, which is characterized as a mature riparian forest, with a high density of mature conifers and deciduous species. The area proposed for development of the acclimation facility slopes toward the river, with minor elevation changes throughout the site. The Klickitat River in this location is low gradient (0-2 percent), and is reported to support spring Chinook, and summer and winter steelhead (SalmonScape 2010b), though StreamNet (2010) does not indicate steelhead presence in this area.

McCreedy Creek from the confluence with the Klickitat River to the road-crossing culvert is well vegetated with a mature canopy containing coniferous and deciduous trees and understory shrubs. The stream gradient increases from 1 to 2 percent below the culvert to greater than 8 percent above the culvert (WDFW 2010). The creek averages 25 feet wetted width below the culvert. Large wood is present and water temperature is suitable for all life stages of anadromous salmonids (Byrne et al. 2001, Byrne 2010). The creek is scoured at the downstream face of the culvert and incised at the location of the proposed intake.

Data for McCreedy Creek is limited; however, results of WDFW/Yakama Nation snorkel surveys conducted in 2000 indicated that anadromous fish do use the lower reaches of the creek from just above the existing road crossing (culvert) to the confluence with the Klickitat River. Species identified include juvenile Chinook and several unidentified salmonids (Byrne et al. 2001). McCreedy Creek is also reported to support *Oncorhynchus mykiss* (mostly resident rainbow with limited steelhead use) and brook trout (Sharp 2010b). According to SalmonScape (WDFW 2010b), McCreedy Creek supports summer and winter steelhead, and spring Chinook spawning and rearing habitat is present in the Klickitat mainstem near the confluence with McCreedy Creek.

3.4.1.2 Fish Populations

The Klickitat River subbasin supports a variety of native and introduced fish species, including fall and spring/summer Chinook salmon, coho salmon, summer and winter steelhead, bull trout, rainbow/redband trout, and mountain whitefish. Table 3-17 lists the fish species present in the subbasin, the associated federal and state status, and whether or not the species is native or introduced to the subbasin.

Table 3-17: Fish Species Present in the Klickitat River Subbasin

Common Name	Scientific Name	Federal Status	State Status	Native (N) or Introduced (I)
Pacific lamprey	*Lampetra tridentata*			N
Western brook lamprey	*Lampetra richardsoni*			N
Coastal cutthroat trout	*Oncorhynchus clarki clarki*			N[1]
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*			N
Coho salmon	*Oncorhynchus kisutch*			I
Rainbow trout	*Oncorhynchus mykiss*			N
Middle Columbia River steelhead (winter and summer)	*Oncorhynchus mykiss*	Threatened	Candidate	N
Sockeye salmon	*Oncorhynchus nerka*			N[1]
Fall Chinook salmon	*Oncorhynchus tshawytscha*			I[2]
Spring Chinook salmon	*Oncorhynchus tshawytscha*			N
Summer Chinook salmon	*Oncorhynchus tshawytscha*			N
Mountain whitefish	*Prosopium williamsoni*			N
Bull trout	*Salvelinus confluentus*	Threatened	Candidate	N
Brook trout	*Salvelinus fontinalis*			I
Chiselmouth	*Acrocheilus alutaceus*			N
Peamouth	*Mylocheilus caurinus*			N
Northern pikeminnow	*Ptychocheilus oregonensis*			N
Longnose dace	*Rhinichthys cataractae*			N
Leopard dace	*Rhinichthys falcatus*		Candidate	N
Speckled dace	*Rhinichthys osculus*			N
Redside shiner	*Richardsonius balteatus*			N
Bridgelip sucker	*Catostomus columbianus*			N
Largescale sucker	*Catostomus macrocheilus*			N
Mountain sucker	*Catostomus platyrhynchus*			N
Three-spine stickleback	*Gasterosteus aculeatus*			N
Shorthead sculpin	*Cottus confuses*			N
Torrent sculpin	*Cottus rhotheus*			N

Sources: BPA 2008; Wydoski and Whitney 2003

[1] *Occasional occurrence*

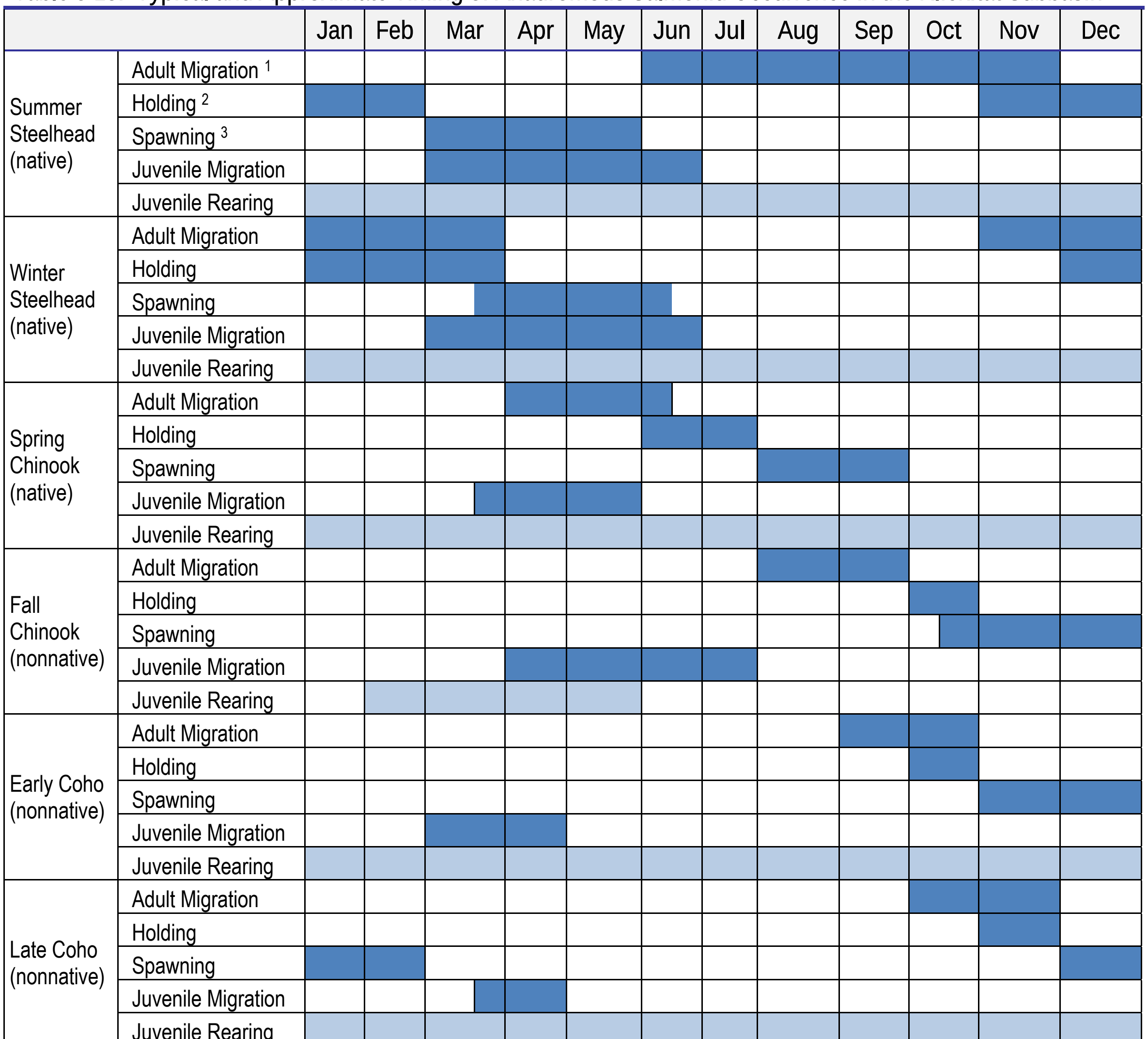
[2] *Native below Lyle Falls*

Anadromous Fish

As presented in Table 3-17, the Klickitat River subbasin supports several important anadromous fish stocks, including fall and spring Chinook, steelhead, coho and Pacific lamprey. Although one sockeye was observed in the Lyle Falls fish ladder trap in 2006 (Gray 2006) and there are anecdotal reports of anglers catching sea-run cutthroat trout in the past, the occurrence of these species in the subbasin is considered rare (Sharp 2010b).

Table 3-18 presents the typical timing of adult migration, holding, spawning, and juvenile rearing and migration for anadromous salmonids present in the Klickitat River subbasin.

Table 3-18: Typical and Approximate Timing of Anadromous Salmonid Occurrence in the Klickitat Subbasin



[1] *Adults may move upstream during any month of the year. The run timing of naturally produced summer steelhead is extensive; at least a few adults enter the Klickitat every month of the year (B. Sharp, as cited in Yakama Nation et al. 2004)*

[2] *Holding is the stage when adults are waiting for the right conditions for movement up to the spawning area.*

[3] *Hatchery summer steelhead spawn from November through January.*

Source: Run timing based on Gray (2006); BPA 2008; and Costello (2011)

Coho Salmon

Coho never successfully exploited the Klickitat River subbasin to any great degree, and for purposes of this EIS are considered an introduced stock. Lyle Falls (RM 2.2) historically prohibited their upstream migration into the river. They were originally introduced in 1952 to achieve harvest objectives (Yakama Nation 2008d). Current returns of coho to the Klickitat River subbasin are from hatchery smolts imported from lower Columbia River hatchery facilities (Washougal and Lewis River) and released in the subbasin. Lower Columbia River coho were identified as a separate evolutionarily significant unit (ESU) and listed as threatened on June 28, 2005; however, the Klickitat River subbasin and associated hatchery population were not included in the ESU (NMFS 2005b), and are therefore not afforded protection under the federal ESA. Klickitat coho are classified as depressed by the Salmon and Steelhead Stock Inventory (SaSSI) (WDFW 2002) due to chronically low adult returns. These fish have a significant role in meeting *U.S. v. Oregon* harvest allocation and regional mitigation goals.

Up to 2.7 million yearling out-of-basin coho (Washougal Hatchery) are currently trucked into the Klickitat River subbasin in early April for release in the Klickitat River at RMs 12 and 29 (HSRG 2009b). In addition, 1.35 million coho eyed eggs (Lewis River stock) are transferred annually from the Washougal Hatchery to the Klickitat Hatchery for incubation, rearing, and release. A naturally spawning population has become established in the mainstem Klickitat River from RM 5 to RM 42 and in the lower reaches of several tributaries, including Swale, Canyon, Summit, and White Creeks and the Little Klickitat River (HSRG 2009b, Yakama Nation 2004a). Since 1987, the Yakama Nation estimates that the number of coho returning to the subbasin each year has averaged approximately 5,500 fish. About 900 coho adults have entered spawning areas over this same time period. The Yakama Nation has estimated that natural spawning coho likely produce less than 10,000 juveniles each year (Yakama Nation 2008a). As shown in Table 3-18, coho adults begin entering the Klickitat River subbasin in the fall and typically spawn from October through February. Naturally-produced coho smolts remain in the system for a year following emergence and typically outmigrate as yearlings between March and April.

Steelhead Trout

The Klickitat River subbasin supports native runs of both winter and summer steelhead. Steelhead returning from November through March are classified as winter stock, while steelhead returning from June through November are considered summer stock. The winter run is one of only two populations of inland winter steelhead in the United States (NMFS 1999). Both the winter and summer runs of Klickitat River steelhead are part of the Middle Columbia River (MCR) DPS and were originally listed as threatened under the federal ESA on March 25, 1999. Hatchery summer steelhead (Skamania Hatchery, Washougal River stock) in the Klickitat River are not included in the MCR steelhead DPS; however, the progeny of these hatchery-derived fish that spawn naturally receive coverage under the ESA and are, therefore, included in the MCR DPS.

While historical hatchery releases of Skamania stock steelhead have provided harvest benefits for fisheries, some uncertainty exists regarding the degree of mixing between the Skamania steelhead and the Klickitat River's natural populations of summer and winter run steelhead. Genetic work has suggested the hatchery strain remains genetically distinguishable from native stocks and that only 4.0 percent of naturally produced steelhead in the subbasin possess the genetics of hatchery fish (Narum et al. 2006). NMFS concluded that insufficient information exists to determine the effects of hatchery releases on natural steelhead populations in the Klickitat River subbasin (NMFS 2008b).

Steelhead typically spawn in the mainstem Klickitat River between RM 5 and RM 50 (Yakama Nation 2004a), and ***redds*** have been documented in tributaries, including Tepee

Creek, White Creek, Dead Canyon Creek, Summit Creek, Little Klickitat River, Swale Creek and Snyder Creek (Yakama Nation 2009d). Mainstem steelhead spawning is concentrated between the Little Klickitat (RM 20) and Leidl Bridge (RM 32) (NMFS 2008b). Spawning occurs from March through mid-May for natural-origin fish, while the Skamania hatchery population typically spawn from November through January.

At the Klickitat Hatchery location, steelhead occasionally spawn in the existing diversion reach (i.e., the area between the surface water intake and the hatchery discharge outfall) in April and May; and within the reach adjacent to the Wahkiacus project site. Steelhead holding occurs in the vicinity of the Wahkiacus project site in the summer and fall months (Sharp 2010b).

Access to areas above Castile Falls has historically been limited due to poor natural migration conditions at the falls. Recently completed passage facilities have improved fish passage, allowing access to the upper watershed. Rainbow trout/steelhead have been reported in McCreedy Creek (Byrne et al. 2001). Use of McCreedy Creek is primarily restricted to resident rainbow trout, though limited steelhead use is likely. Within McCreedy Creek, steelhead likely spawn from April through May, and juvenile rearing occurs year-round (Sharp 2010b).

With the exception of 2005 (when two redds were identified), no steelhead redds were observed during Yakama Nation steelhead spawning surveys conducted from 1990 to 2009 in the upper Klickitat River Subbasin, from Castile Falls to McCormick Meadows (RM 85) (Sharp 2010b). There have been historic accounts by tribal members of both steelhead and spring Chinook above Castile Falls prior to the installation of the fishway (Sharp 2011). It should be noted that steelhead spawner surveys are often difficult due to high flows during the spawning season. Habitat modeling work conducted by both the Interior Columbia Technical Review Team (ICTRT) and the Yakama Nation indicates that adult steelhead production potential above Castile Falls may be as high as 750 adults.

Steelhead fry typically emerge from April through mid-June (Myers et al. 2003), and migrate to the ocean from early spring through June after 2 to 3 years of rearing in freshwater. Juvenile steelhead are assumed to rear in all areas where spawning occurs (WSCC 1999). Smoltification and outmigration in the Klickitat River subbasin occurs from March through June, peaking in May (WSCC 1999).

The Klickitat Hatchery summer steelhead program currently has an annual release goal of 120,000 smolts to support sport and tribal fisheries in the basin; however, actual releases since 1961 have averaged 85,000 fish. Summer steelhead reared at the Skamania Hatchery are directly released in the Klickitat River at RMs 10, 18, 25, and 28 (WDFW 2004a).

Spring Chinook Salmon

The Klickitat spring Chinook population is included in the MCR Spring Chinook ESU, which is currently not listed under the ESA. Although the Klickitat River subbasin historically supported large runs of native spring Chinook salmon, the population is now considered depressed due to chronically low numbers of adults returning to the Klickitat River (WDFW 2002; Yakama Nation 2008c). The current Klickitat spring Chinook population is a mixture of natural- and hatchery-origin fish.

Artificial production of Klickitat spring Chinook began in 1951 with the construction of the Klickitat Hatchery. Initially, natural-origin adults were collected for broodstock at Lyle Falls; however, since 1959, collection of broodstock has relied on fish returning directly to the Klickitat Hatchery (RM 42). Annual hatchery releases have consisted of both yearling and subyearling spring Chinook ranging from 578,000 to 963,000 for release years 1993 through 2004, with a release goal of 800,000.

On average, the Klickitat spring Chinook run comprises approximately 75 percent hatchery and 25 percent natural fish (Yakama Nation 2008c). Since 1977, the run size has ranged between 500 and 5,300 fish with an average of 1,900 fish. Natural escapement has ranged from 100 to about 1,100 fish and has averaged about 300 fish annually since 1977 (Yakama Nation 2008c).

Adult spring Chinook enter the Klickitat River subbasin from late April though mid-June and hold in the mainstem until August. They then quickly migrate upstream when spawning begins (Yakama Nation 2008c). Spring Chinook spawn in the Klickitat River from RM 32 to RM 84, although more than 95 percent of the spawning is concentrated in a 10-mile reach between Big Muddy Creek (RM 54) and Castile Falls (RM 64). Spring Chinook spawner surveys conducted by the Yakama Nation from 1989 to 2009 in the upper mainstem reach from Castile Falls to McCormick Meadows indicate spawning does occur upstream of Castile Falls, though it is limited. Peak spawning occurred during the 2002, 2003, and 2004 spawning seasons when the Yakama Nation and WDFW transported adults upstream of Castile Falls from the Klickitat Hatchery in attempts to seed upstream habitats prior to the completion of ladder enhancements at Castile Falls. During those years, 243 redds, 165 redds, and 122 redds were observed, respectively. Transport of fish upstream of Castile Falls was not conducted following the completion of ladder enhancements at Castile Falls. Although spring Chinook ascended the ladder and spawned upstream, the number of redds upstream of Castile Falls has been low (36, 0, and 4) in recent years (2007, 2008, and 2009, respectively) (Yakama Nation 2010).

Spawning occurs from mid-August to mid-September above the Klickitat Hatchery (RM 42) and from mid- to late-September below the hatchery. Spring Chinook (primarily hatchery fish) hold in the reach of the mainstem river adjacent to the Klickitat Hatchery during the months of June and July and spawn in the hatchery diversion reach during August and September. Limited numbers of spring Chinook hold during June and July in the vicinity of the Wahkiacus site, and spawn in the reaches upstream during August and September. Spring Chinook spawning is not known to occur in tributaries (Yakama Nation 2004b).

Juveniles have been documented rearing in the lower reaches of Swale Creek, Little Klickitat River, and Canyon and White creeks (Yakama Nation 2004a). McCreedy Creek supports limited spring Chinook rearing, and a limited number of juveniles could be present year-round at that location. Outmigration of naturally-produced juvenile spring Chinook occurs from mid-March through May (Zendt 2010).

Fall Chinook Salmon

Fall Chinook are not indigenous to the Klickitat River subbasin above Lyle Falls. It is assumed that low flows during adult migration periods historically prohibited passage. Hatchery releases of fall Chinook began in 1946. Currently, individuals returning to the Klickitat River subbasin are hatchery-origin upriver bright stock imported as eggs from Little White Salmon National Fish Hatchery and reared and released as subyearling smolts from the Klickitat Hatchery (Yakama Nation 2008b). The upriver bright stock fall Chinook are part of the Upper Columbia summer/fall Chinook ESU, which is not listed under the ESA. These fish play a significant role in meeting *U.S. v. Oregon* harvest allocation and regional mitigation goals.

Stocking of the Tule type (stock of Chinook that enters freshwater darker in coloration and spawn shortly after entering their home rivers) fall Chinook began in 1952 and ceased in 1986; however, a small naturally-spawning population averaging 675 adults annually (ranging from 500 to 2000 fish [Yakama Nation 2004a]) persists in the mainstem Klickitat River between RM 5 and RM 42 (Yakama Nation 2004a). This naturally-spawning population is believed to be composed of hybrids of the tule and upriver bright stocks.

Approximately 4 million fingerling fall Chinook are released into the Klickitat River annually from the Klickitat Hatchery. Since 1986, smolt to adult returns have averaged about 0.25 percent (10,000 adults). Estimates of hatchery fall Chinook escaping fisheries and spawning naturally in the Klickitat River have ranged from about 2,500 to 25,000 fish annually from 1989 to 2005 (Yakama Nation 2008b).

Adult fall Chinook migrate upstream from August through September when flows are sufficient to allow passage at Lyle Falls. Fall Chinook spawn in the Klickitat River between RM 5 and RM 42, which includes project reaches from mid-October to December (Yakama Nation 2004a, 2008b, Sharp 2010b). Juveniles outmigrate in the spring and early summer. Although fall Chinook are documented in Swale Creek (SalmonScape 2010b), their use of this tributary is minimal.

Pacific Lamprey

Pacific lampreys are an important traditional food source for the Yakama Nation and other tribes (Yakama Nation 2004a). Lamprey are known to occur in the Klickitat River subbasin, though the historic and present distribution and status are relatively unknown. Adults have been observed as far upstream as RM 57 (Yakama Nation 2004b, 2004c). Lamprey typically reach spawning grounds in mid-summer (Kan 1975, Beamish 1980) and spawn the following spring. Eggs typically hatch into ***ammocoetes*** in less than 2 weeks; these newly hatched larvae drift downstream and bury themselves in silt, mud, or fine gravel along the margins and backwaters of streams and rivers (Scott and

Crossman 1973, Hammond 1979). The naturally high glacial sediment load in the Klickitat River Subbasin provides good rearing conditions for juveniles. Ammocoetes generally spend 5 to 6 years in freshwater (Scott and Crossman 1973) before outmigration in late winter and early spring (Hammond 1979).

Resident Fish

There are 18 native resident fish species and one introduced species in riverine habitats in the Klickitat River subbasin (Table 3-17). Managed species or those with special status are discussed below.

Bull Trout

The Columbia River bull trout DPS was listed as threatened under the ESA in 1998 (63 FR 31647), and includes bull trout in the Klickitat River. Since 1960 there have been 14 observations of bull trout within the mainstem Klickitat River, and from 2000 to 2007, nine bull trout were observed or collected and released between the river's mouth and up to the base of the first falls at Castile Falls (BPA 2008). The only known population in the basin is an isolated resident population found upstream of impassable falls in the West Fork of the Klickitat River (RM 63.0). The mainstem Klickitat River is primarily used as a migratory corridor for adult and subadult bull trout. Section 3.7 provides detailed information on the Columbia River bull trout DPS status and their distribution, abundance, and life history in the Klickitat River subbasin and project study areas.

Other Resident Species

Naturally reproducing populations of rainbow trout are found in the mainstem Klickitat River from the Columbia River confluence to RM 85, and in virtually all tributaries. Every June, the Yakama Nation plants 4,500 catchable triploid rainbow trout in high mountain lakes and streams in the subbasin. In late spring, WDFW also releases 6,000 catchable rainbow trout in the Little Klickitat River, and Spring, Outlet and Bird Creeks; and other small tributaries (Yakama Nation 2004a, WDFW 2006b).

Resident cutthroat trout were observed in limited numbers in McCreedy and Summit creeks during the 1980s; however, none were observed during a late 1990s reinvestigation of known locations. In the summer of 2010, one resident cutthroat was caught and released between Summit Creek and Leidl Bridge: such an occurrence is rare (Zendt 2011). The historic and present distribution and status are relatively unknown.

Brook trout were introduced into the Klickitat River subbasin in the late 1970s and early 1980s, primarily in high mountain lakes. Currently, natural reproducing populations are found throughout the upper Klickitat River mainstem and in major tributaries upstream of Big Muddy Creek (RM 53.8). The presence of brook trout is a management concern in areas where they overlap with bull trout and cutthroat trout because of potential hybridization, predation, and competition.

Leopard dace may be present in the lower Klickitat River subbasin (potentially near the Wahkiacus project site). Due to declines in abundance and distribution, leopard dace were listed as a state "Candidate" species in 1998. Leopard dace prefer stream habitats with currents less than 1.5 feet per second. Such habitats may be present in the mainstem Klickitat River; however, suitable habitat is not present in the immediate vicinity of in-water construction locations associated with this project. During lower flow periods, Swale Creek may provide suitable habitat for dace species.

3.4.1.3 Ecological Interactions

Ecological interactions can take the form of competition between species or stocks of fish for food (prey) or space (habitat niches such as pools and undercut banks). Interactions can also occur on a genetic level. Breeding between stocks of fish from differing genetic origin can change the genetic structure of a population, or the reproductive success of a population.

According to the HSRG (2004) and Flagg et al. (2000), the potential for predation of wild salmonids by hatchery-reared smolts depends on the size, number, and spatial distribution of both predators and prey, the functional and numerical responses of the predators, and the amount of time that predators and prey are in proximity. Several authors, including Busack et al. (2005), reviewed published rates of predation by juvenile hatchery salmonids on wild juvenile Chinook and found that predation rates were generally low (<2 percent of natural population consumed). In contrast, data collected on hatchery coho predation rates on wild fall Chinook juveniles in the Lewis River were quite high (>11 percent) (Hawkins and Tipping 1999). The variability in study results is one reason the HSRG (2004) suggested that hatcheries monitor predation impacts resulting from hatchery releases. Such predation studies are conducted in the Klickitat River subbasin by the Yakama Nation through Research, Monitoring and Evaluation (RM&E) projects funded by BPA. Environmental review of those projects occur independent of this analysis.

In general, hatchery fish can consume fish that are 50 percent of their body size; however, studies reviewed by Busack et al. (2005) indicated that the range may extend from approximately 38 percent (steelhead) to 75 percent (coho). In a number of documents, NMFS and the USFWS (USFWS 1994, NMFS 1999) expressed the opinion that juvenile salmonids can consume prey up to 33 percent of their body length and smaller. Predation by hatchery fish on wild fish can occur anywhere the two stocks exist in the same space and time, and risks to wild fish are increased when hatchery fish, particularly larger smolts, are released during periods when vulnerable newly emergent fry are present.

Summer Steelhead

Current hatchery management of Skamania River stock summer steelhead releases in the Klickitat River subbasin function to support the tribal and sport terminal fisheries with no conservation objectives. The program currently releases these smolts at various locations in the mid and lower watershed (below Klickitat Hatchery) without acclimation. Potential effects to natural steelhead populations associated with the current hatchery production program include:

- Introgression (movement of gene flow from one population to another) and domestication (the adaption to the hatchery environment that may reduce survival outside the hatchery).
- Reduction in natural population genetic diversity.
- Alteration of juvenile and adult run-timing and age structure.
- Direct juvenile competition and predation.
- Competition and predation on other anadromous species.
- Increased disease risks to native fish stocks due to importing fish from out-of-basin.

The HSRG (2009b) determined there is currently insufficient information to determine the effects of ongoing hatchery releases on the natural steelhead population and, while it is likely that hatchery hybridization of Skamania River stock with wild steelhead has occurred in the Klickitat River subbasin (Yakama Nation 2004b), the level of impact on the natural population is unknown. The ICTRT (2007) reported that the hatchery contribution rate to natural steelhead spawning in the Klickitat River subbasin has exceeded 5 percent for more than four generations. However, Narum et al. (2006) argued that about 4 percent of the naturally-produced steelhead could be attributed to the hatchery stock, and that genetic integrity and variation of native Klickitat River steelhead have been maintained despite long-term hatchery introductions.

Berejikian and Ford (2004) estimated that the nonlocal Skamania Hatchery summer steelhead are less than 30 percent as effective as the naturally-produced steelhead in producing returning adults. Weber and Fausch (2003) report that competition from hatchery steelhead has potentially decreased the productivity of natural-origin juvenile life stages and increased predation of wild juvenile steelhead rearing in streams where hatchery steelhead occur.

Spring Chinook Salmon

Currently, spring Chinook yearlings are released at the Klickitat Hatchery to provide fish for tribal and nontribal fisheries. Concerns associated with the existing hatchery program include:

- Domestication/reduced productivity: fish are more productive in the wild and bringing fish into the hatchery environment reduces their productivity.
- ***Residualism***.

- Direct juvenile competition and predation.
- Competition and predation on other anadromous species rearing or migrating through the Klickitat River.

Hatchery and naturally spawning Klickitat spring Chinook are genetically indistinguishable (Busack 1990 as cited in WDFW 2004b). There are no known genotypic, phenotypic, or behavioral differences between either the hatchery stock or natural stock in the subbasin. Marking programs allow brood fish to be identifiable as to hatchery- or natural-origin. The production and volitional release of smolts promotes rapid seaward migration with minimal rearing delay in river, limiting interactions with naturally produced juveniles (Yakama Nation 2008c).

Coho Salmon

A review of the Klickitat Hatchery coho program by the HSRG (2009b) determined that the current program is likely resulting in negative ecological effects to native salmonids. Negative effects are primarily due to use of nonnative coho, the release of too many smolts into the subbasin, and direct stream releases that may result in competition with and predation on native juvenile salmonids occupying habitat at and downstream of release locations. Direct stream releases from the Washougal Hatchery are reported to result in high stray rates, poor survival, and low contribution to fisheries.

The existing management strategy for coho focuses primarily on hatchery production to achieve harvest goals. The existing strategy meets the harvest goal of 14,000 adult coho, but does so in a manner that imposes avoidable risks to other native fish species. Concerns with the existing hatchery program include:

- Hatchery coho may be competing with, and preying on, ESA-listed juvenile steelhead.
- Fish transfers between subbasins increase the risks of introducing, or amplifying, fish pathogens in the receiving subbasin (HSRG 2004). Historically, fish obtained from the Washougal Hatchery have had problems with cold water disease, which has resulted in large losses of fish after release.

  Transporting and releasing fish directly to a river system without acclimation has been shown to reduce their survival rate. The HSRG (2009) states that proper acclimation and imprinting of hatchery juveniles can reduce straying and enhance survival. According to a study conducted by the Technical Advisory Committee of the Inter-Tribal Fish Commission (1996), coho acclimated and released from the Klickitat River Hatchery had survival rates 3 times higher than for fish transported from the Washougal Hatchery and released directly into the lower river. Further, in one experiment with yearling coho salmon, Hopley et al. (1978) found that those fish exposed to ambient river water for 6 weeks prior to release survived at a significantly higher rate than those released at a comparable size and time without acclimation. As reported in Dunnigan et al. (2002), Cuenco et al. 1993 recommends the use of acclimation sites to provide fish time to adjust gradually to natural stream conditions, to reduce transportation-induced stress, and to promote homing of fish to the location where they are intended to return. Johnson et al. (1990) studied coho on the Oregon coast and found higher adult survival rates for fish acclimated for 6 weeks prior to release than for fish direct- planted without acclimation. Studies with other species (Isaksson et al. 1978 and Whitesel et al. 1994) suggested that fish acclimated prior to release survive at higher rates and have improved homing fidelity.

Fall Chinook Salmon

Though the fall Chinook program produces sufficient adult fall Chinook to meet the combined (ocean, mainstem, and tributary) harvest goal of 18,000, it also poses risks to other native fish species. Concerns with the existing program include:

- Egg transfers between subbasins increase the risks of introducing or amplifying fish pathogens in the receiving subbasin.
- Fall Chinook that escape fisheries are able to spawn naturally in stream reaches that may also be used by native spring Chinook. As fall Chinook spawn in similar habitat later in the season than spring Chinook, their spawning activities may displace or degrade the quality of spring Chinook redds. This may result in decreased spring Chinook egg-to-fry survival.
- Offspring of fall Chinook natural spawners may compete for food and space with native spring Chinook juveniles. This competition for resources may also result in decreased survival and productivity of native spring Chinook.

3.4.1.4 Harvest

Tribal harvest by the Yakama Nation occurs during set periods established by tribal regulations and targets all stocks of salmon and steelhead. Ceremonial fishing generally targets spring Chinook salmon. The general tribal harvest season occurs weekly (Tuesday through Saturday) from the second week of April through December 31. The season may be closed temporarily during June to allow spring Chinook escapement to the Klickitat Hatchery to meet broodstock needs.

The annual in-river harvest goal for Klickitat River steelhead is 1,400 fish in the recreational fishery and 1,000 fish in the tribal fishery. Estimated harvest rates since 1986 have averaged 1,398 fish in the recreational fishery and 1,146 in the tribal fishery (Yakama Nation 2008b). Both hatchery- and natural-origin fish may be retained in the tribal fishery. The recreational fishery is selective, allowing retention of only marked hatchery-origin steelhead and requiring release of all unmarked wild steelhead. Current regulations prohibit recreational fishing for steelhead in the Klickitat River from December through May, and the treaty fishery is closed from January through March to protect the winter run steelhead (Yakama Nation 2004b). Although tribal harvest regulations do not require the release of unmarked fish, many tribal fishers elect to return wild fish to the river (Kiona 2005).

Harvest objectives for Klickitat spring Chinook in the Klickitat terminal fishery total 3,000 fish, half for the tribal and half for the recreational fishery (Yakama Nation 2008b).The spring Chinook tribal fishery occurs from early April through the end of May with an in-basin harvest goal of 30 percent. In-river harvest occurs in the lower river recreational fishery and in the tribal dip net fishery at Lyle Falls. The combined recreational and tribal harvest of spring Chinook within the Klickitat River subbasin has averaged 894 fish annually from 1996 to 2005. The fisheries result in a combined total harvest rate of 43 percent (Yakama Nation 2008b).

Fall Chinook salmon released in the Klickitat River provide an important contribution toward the *U.S. v. Oregon* harvest allocation and regional fishery mitigation goals. The average annual harvest of fall Chinook from Klickitat River releases in combined ocean, Columbia River, and Klickitat River fisheries is estimated to exceed 19,000 fish. Recreational and tribal fall Chinook fisheries in the Klickitat River take about 3,600 fish each year (Yakama Nation 2008). Klickitat River terminal harvest rates of upriver bright fall Chinook averaged 35 to 40 percent from 1986 to 2005 (Yakama Nation 2008). This suggests that 60 to 65 percent of returning fish are not being harvested and a portion of those fish may be spawning naturally in the subbasin.

Coho salmon released from the Klickitat River also contribute substantially to the *U.S. v. Oregon* harvest allocation and regional fishery mitigation goals. According to data collected by the Yakama Nation, the total harvest rate on Klickitat River coho has averaged about 95 percent since 1987. The high harvest rate is due primarily to terminal fisheries within the subbasin that harvest nearly 84 percent of all returning adults.

3.4.2 Environmental Consequences

Thresholds of significance include potential take of listed fish or adverse effects to their associated critical habitat in quantities that could result in jeopardy to the species. These thresholds are unlikely to be exceeded as a result of the alternatives considered in this section. However, potential actions that would result in some level of take would include:

- Fish salvage operations during in-water work.
- Operation and use of proposed fish ladders at the Wahkiacus and Klickitat facilities and proposed fish bypass facilities at Klickitat (resulting in potential delays to migration).
- Loss of aquatic habitat due to new in-water elements.
- Loss of large woody debris (LWD) or shading along the riparian corridor.
- The creation of significant diversion reaches associated with facility intakes and subsequent withdrawals.
- Operation of the surface water intake structures on the mainstem Klickitat River at the Wahkiacus and Klickitat facilities, and on Swale Creek.

Additionally, potential implementation of the McCreedy Creek facility could result in effects to native fish due to competition for resources and potential predation during smolt outmigration in areas not currently included in the existing hatchery program.

For purposes of this EIS, the intensity of impacts to fisheries are categorized as follows:

> ***Minor:*** Impacts to native fish, their habitats, or the natural processes sustaining them would be detectable, but localized. Small changes to population numbers, population structure, and other demographic factors might occur, but these factors could return to pre-project conditions. Sufficient habitat would remain functional to maintain viability of all species.
>
> ***Moderate:*** Impacts to native fish, their habitats, or the natural processes sustaining them would be detectable but localized. Moderate changes to population, population structures, genetic variability, and other demographic factors would occur, but species would remain stable and viable. Sufficient habitat would remain functional to maintain viability of all native species.
>
> ***Major:*** Impacts to native fish, their habitat, or the natural processes sustaining them would be detectable and occur outside of the immediate project area. Population numbers, population structure, genetic variability, and other demographic factors would experience changes that could affect species viability. Loss of habitat might affect the viability of at least some native species.

Table 3-19 provides population data for managed fish species in the subbasin under each of the three alternatives.

Table 3-19: Fish Production Associated with the Project Alternatives

	Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
Description	Maintain US v OR production that currently exists with existing facilities at Klickitat Hatchery (RM 42) and out of basin releases.	Infrastructure improvements at Klickitat Hatchery, new hatchery construction at Wahkiacus (RM 17) for non-native fall Chinook and coho, freeing up space for spring Chinook. If needed, future acclimation site at McCreedy Creek (RM 70) for steelhead	Infrastructure improvements at Klickitat Hatchery and, if needed, future acclimation site at McCreedy Creek for steelhead
Species			
Spring Chinook	<u>Program Type</u>: Segregated <u>Release Numbers</u>: 600,000 in-basin smolts <u>Acclimation and Release:</u> volitional for a period of 1-2 weeks, followed by gradual pond draw down/forced release from Klickitat Hatchery due to water and space limitations. Acclimation in spring water. <u>Broodstock collection</u>: in-basin, hatchery-origin adults only	<u>Program Type</u>: transition to Integrated <u>Release Numbers</u>: 800,000 in-basin smolts <u>Acclimation and Release:</u> volitional release from Klickitat Hatchery. Switch to river water acclimation per HSRG recommendation. <u>Broodstock collection</u>: in-basin, hatchery- and natural-origin adult mix[1] **Some natural-origin adults released above Castile Falls (RM 64) to allow for natural spawning **Switch to river water acclimation	Same as Alternative 2

Table 3-19: Fish Production Associated with the Project Alternatives

	Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
		Adaptive Management Option: HSRG recommends that no more than 25% of the natural-origin adults be taken for broodstock. However, in order to expedite the broodstock transition process during the initial years, the proportion of the natural-origin adult return taken for broodstock may exceed 25% until the transition has been completed and adult outplants are no longer necessary in the upper basin.	
Summer Steelhead	Program Type: Segregated Release Numbers: 120,000 out-of-basin smolts Acclimation and Release: direct release into mid/lower Klickitat River with no acclimation Broodstock Collection: out-of-basin, hatchery-origin adults only	Program Type: Segregated Release Numbers: 130,000 in-basin smolts Acclimation and Release: volitional release from Klickitat Hatchery Broodstock Collection: in-basin, hatchery-origin adults only Adaptive Management Option A: add to above if returns above Castile do not meet goals by 2014 Program Type: Integrated (Conservation) Release Numbers: up to 70,000 in-basin smolts Acclimation and Release: volitional release from McCreedy Creek Broodstock Collection: in-basin natural-origin adults only Adaptive Management Option B: would replace segregated program if introgression increases above 4-5% Program Type: Integrated Release Numbers: 130,000 in-basin smolts Acclimation and Release: volitional release from Klickitat Hatchery Broodstock Collection: in-basin, hatchery- and natural-origin adult mix	Same as Alternative 2, **Actual production could be lower based on capacity at Klickitat Hatchery
Coho	Program type: Segregated Release Numbers: 3.7 million out-of-basin smolts Acclimation and Release: 1-1.2 million volitional release for a period of 1-2 weeks, followed by gradual pond draw	Program type: Segregated Release Numbers: 1 million in-basin smolts Acclimation and Release: volitional release from Wahkiacus Hatchery Broodstock Collection: in-basin, hatchery-origin adults only	Program type: Segregated Release Numbers: 1 million in-basin smolts Acclimation and Release: volitional release from Klickitat Hatchery; Broodstock Collection: in-basin, hatchery-origin adults only

Table 3-19: Fish Production Associated with the Project Alternatives

	Alternative 1 No Action Alternative	Alternative 2 Full Master Plan Build Out	Alternative 3 Klickitat Hatchery Build Out
	down/forced release from Klickitat Hatchery due to water and space limitations. 2.5-2.7 million direct release into the lower Klickitat River between RM 10 and 17. Broodstock Collection: out-of-basin hatchery-origin adults only	Adaptive Management Option: if harvest goal not met, re-initiate direct releases of up to 2.5 million out-of-basin smolts into lower Klickitat River as needed to meet the goal	Adaptive Management Option: if harvest goal not met, re-initiate direct releases of up to 2.5 million out-of-basin smolts into lower Klickitat River as needed to meet the goal
Fall Chinook	Program type: Segregated Release Numbers: 4 million out-of-basin smolts Acclimation and Release: volitional for a period of 1-2 weeks, followed by gradual pond draw down/forced release from Klickitat Hatchery due to water and space limitations. Broodstock Collection: out of basin, hatchery adults only	Program Type: Segregated Release Numbers: 4 million in-basin smolts Acclimation and Release: 2 million smolt volitional release from Wahkiacus Hatchery and 2 million smolt volitional release from Klickitat Hatchery Broodstock Collection: in basin, hatchery adults only	Program Type: Segregated Release Numbers: 4 million in-basin smolts Acclimation and Release: 4 million smolts released from Klickitat Hatchery. Broodstock Collection: in basin, hatchery adults only **Some incubation and rearing may need to occur at out-of-basin hatcheries, and/or production may need to be lowered due to capacity limitations.

[1] *Initially 200,000 natural-origin adult offspring and 600,000 hatchery- and natural-origin offspring mix, transitioning to all 800,000 mix as natural-origin adult returns increase*

3.4.2.1 Alternative 1 – No Action Alternative

Under Alternative 1, the existing Klickitat Hatchery Complex Program would continue to function under the current management guidelines with no change in infrastructure, no cessation of out–of-basin rearing and direct release, no reduction in coho production, and no shift of coho and fall Chinook release to downstream areas. There would be no construction effects to fishery resources. Operational effects from the existing program operations would continue at current levels.

Operations

The existing surface water intake on the left bank of the Klickitat River is out of compliance with current NMFS and WDFW screening criteria. Modifications are required to bring the intake screening structure into compliance and protect juvenile salmonids in the Klickitat River. Impacts to juvenile fish that can occur include potential impingement or entrainment of fish on the screen face, resulting in injury or death of juvenile fish.

The current hatchery withdrawal causes a minor, and likely immeasurable, decrease in the amount and quality of habitat for approximately 0.25 RM (the diversion reach between the hatchery intake and outfall). The loss in habitat may result from a decrease in wetted river area and river depth, and in a decrease in native fish abundance in the diversion reach; however, the loss has not been quantified and is anticipated to be minor given the relatively small amount of water withdrawn compared to average monthly flows (see Section 3.3 for analysis of withdrawal).

The existing fish ladder entrance has limited effectiveness in attracting fish and is a maintenance problem for the hatchery staff. Currently, a backwater area exists at the ladder entrance and sediment is deposited in this area, requiring hatchery personnel to maintain the entrance to keep the ladder open. This maintenance likely results in minor sediment suspension and turbidity at this location. Suspended sediment and turbidity can affect fish by reducing their ability to visually seek and capture prey; it can displace fish from habitat, irritate gills, and if in sufficient quantity, can smother redds and cause egg mortality.

Ongoing ecological interactions and effects to tribally or recreationally important fish, as well as to harvest opportunities, are presented by fish stock below.

Ecological Interactions

Under Alternative 1, ongoing ecological interactions between hatchery and wild fish stocks would continue at current levels as no change in hatchery production programs would occur. Ongoing out-of-basin rearing of steelhead would continue the potential for introduction of fish pathogens from outside the subbasin for this portion of the hatchery program. Similarly, pathogen exposure would continue due to ongoing direct-planting of coho smolts reared out-of-basin.

<u>Spring Chinook Program</u>

Under Alternative 1, concerns associated with existing hatchery programs would continue at current levels. Existing concerns include lowered life history diversity due to the production of high levels of mini-jacks and subsequent reduced productivity, and increased predation of juvenile salmonids by hatchery-produced mini-jacks that remain in the watershed.

<u>Steelhead Program</u>

Maintenance of the existing steelhead program under Alternative 1 does not meet current conservation goals identified for the subbasin, primarily due to the lack of acclimation prior to release (direct river release from an out-of-basin hatchery), and potential competition and predation risks posed to other native fish species. The continuation of the steelhead program without modifications may pose unacceptable risks to the wild population from potential interbreeding if hatchery fish are not effectively collected for broodstock and subsequently spawn in the wild.

<u>Coho Program</u>

Maintenance of the existing coho program under Alternative 1 does not meet current conservation goals identified for the subbasin primarily due to the potential competition and predation risks posed to native fish species. The direct release of 2.5 million smolts raised out-of-basin at the Washougal Hatchery would continue without the benefit of acclimation to Klickitat River water. This poses continued competition and predation risks to other native fish species. Ecological interactions between coho and native salmonids would not be reduced under this alternative since release numbers would remain the same, and smolts would not be acclimated to the local water source.

Fall Chinook Program

Maintenance of the existing fall Chinook program under Alternative 1 does not meet current conservation goals identified for the subbasin primarily due to the potential competition and predation risks posed to native fish species. The fall Chinook production, including incubation and rearing, would continue to be necessary out of basin. This would maintain the current level of potential for transfer of fish pathogens between basins. The need for out-of-basin rearing would require transport of fish to the Klickitat Hatchery for final rearing and release. Potential effects to transported fish due to hauling would include increased stress levels and reduced survival.

Fishery and Harvest Effects

Summer Steelhead

Current hatchery management of summer steelhead releases in the Klickitat River subbasin support the tribal and sport terminal fisheries. Under Alternative 1, the terminal fisheries would be expected to maintain harvest opportunities.

Spring Chinook

Current harvest strategies would persist for both treaty and non-treaty fisheries occurring in the Klickitat River. However, because of low hatchery productivity, the overall harvest goal of 3,000 adults in terminal sport and tribal fisheries is not likely to be achieved.

Coho

Continued implementation of the existing strategy is expected to meet the combined (ocean, mainstem, and tributary) harvest goal of 14,000 adult coho. However, direct releases from the Washougal Hatchery would continue. Such direct releases, without acclimation, are reported to result in reduced survival rates (Yakama Nation 2008c). Therefore, under this alternative, the hatchery program would continue to contribute less than optimal numbers of coho to the fishery and maintain straying risks to other watersheds. Tardy and Denny (2011) conducted a hatchery smolt survival study to investigate survival differences between direct-stream and acclimated releases of Chinook salmon in the Salmon River in Idaho. Results indicated that the acclimated release group (acclimation period limited to two days) showed significantly higher survival than the direct stream release, and authors suggested that elevated stress is the key contributor to juvenile fish mortality of direct-releases.

Fall Chinook

Under Alternative 1, the program is expected to continue to produce sufficient adult fall Chinook to meet the combined (ocean, mainstem, and tributary) harvest goal of 18,000 fish.

3.4.2.2 Alternative 2 – Full Master Plan Buildout

The potential effects associated with construction and operation of the facilities proposed under Alternative 2 are described first, followed by a discussion of anticipated potential ecological interactions resulting from implementation of the artificial production programs proposed under this alternative.

Wahkiacus Study Area

Construction

Under Alternative 2, a new hatchery and acclimation facility would be constructed at the Wahkiacus project site (refer to Figure 2-6). Construction of the Wahkiacus facility would include work in riparian habitats along the streambank, and within the Klickitat River and Swale Creek. The effects of construction activities on fish habitat and fish are described below.

<u>Upland and Riparian Actions</u>

Construction and grading activities would disturb upland areas at the site. The majority of construction would occur in areas that are previously disturbed or have limited vegetation. Construction of facilities would result in an increase in impervious surface area that could result in increased or rerouted runoff and sediment carried into the river, which can disturb fish causing them to relocate, or impair feeding ability. Most construction activity would occur away from the river or creek channels and would be managed by the use of erosion control devices, removal of the least amount of vegetation possible and revegetation of the site with native grasses, shrubs and trees following disturbance. Direct impacts to fish or their habitat are anticipated to be localized to the site and short term. Demolition of existing upland structures should not result in any effects to fish or other aquatic resources.

Construction and grading activities at the proposed intake locations (on the Klickitat River and Swale Creek) and at the fish ladder on the Klickitat River would result in the removal of some riparian vegetation. The riparian corridor at these locations contains grasses, willows, aspen, and white oak. These species provide limited shading benefits as the vegetation is sporadic and the functional riparian corridor is relatively narrow in width. Loss of riparian vegetation would result in a minor decrease in local nutrient recruitment to adjacent waterbodies; however, this loss is unlikely to be measurable on a watershed scale.

The clearing of trees that could contribute to future LWD along riparian corridors could affect fish species by reducing habitat complexity at and downstream of the site; however, the removal of future LWD is anticipated to be minor as recruitment trees for LWD are sparse at the Wahkiacus site. Any existing LWD that interferes with facility installation would be relocated either upstream or downstream of the construction area, but not removed from the river or creek corridor.

In-stream Actions

The Klickitat River channel would be affected by activities associated with construction of the following facility components:

- Adult fish ladder immediately downstream of the existing Horseshoe Bend Road county bridge; the ladder would serve as facility outfall.
- Surface water intake structure upstream of the Horseshoe Bend Road county bridge, and associated armoring.

Swale Creek would be affected by activities associated with installation of the following facility components:

- Surface water intake structure and associated armoring.
- In-channel rock chevron or barb to route river water towards the intake. The rock chevron/barb will be designed with a low-flow notch to facilitate fish passage upstream and downstream of the structure during periods of low flow.
- Five LWD jams downstream of proposed intake and removable weir (refer to Figure 2-6).

Displacement and Passage Delays

During in-water construction, fish that inhabit or migrate through the mainstem project area, including juvenile salmonids, may be disturbed or displaced. Reach-specific in-water work periods are recommended by WDFW, the USFWS, and NMFS to afford the greatest protection to the salmonid species that may occur in the work area. However, not all ages and classes of fish would be absent during that work period. The recommended in-stream work window for the Klickitat River in Klickitat County is June 15 – August 15. For Swale Creek the window is June 15 – September 30. Salmonids that are likely to be present within the in-water work periods for Swale Creek and the Klickitat River include adult summer steelhead (holding), adult spring/summer Chinook (holding and potentially early spawners); and rearing juvenile steelhead, Chinook and coho. Lamprey ammocoetes may be present in locations with suitable substrate (silt and sand). Juvenile bull trout are unlikely to be present in the Wahkiacus facility study area. Resident fish species would likely be present. Although these work periods represent likely in-water work timing scenarios, in-stream work timing will be refined during the Section 7 ESA consultation process for this project.

In-water work areas would be isolated from the free-flowing river or creek by use of cofferdams (described in Chapter 2). Spring Chinook or summer steelhead adults may be directly affected as available in-stream habitat would be temporarily reduced due to the presence of in-water cofferdam structures in the channel; however, the occurrence of early spawners would likely be low and direct adverse effects would be minor. Adults may be displaced from the construction area due to ongoing work within and adjacent to the channel; however, following installation of cofferdams, all in-stream work would occur “in the dry.” The area of habitat behind the cofferdams would be temporarily unavailable during in-stream work; however, this habitat represents a small fraction of available habitat in the study area for each waterbody. Because the cofferdams would not span the full width of the channel (in Swale Creek or the Klickitat River), upstream and downstream fish passage around the work area would be available at all times. The presence of the cofferdams and associated construction may cause minor delays in migration, and migration and rearing corridors would be temporarily reduced during in-water construction work. Construction would not occur after dark; therefore, migrating fish would likely resume movement following daily construction activity. As such, the presence of cofferdams would not preclude migration, though individual fish may experience minor, adverse migratory delays.

The occurrence of fish, particularly salmonids, in Swale Creek during in-stream work is expected to be low due to the extreme low flows in the creek during the summer; therefore, direct adverse effects would likely be minor in intensity. The proposed rock chevron/barb used to route water to the intake would likely be installed in the dry. Fish salvage, if necessary, to isolate the in-water work area would result in the temporary displacement and relocation of fish present in Swale Creek. However, habitat (flow) is very limited in Swale Creek during the summer in-stream work period. This, combined with probable in-stream temperatures that are lethal for cold water fish, including salmonids, limits use of this system during the summer work period. As such, the potential for adverse effects to fish, particularly juvenile salmonids, in Swale Creek due to instream construction associated with this alternative element would be minor.

Physical Habitat Alteration

The physical disturbance of in-stream habitat has the potential to affect fish spawning, feeding, and rearing. Loss of habitat and habitat features such as holding pools, spawning habitat, migratory pathways, and rearing areas, would impact fish populations occupying the study area. Loss of habitat can cause fish to over-occupy remaining available habitat or disperse to lower quality habitat. These impacts can reduce survival or reproductive success. These adverse impacts could be both direct and indirect, and would be permanent for the installation of infrastructure. These impacts are anticipated to be of minor intensity.

The riverbed would be disturbed due to the installation of intake structures (Klickitat River and Swale Creek) and the fish ladder entrance on the Klickitat River. In addition, the substrate of Swale Creek would be disturbed due to excavation required for installation of large rocks associated with the rock chevron/barb intake pooling structure. Potential spawning substrate would be permanently lost in this section of the creek, in the footprint of the proposed rock chevron/barb. This would result in a minor, low intensity direct effect to species that are documented to spawn in Swale Creek, including coho and steelhead.

Bank protection in the form of large cobbles and/or riprap would be placed in-stream to stabilize the river channel around the intakes and Klickitat River ladder entrance, and to minimize scour and resultant sedimentation. The loss of riverbed in the footprint of these structures is limited in extent, but would be permanent (long term), and result in minor direct adverse effects to fish habitat.

Sedimentation and turbidity would occur during the placement and removal of cofferdams. Placement of cofferdams to isolate the in-water work areas may require the relocation of river boulders or bank substrate to allow the cofferdam material to be properly placed for adequate water exclusion. These habitat features would be replaced in the creek as close to the original location as possible following construction. Increases in suspended sediment levels can reduce light penetration, inhibit primary production, abrade and clog fish gills, prevent feeding by sight feeders, stop or delay migration, or cause any fish in the area to avoid the disturbed reaches within a few hundred feet of construction activities.

Salmonids have evolved in systems that periodically experience short-term (days to weeks) pulses of high suspended sediment loads and are adapted to such seasonal, high-pulsed exposures. In this way, these effects would resemble a natural storm event more than chronic turbidity associated with land use changes. Effects to salmonids that may be present during the construction phase of the project would be temporary in nature. Of all the anadromous salmonids present in the study area(s), only spring Chinook have the potential to spawn during the latter portions of the recommended in-stream work windows.

Disturbed substrate behind isolation structures may be re-suspended within the water column when the cofferdam is removed. Removal of cofferdams could result in spawning delays for spring Chinook or sedimentation and potential loss of eggs on existing redds. If sufficient amounts of sediment are deposited on a redd, the eggs or newly hatched fry could suffocate. However, by removing cofferdams incrementally, the temporary pulse of sediment released during the removal of cofferdams and rewatering of the in-water project sites is unlikely to generate sediment sufficient to affect any redds that may be present downstream. Considering that any sedimentation generated during in-stream work would be a temporary rather than a chronic condition, and that most fish can avoid sediment plumes that will likely be distributed over relatively short distances, the potential for adverse effects to fish species due to construction-related sediment and turbidity is anticipated to be minimal.

The proposed installation of five LWD jams along the right bank of Swale Creek would add LWD to the system where LWD is now limited. These jams are intended to facilitate bank stabilization, reduce stream velocity, and provide for fish habitat. Benefits to in-stream habitat include creation of scour pools for fish use and increased spawning habitat.

In-stream temperature can be altered by the removal of overhanging, shading canopy and by the use and return of water to the river that has been heated during its use. Limited amounts of riparian vegetation would be removed at the Wahkiacus site; therefore, measureable changes to in-stream temperatures are not anticipated to result from vegetation removal. Indirect adverse effects to aquatic species due to in-stream temperature changes are unlikely to occur. Vegetation removal is not anticipated to result in any new exceedance of the State of Washington temperature standards for salmonids (WDOE 2003).

Pool frequency and quality would only be slightly altered from the existing condition at the Klickitat River intake location. The surface water intake would be placed in an existing shallow pool. The intake structure would encroach on the pool with the placement of the structure and protective armoring. As mentioned above, the placement of LWD in Swale Creek would increase pool frequency, which would result in a beneficial indirect effect (beneficial modification to ecosystem over time) for fish utilizing Swale Creek in the study area.

Prey Species

Benthic macroinvertebrates are an important component in the diet of juvenile salmonids. Many of the benthic invertebrates within the work area isolated by cofferdams would suffer mortality during streambed and bank excavation. In addition, increased turbidity and sedimentation downstream of the in-water work areas are likely to negatively affect benthic invertebrates through alteration of water quality and substrate conditions. Benthic macroinvertebrate communities within the areas isolated by cofferdams and areas immediately downstream are expected to recolonize rapidly following construction. Full recovery of benthic invertebrate communities usually requires 6 months to a year after in-water work associated with excavation (Tsui and McCart 1981, Young and Mackie 1991, Vinikour and Schubert 1987, Anderson et al. 1998). Because of the small area of river that would be affected by instream construction and isolation (i.e., relative to the shoreline of the Klickitat River), and the ability of juvenile salmonids to seek and use other food resources (e.g., terrestrial insects) during the summer months, minor, if any, measurable effects on the growth or survival of juvenile salmonids are anticipated at the in-water work sites.

Release of Construction Fluids

There is some risk to rearing and migrating fish associated with potential accidental releases of fuel or oil into the Klickitat River or Swale Creek from equipment and machinery used during in-water activities. Site-specific pollution control measures would be developed for construction of the Wahkiacus Hatchery and Acclimation Facilities as part of the NPDES construction general permit. In the event of a spill, fish could be adversely affected by released chemicals or contaminants; effects could range from death to behavioral changes resulting in abandonment of the area of the spill.

Fish Salvage

The presence of construction workers near the stream channel would likely cause most fish to voluntarily move to sites upstream or downstream of the work area. However, as required, qualified fish biologists would remove all remaining fish from the immediate area of the cofferdam. This removal would avoid the lethal take of fish that could be trapped under material as cofferdams are placed. Cofferdams would be installed incrementally to allow the site to dewater gradually. Any remaining fish would be flushed from the area behind the cofferdams, typically by seining and if absolutely necessary by use of a conventional backpack electro-fisher (or other methods as determined by USFWS, NMFS, and/or WDFW). If capture is necessary, fish would be placed into a 5-gallon bucket using small dip-nets. Captured fish would be released back into the stream channel a safe distance upstream of the work area.

Approximately 85 percent of steelhead smolts normally outmigrate past Lyle Falls by June 1 each year (Yakama Nation 2004a). Therefore, some portion of the remaining 15 percent of outmigrants, as well as rearing juveniles, could be affected by fish salvage handling, or by delayed downstream passage due to in-water disturbances. Similar effects are anticipated on other juvenile anadromous salmonid stocks. Typical juvenile outmigration of yearling coho and Chinook, as well as subyearling Chinook peaks in May and June. However, juveniles, particularly Chinook, still actively outmigrate during the in-water work windows and many younger juveniles rear year-round. Release periods for hatchery spring Chinook (March – May), fall Chinook (May – June), and coho (April – June) do not coincide with in-water work at Wahkiacus; similarly, adult lamprey spawn in the spring, outside of the in-water work periods, and ammocoetes emerge a few weeks following spawning. Little, if any, direct mortality is anticipated from handling of juvenile or adult fish during salvage operations.

Operational

<u>Surface Water Intake</u>
The Klickitat River intake would be designed for a maximum water demand of 30 cfs. The proposed intake has been sited at an existing constriction in the river created by a bridge abutment. This constriction provides a maintained scour hole from which to draw surface water for hatchery operations. Long-term direct effects to aquatic habitat due to the presence of this structure would be minor, though a small amount of bed and bank habitat would be lost.

The Swale Creek intake would be used in emergencies; e.g., during times of poor water quality in the Klickitat River due to sediment or temperature, and during maintenance downtime of the Klickitat River intake. The Swale Creek intake has been designed to operate within NMFS criteria for diversion of up to 20 cfs; however, the average diversion from Swale Creek would be approximately 12 cfs. During Swale Creek withdrawals, hatchery operations would be scaled back to reduce water demand.

The Swale Creek intake design incorporates a rock chevron or barb that will route water to the intake and create a deep pool from which to draw water. Intake abutments would be placed at top of bank to maintain the existing channel and flow conveyance area. Due to the low flow condition on this creek, the presence of the rock chevron/barb and intake could result in moderate long-term effects to aquatic resources in Swale Creek, including loss of habitat and potential hydrologic modifications in the vicinity of in-stream structures. However, although sediment could fill behind the rock chevron and slow bedload movement, upstream and downstream passage around the structure would be available through the proposed low flow notch that would be incorporated into the rock weir structure. The rock chevron/barb would be designed to mimic a natural channel-spanning rock weir.

The new intake structures would be screened to meet NMFS juvenile salmonid screening criteria. A compressed air cleaning system is proposed for the intake screens. This type of screen cleaning system uses compressed air to clean debris from the screen to prevent entrainment or impingement of juvenile salmonids. These systems operate automatically and can disperse fish from the area when activated. Frequency of operation is dependent on the sediment and debris load in the river. In the immediate vicinity of the intake, fish may exhibit minor behavioral changes, including startling, resulting in displacement from the area.

Effects of Changes to Water Quantity and Quality

The water requirements for the facility are anticipated to be a maximum of 25 cfs during the month of March and a low of 9.4 cfs in August (Harbor 2010b). The majority of this water would be provided from the Klickitat River, though, at times, a portion would be withdrawn from Swale Creek. Anticipated average intake from Swale Creek would be 12 cfs, and only when in-stream flows are sufficient to maintain passage of fish downstream of the diversion.

The maximum withdrawal of 25 cfs from the Klickitat River would equate to 0.8 to 2.8 percent of average monthly flows in this section of the river (see Section 3.3.2). Surface water would be returned to the river at the outfall (fish ladder) approximately 100 feet downstream of the intake diversion location. Considering average monthly flows, facility water use would not likely result in a measurable change in surface water elevation within the diversion reach. Potential long-term adverse effects to aquatic habitat and fisheries resources resulting from surface water withdrawals on the Klickitat River are anticipated to be minor.

The diversion of up to 12 cfs November to May could result in a direct loss of in-stream habitat in Swale Creek from the intake to the confluence with the Klickitat River, approximately 1,400 feet. If baseline flows are low during this period, this loss of habitat could affect critical habitat for steelhead, and could potentially reduce available spawning and rearing habitat for steelhead and coho, and rearing habitat for spring and fall Chinook. However, the Swale Creek intake would only be used when adequate instream flows are available to support hatchery withdrawals while maintaining suitable instream flows for passage and rearing of anadromous salmonids. The use of an adaptive management strategy for withdrawals on Swale Creek should minimize the loss of instream habitat associated with operation of the intake. Flow quantities required for maintenance of instream flow and habitat would be determined during future permitting process, and evaluated in the ESA consultation document to be prepared for this project relative to listed steelhead and critical habitat.

Effluent from the proposed facility (see Section 3.3 for analysis of effluent) has the potential to alter water temperature, pH, suspended solids, ammonia, organic nitrogen, total phosphorus, and chemical oxygen demand in the Klickitat River mixing zone (within about 300 feet of the outfall). If not properly treated, excessive amounts of discharged substances can combine with other conditions to cause adverse impacts to the aquatic environment. Water quality changes due to discharges from the facility may disrupt the behavior and distribution of individual fish immediately adjacent to and downstream of the outfall structure. According to NMFS (1999), although "the level of impact [of hatchery effluent] or the exact effect on fish survival is unknown, it is assumed to be very small and is probably localized at outfall areas as effluent is rapidly diluted in the receiving streams and rivers." Pollution abatement ponds would allow for the settling of solids and cleaning waste from the rearing units to reduce potential impacts.

The withdrawal of water from Swale Creek, would have a minor direct adverse effect on aquatic resources because the Swale Creek intake would only be used when adequate flows are available to support use and maintain adequate instream flows for passage and rearing of anadromous salmonids.

Overall, the water use for fish rearing is not anticipated to result in a measureable change within the Klickitat River. By complying with acceptable values, the impact of effluent on receiving waters, the aquatic environment, and fish is expected to be minor. Water quality changes due to discharges from the facilities may disrupt the behavior and distribution of individual fish immediately adjacent to and downstream of the outfall structure, but the overall impact is expected to be minor.

<u>Fish Ladder and Outfall</u>

The fish ladder would discharge water from the Wahkiacus facility so that returning adults "home" back to the facility. If insufficient flow (in relationship to the river flow) is discharged from the ladder, homing attraction is compromised. Operational guidelines would be in place to ensure that attraction is optimized. Nontarget species or stocks can also ascend the ladder and enter the adult holding facilities. Collected broodfish would be sorted from the trap chamber into adult holding ponds every 24 hours and any species or stocks collected at the facility that are not used for broodstock would be returned to the river. Nontarget adults collected at the facility would be returned to the river upstream of the fish ladder entrance, resulting in minor migratory delays. Ladder operations would be monitored daily during the adult collection season to ensure that it functions safely to avoid adverse effects to nontarget species.

Klickitat Hatchery Study Area

Construction

Modifications to existing facilities and construction of new structures at the Klickitat Hatchery site (refer to Figure 2-5) would entail disturbance in riparian habitats as well as construction on the streambank and within the river channel.

<u>Upland and Riparian Actions</u>

Construction and grading activities would disturb over 20 acres (riparian and upland inclusive), which may lead to increased or rerouted runoff and sediment carried to the river. Riparian vegetation would be disturbed due to construction at the following locations: fish ladder, surface water intake, juvenile bypass pipeline and outfall, and raceways on the west side of the river. The vegetation in these areas is primarily composed of willows; mature overstory vegetation is largely absent. As such, measurable decreases in overwater shading are not anticipated due to vegetation removal. Following construction, willows should recolonize disturbed areas, which would supplement revegetation efforts along disturbed riparian corridors. Minor increases in sedimentation and turbidity, particularly during rain or snowmelt, could result from new access roads located immediately adjacent to the river corridor. These roads are typically dirt and gravel based, and solely used by hatchery vehicles. Demolition of existing upland structures should not result in any effects to fish or other aquatic resources.

The impact to potential recruitment trees for LWD would be minor as large trees are sparse to absent at the disturbance locations.

<u>In-stream Actions</u>

The Klickitat River channel would be affected by construction of the following facility components:

- New (replacement) river water intake structure on the left bank of the river and associated armoring.
- Juvenile fish bypass outfall downstream of the intake.
- Fish ladder entrance and associated bank riprap.
- Weir modifications, including removal of the weir plate on the existing concrete weir that spans the river, and installation of passage ports on the weir structure.
- Juvenile release pipe from the steelhead rearing units.

Displacement and Passage Delays

Temporary displacement and passage delays could occur during in-water construction. Isolation of in-water work areas through use of cofferdams would have the same displacement and passage delays for fish in the Klickitat Hatchery study area as described for the in-water work at the Wahkiacus site. The recommended in-stream work window for the Klickitat River in Klickitat County is June 15 – August 15, which would apply to proposed in-water construction at Klickitat Hatchery. However, in-water work timing will be refined during the ESA consultation process for this project. Fish that may be present during the standard in-water work window include: adult spring Chinook and steelhead, juvenile spring Chinook and coho salmon and steelhead trout; adult and subadult bull trout; numerous resident species, and lamprey ammocoetes.

Physical Habitat Alteration

The physical disturbance of in-stream habitat has the potential to affect fish spawning, feeding, and rearing. Loss of habitat and habitat features such as holding pools, spawning habitat, migratory corridors, and rearing areas would impact fish populations occupying the study area. Loss of habitat can cause fish to over-occupy remaining available habitat or disperse to lower quality habitat. These impacts can reduce survival or reproductive success. These adverse impacts could be both direct and indirect, and would be permanent relative to new in-stream infrastructure. These impacts are anticipated to be of minor intensity.

In-stream excavation associated with installation of the new in-water structures and modifications to the existing concrete weir would result in moderate adverse effects to lamprey ammocoetes if present in the substrate. However, the amount of streambed to be excavated is minor compared to the available substrate habitat in the Klickitat River subbasin. Salmonid species would be protected from direct impacts due to the presence of cofferdams. Some permanent loss of available substrate at the intake location and the ladder outfall would occur, resulting in minor, though long-term, adverse effects to aquatic resources due to a loss of habitat. Placement and removal of cofferdams would have temporary effects on substrate and cause sedimentation and turbidity in the immediate vicinity of the work area. These effects may extend downstream up to 300 feet, depending on flow and levels of turbidity attributed to the specific substrate being affected. Effects would be similar to those described previously for construction at the proposed Wahkiacus facility.

Limited amounts of riparian vegetation would be removed at the Klickitat Hatchery site; therefore, measureable changes to in-stream temperatures are not anticipated to result from vegetation removal. Indirect adverse effects to aquatic species from in-stream temperature changes are unlikely to occur. Vegetation removal is not anticipated to result in any new exceedance of the State of Washington temperature standards relative to beneficial uses for aquatic species (WDOE 2003).

Pool frequency and quality would only be slightly altered from the existing condition, and this would occur at the intake location. The surface water intake would be expanded in size and the existing pool may be encroached on with the placement of the structure and protective armoring. Reduction in pool frequency and quality would negatively affect fish by reducing available holding and rearing habitat for adult and juvenile salmonids. Pools are particularly important during low flow periods, when they may provide refuge habitat. The riverbank in this location is currently armored with riprap; therefore, it is anticipated that portions of the existing riprap would be replaced with the intake structure and only minor direct effects to aquatic habitat would occur from the disturbance and loss of habitat due to expansion of the intake footprint.

Riprap would be placed at the surface water intake, juvenile bypass outfall and ladder entrance locations. These locations are currently armored with riprap and new construction should result in only a minor increase in the amount of riprap. As such, new riprap placement would not be anticipated to affect flow or habitat beyond existing conditions.

Prey Species

As noted in the description of impacts to prey species for the Wahkiacus facility, many of the benthic invertebrates within the work area isolated by cofferdams would suffer mortality during streambed and bank excavation. Increased turbidity and sedimentation downstream of the in-water work areas also are likely to negatively affect benthic invertebrates through alteration of water quality and substrate conditions. The effect would be temporary; rapid and full recovery of benthic invertebrate communities is expected. Little if any measurable indirect effects on the growth or survival of juvenile salmonids are anticipated at the in-water work sites.

Release of Construction Fluids

The potential accidental releases of fuel or oil into the Klickitat River from equipment and machinery used during in-water activities could affect rearing and migrating fish. In the event of a spill, fish could be adversely affected by released chemicals or contaminants. Effects would depend on the type and amount of fluid released, but could range from death to behavioral changes resulting in abandonment of the area of the spill.

Fish Salvage

Fish salvage procedures would be the same as described for the Wahkiacus site. Little, if any, direct mortality is anticipated from handling of juvenile or adult fish during salvage operations. However, some harassment and handling of fish species would occur, which could result in stress and lowered fitness until fish recover.

Operational

Surface Water Intake

The surface water intake would be designed with a juvenile fish bypass. The fish bypass would transport any fish approaching the intake screen through a conveyance pipe and return them to the river downstream of the intake. The fish bypass outfall would be placed at a location that would minimize predation and provide good egress conditions for downstream migrants with sufficient depth to ensure that fish injuries are avoided at all river and bypass flows (NMFS 2008a). Flows would be such that juveniles could not re-enter the bypass pipe. The bypass is anticipated to result in minor indirect adverse effects to fish species over the long term. Design review by NMFS would be required for final plan approval.

Weir modifications, including removal of a weir plate on the existing channel-spanning weir at the Klickitat Hatchery and creation of passage ports, would benefit fish during base flow periods. These modifications would provide passage upstream and downstream of the structure allowing access to habitats that are currently inaccessible during low flow periods.

As with the Wahkiacus facility, a compressed air cleaning system is proposed for the intake screen. The system could disperse fish from the area when activated. Frequency of operation is dependent on the sediment and debris load in the river. In the immediate vicinity of the intake, fish may exhibit minor behavioral changes, including startling, resulting in displacement from the area.

The new surface water intake at the Klickitat Hatchery would be equipped with an oversized trash rack that would be placed parallel to the river to maximize sweeping velocity and minimize transverse water velocities at the intake entrance (Harbor 2010a). This structure would minimize juvenile fish entrainment and reduce larger-sized sediment in the intake (Harbor 2010a). The new intake would meet current NMFS screening criteria and would reduce the risk of impingement or entrainment of juvenile fish. The upgraded cleaning system would ensure the intake operates to criteria.

Effects of Changes to Water Quantity and Quality

There would be no change to water quantity or quality in the Klickitat Hatchery study area (see Section 3.3 for analysis of effects on water quantity and quality). Water withdrawals from the Klickitat River would not change as a result of the replaced intake structure and fish bypass. No new impacts from water withdrawals are anticipated.

Upgraded facilities at the hatchery would be designed to meet EPA-approved water quality standards. The NPDES permitting system, administered by WDOE, would ensure water quality compliance associated with any production changes at the facility. If monitoring showed these standards were not being achieved, then actions would be implemented to ensure compliance. A two-part settling basin coupled with aeration is anticipated to reduce dissolved and settleable solid discharge (Harbor 2010a). Waste from the left bank raceways would be conveyed to new treatment facilities through existing piping that crosses the river in the existing concrete weir.

Fish Ladder

The new ladder would be situated along the bank of the river at an angle that would maximize the effectiveness of collection of hatchery-origin adults, while minimizing any adverse effects to fish species in the Klickitat River. Improved collection of hatchery-origin adults would lessen the risk of hatchery adults straying and impacting wild populations. Nontarget species or stocks would also be able to ascend the ladder and enter the adult holding facilities. Collected broodfish would be sorted from the trap chamber into adult holding ponds every 24 hours and any nontarget species or stocks would be returned to the river. A return chute would safely transport nontarget fish back to the river. Ladder operations would be monitored daily during the adult collection season to ensure it functions safely and properly. As such, only minor direct adverse effects, in the form of migratory delays, are anticipated to occur due to operation of the new ladder.

McCreedy Creek Study Area

An acclimation facility at McCreedy Creek would be developed if natural recolonization of habitat for summer steelhead above Castile Falls is unsuccessful. Steelhead use of this upper river habitat would be monitored until 2014. If returning adult steelhead numbers do not reach 150 (Yakama Nation 2008d), new acclimation facilities would be constructed at McCreedy Creek (RM 70).

Construction

As described in Chapter 2, construction of an acclimation facility at McCreedy Creek would necessitate work in upland habitats as well as construction along the streambank and within the channel.

Upland and Riparian Actions

It is anticipated that clearing of minimal portions of the site to accommodate acclimation facilities would require the removal of several large trees from the riparian corridor of McCreedy Creek. Because the proposed McCreedy Creek acclimation site currently supports upland conifer forest, clearing in the riparian area has the potential to affect water quality and natural cover for fish species. Removing mature riparian vegetation has several associated effects: increased sediment input to the streams; reduced filtering of nutrients washing in from cleared uplands; increased water temperature at and downstream of the cleared riparian area; and reduced detritus and LWD recruitment potential. Potential effects to in-stream habitat would be relatively minor on a watershed scale. Direct adverse effects due to habitat loss would continue over the long term until planted vegetation reaches the level of maturity of existing vegetation to be removed onsite.

<u>In-stream Actions</u>

The McCreedy Creek channel would be affected by activities associated with construction of the following facility components:

- Removal of the existing culvert on the gravel road.
- Construction of bridge abutments.
- Seasonal installation of gradient control structures (stop log weir), and, possible concrete anchor support structures.
- Construction of either permanent or temporary surface water intake and outfall structures that would be used during the acclimation period (April to June).
- Seasonal installation of the portable intake and outfall structures.
- Seasonal installation of Denil fishway.
- Small culvert for road drainage for new gravel access road.

In-water work associated with removal of the existing culvert, installation of a new bridge, and construction of proposed intake and potential concrete anchor points for seasonal stop log weir installation would require dewatering of the construction area through the use of cofferdams and/or a bypass flume.

Displacement and Passage Delays

Under the tribal water code, the in-water work window is not specified and is established on a case by case basis. For this project it would likely mirror the federal and state timing of July 1 to August 15 for the Klickitat River, and June 1 to September 30 for Klickitat River tributaries, including McCreedy Creek. Although this work period represents likely in-water work timing, in-stream work timing will be refined during the Section 7 ESA consultation process. To construct the bridge and intake structure, a cofferdam or creek bypass flume would be utilized to create a dry work area. A bypass flume would dewater the work site by passing creek water around the construction area using a temporary pipeline that captures water upstream of the in-stream work location. Potential effects associated with the installation and removal of a cofferdam or bypass flume include short-term loss of in-stream habitat, displacement and passage delays, short-term increased sedimentation and turbidity, and fish salvage. These construction impacts would have the same effects on fish as described for the Wahkiacus facility and are anticipated to be minor.

Physical Habitat Alterations

Some streambed habitat that is currently available for juvenile rearing would be permanently replaced with facility infrastructure, including several gradient control structures. Bank armoring (likely large boulders or riprap) would be placed at the intake to protect this structure during high water events.

The downstream end of the gravel road culvert has created a scour pool, which currently leaves the culvert perched above the creek bed. Fish passage may be impaired at this downstream area during low flow conditions. Replacing the culvert with a bridge would allow sediment to be transported through this reach, and placement of in-channel gradient control structures is anticipated to control the channel elevation profile and return it to pre-erosion levels.

The removal of the road culvert and replacement with a channel spanning bridge would result in disturbance to the creek channel and riparian area. Sediment and turbidity within the creek would occur during dewatering and rewatering of the construction area. Overall, the creek substrate condition is anticipated to improve with development of the McCreedy Creek site, even though some loss of substrate habitat would occur. The minor loss of an artificially-created pool is anticipated to be offset by beneficial effects resulting from improved habitat conditions due to removal of the culvert.

Fish that utilize McCreedy Creek would benefit from replacement of the culvert with a bridge as access to habitat upstream of the culvert would be fully restored. The proposed intake structure and bridge would preclude channel migration at this location; however, the creek is currently incised, resulting in limited lateral movement at this location. The bridge would restore stream process through improved water and sediment transport, removal of backwater effects of the undersized culvert, and increasing channel width within this reach; all of which would directly benefit fish utilizing McCreedy Creek through improved fish passage and creek substrate transport.

Installation of a bridge would also reduce in-stream artificial shading that is occurring within the culvert. Distinct light to dark changes can affect fish passage and potentially increase predation of juvenile fish by allowing predators to “hide” in darker waters. The wider spanning bridge structure would reduce the distinct light change occurring with the culvert. This would result in minor beneficial effects associated with improved passage and access to upstream habitats.

Prey Species

As noted in the description of impacts to prey species for the Wahkiacus facility, many of the benthic invertebrates within the work area isolated by the cofferdam or bypass flume would suffer mortality during streambed and bank excavation. Increased turbidity and sedimentation downstream of the in-water work areas also are likely to negatively affect benthic invertebrates through alteration of water quality and substrate conditions. The effect would be temporary; rapid and full recovery of benthic invertebrate communities is expected. Little if any measurable effects on the growth or survival of juvenile salmonids are anticipated at the in-water work site.

Release of Construction Fluids

The potential accidental releases of fuel or oil into McCreedy Creek from equipment and machinery used during in-water activities could affect rearing and migrating fish. In the event of a spill, fish could be adversely affected by released chemicals or contaminants; effects could range from death to behavioral changes, resulting in abandonment of the area of the spill.

Fish Salvage

Fish salvage procedures would be the same as described for the Wahkiacus site. Little, if any, direct mortality is anticipated from handling of juvenile or adult fish during salvage operations. However, some harassment and handling of fish species would occur, which could result in stress and lowered fitness until fish recover.

Operational

Surface Water Intake

A seasonally-installed stop log weir would span the creek to create a water intake pool sufficient to screen 7 cfs for the screened intake along the right bank. Screen cleaning would be completed manually at this location due to the lack of power on-site. On-station fish culturists would perform periodic screen cleaning at intervals consistent with local weather and streamflow conditions. During active acclimation periods, fish passage at the intake would be maintained with the installation of a Denil fishway; as such, direct effects to fish in the project area are anticipated to be minor. During periods when the facility is not under operation, fish passage in the lower portion of McCreedy Creek would be available, and passage through the permanent infrastructure (intake apron and gradient control structures) would be maintained.

Effects of Changes to Water Quantity and Quality

A water supply of 7 cfs would be required for the acclimation program at McCreedy Creek. According to the Yakama Nation Master Plan (2008b), studies indicate that McCreedy Creek is capable of delivering this volume of water (see analysis of water use at McCreedy site in Section 3.3). Acclimation water would be discharged as close to the point of withdrawal as possible (no further than 150 feet downstream). In the immediate vicinity of the facility outfall, fish may experience elevated levels of phosphorous and nutrients, and potentially decreased levels of dissolved oxygen. These potential modifications to water quality parameters could result in behavioral changes and avoidance of affected waters; however, effects should dissipate quickly as acclimation water mixes with McCreedy Creek flow and, further downstream, with the flow of the Klickitat River. The short period of acclimation (April – June) combined with the low quantity of fish on-station should limit, in duration and intensity, any minor direct adverse changes to water quality. As such, the facility is anticipated to result in minor, low intensity direct effects to fish in McCreedy Creek or downstream in the Klickitat River.

Any potential increase in discharge temperature due to solar gain of surface waters flowing through the mobile raceways is anticipated to be minor given the rapid turnover of water in the mobile rearing system. Therefore, adverse effects to the aquatic ecosystem or fish present in the creek due to discharging acclimation water back to McCreedy Creek are not anticipated.

Fish Ladder and Outfall

An annually-installed aluminum Denil fish ladder would be used to provide passage at the seasonal intake structure, and would provide for fish passage over the anticipated range of flows during facility operation. The presence and use of this ladder would result in minor direct effects to fish species in the project area due to passage delays.

The proposed outfall structure would return water to McCreedy Creek and function as a fish release site from the acclimation ponds. The outfall would likely consist of a pool constructed of cobble to minimize scour erosion and the generation of suspended sediments.

Ecological Interactions and Impacts Resulting from Alternative 2 Fish Production Program

The main objective of implementing Alternative 2 is to minimize potentially negative interactions between native (spring Chinook, steelhead, and bull trout) and nonnative (coho and fall Chinook) salmonids. Hatchery programs can affect the ecological balance of the river system in which they are operated. Evaluation of lessons learned and research conducted on hatchery operations is providing guidance on ways to minimize these impacts. The Alternative 2 – Full Master Plan Buildout works toward applying this guidance for reducing the impact of the existing Klickitat Hatchery Complex Program and minimizing negative ecological interactions.

A detailed description of the proposed fish production program changes for the Klickitat Hatchery Complex Program was presented in Chapter 2. In summary, proposed changes include:

- Conversion to an integrated hatchery program for spring Chinook.
- Development of a locally-adapted segregated summer steelhead program (potentially integrated in the future) to release 130,000 juveniles from the Klickitat Hatchery.
- Segregated programs using locally derived broodstock for fall Chinook and coho.
- Reduction of coho smolt releases from current levels (3.5 to 3.7 million) to 1 million if harvest goal can be met; otherwise direct releases in the lower river would be continued to meet the goal.
- Acclimation and release of coho (initially at Klickitat Hatchery) and half of the 4 million fall Chinook production at the proposed Wahkiacus facility.
- Employ volitional release.
- Implementation of an integrated conservation program for steelhead at McCreedy Creek, if needed.

General Hatchery Production Actions

Acclimation

Under this alternative, smolts would be acclimated as opposed to direct-released. This would reduce, though not eliminate, the potential for hatchery-origin fish to spawn with native fish in the wild, result in beneficial effects to fisheries resources in the study areas. During acclimation, imprinting fish to a local water source (Klickitat Hatchery river and spring water, or ground water at Wahkiacus) could minimize straying of returning adults as fish seek out their natal rearing waters and would readily ascend the Klickitat Hatchery and Wahkiacus ladders for removal from the system. The potential for groundwater use at the Wahkiacus facility to enhance the uniqueness of the water source would be determined following further investigation of well water quality.

The use of acclimation facilities reduces the impact (stress) of transportation on fish and provides a means by which fish may imprint on the characteristics of the water and environment into which they are released. The HSRG (2009b) states that proper acclimation and imprinting of hatchery juveniles can reduce straying and enhance survival. Transporting and releasing fish directly to a river system without acclimation has been shown to reduce survival rates. According to a study conducted by Technical Advisory Committee (1996), coho released from the Klickitat Hatchery had survival rates three times higher than fish transported from the Washougal Hatchery and released directly into the lower river. Based on those results, proposed acclimation is anticipated to result in moderate beneficial effects to fisheries resources in the study areas.

<u>Volitional Release and Homing</u>

Volitional release allows smolts to voluntarily exit rearing areas rather than being forced to exit. This ensures that those fish not ready to migrate remain in the rearing areas until they are ready, and effectively reduces the potential for residualism and associated competition and predation effects to native fish populations. According to the HSRG (2009), the volitional release strategy combined with removal of residual fish (those that do not outmigrate) may increase the long-term survival of released fish, while decreasing negative ecological interactions with natural populations.

Volitional release strategies are currently employed for the spring Chinook program at the Klickitat Hatchery. Under this alternative, proposed releases of coho and fall Chinook from the Wahkiacus facility and releases of summer steelhead and fall Chinook from the Klickitat Hatchery would similarly implement volitional release strategies. Releases from the McCreedy Creek facility would also be conducted volitionally. Releasing juveniles volitionally should result in high adult homing fidelity back to the release sites.

For fall Chinook, releasing juveniles volitionally should result in high adult homing fidelity and volunteer rates back into the hatchery similar to those observed for spring Chinook, i.e. 80% to 90% (YN 2008c). Combined with the target terminal harvest rate, the anticipated high adult homing rate is expected to limit the percentage of the hatchery adults returning to the subbasin spawning in the wild (Yakama Nation 2008b). This would minimize the potential for degradation of spring Chinook redds by fall Chinook that escape the fishery and spawn naturally, resulting in direct beneficial effects to spring Chinook. The HSRG has concluded that genetic and reproductive risks to wild fish from hatchery fish spawning in the wild are low as long as hatchery fish make up less than 5 percent of the total spawning population (HSRG 2009b, HSRG et al. 2004a and 2004b).

For the summer steelhead program, smolts that do not migrate volitionally from the Klickitat Hatchery or McCreedy Creek may not be released, but instead may be transferred and released into landlocked lakes to support local fisheries such as Mount Adams Lake and/or Howard Lake (Yakama Nation 2008d). Coho that do not volitionally exit the proposed Wahkiacus facility would be collected and buried in upland landfill area (Yakama Nation 2008a).

Broodstock Collection

Under Alternative 2, broodstock for various production programs would be collected at the Klickitat Hatchery, the proposed Wahkiacus facility, Lyle Falls and Castile Falls. For steelhead, the current out-of-subbasin smolt release program would be replaced with a local broodstock segregated harvest program and adults would be collected at the Lyle Falls Fishway and from returns to the Klickitat Hatchery. If rates of introgression increase from current estimates, the summer steelhead program would be converted to an integrated program and broodstock would be collected from the Klickitat River. If the upper river steelhead conservation program is implemented, natural-origin summer steelhead would be taken for the broodstock at Castile Falls (or other locations as appropriate) to supplement conservation programs. Proportions of wild fish utilized for broodfish will meet HSRG and NMFS recommendations, typically not exceeding 25 percent of the total return.

Under Alternative 2, the proposed integrated hatchery/harvest program for spring Chinook would require the collection of natural-origin (and hatchery) broodstock. Natural-origin adults would be collected at Lyle Falls Fishway and Castile Falls, as circumstances permit (i.e., depending on abundance of natural-origin adults). After the current hatchery stock has been replaced with the local natural-origin founder stock and the adult outplants are no longer necessary in the upper basin, no more than 25 percent of the natural-origin spring Chinook would be taken for broodstock in a given year. Until then, if the natural-origin adult return numbers drop below 400, the proportion of the natural-origin return taken for broodstock may need to exceed the 25 percent criteria. Any exceedance of the 25 percent natural-origin broodstock criterion established by the HSRG and NMFS would result in a temporary reduction of spring Chinook naturally spawning in the Klickitat River Subbasin, which would temporarily reduce the abundance of juveniles with natural-origin lineage. However, as less hatchery fish are collected, more will spawn naturally, and be available for harvest.

All adult collection facilities have been designed to meet NMFS standards; therefore, injury to nontarget species during fish handling and sorting procedures should be minimized. Environmental effects of the Lyle Falls and Castile Falls collection facilities have been addressed through environmental reviews independent from this document (BPA 2008, 2009). Operational effects associated with broodstock collection at Lyle Falls and Castile Falls would include temporary delays to upstream migration and potential temporary stress and minor increased mortality associated with handling at the collection facility.

Competition and Predation

It is possible for hatcheries to release numbers of fish that can exceed the capacity of the natural productivity in a limited area for a short period of time, leading to competition with native fish. Density-dependent effects would be minimized under the program proposed under Alternative 2. Managers would ensure that appropriate fish size and condition, and timing of release are adhered to, facilitating the development of smolts that would migrate rapidly from the system, thereby reducing potential habitat competition effects on native populations.

The site-specific nature of predation, and the limited number of empirical studies that have been conducted, make it difficult to predict the ongoing predation effects of this specific hatchery release. The Yakama Nation recently conducted a study analyzing coho predation on non-listed spring Chinook in the Yakima River. The results of the study indicated that there was no increased risk to spring Chinook from coho predation in the system (Bosch et al. 2007). The identification of risk factors can be a useful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented. The Yakama Nation has identified that inappropriate dates of release, size at release, and condition factors may contribute to competition and predation on native fish in the subbasin (Yakama Nation 2008d).

While not always desired from a hatchery production and management standpoint, hatchery fish provide an additional food source for natural predators that might otherwise consume native fish. Hatchery fish may be so numerous that predators consume them in greater numbers, resulting in less predation on wild fish. Aquatic species that consume salmonids would benefit from the continued release of fish from this program. Common species that may benefit include northern pikeminnow and smallmouth and largemouth bass. Bull trout may also benefit if present along the smolt outmigration route.

Potential Residualism of Hatchery-Released Smolts

If hatchery-released smolts do not possess the smolting characteristics necessary to ensure their rapid migration out of the Klickitat subbasin, they may remain in the system (i.e., residualize). The continued presence of residualized fish represents an increased potential for competition for resources with native fish, and predation on smaller fish. To minimize residualism, the Yakama Nation would continue to adhere to a combination of acclimation, volitional release strategies, size, and time guidelines as described in the HGMPs prepared in support of the *Klickitat River Anadromous Fisheries Master Plan* (Yakama Nation 2008b).

Disease

Historical hatchery releases of steelhead in the Klickitat have consisted of summer steelhead smolts derived from the Skamania-origin steelhead reared at both the Skamania and Vancouver hatcheries. Under this alternative, broodstock would be collected in the Klickitat subbasin and juveniles would be reared and released from the Klickitat Hatchery. The elimination of out-of-basin rearing for steelhead would remove the potential for introduction of fish pathogens from outside the subbasin for this portion of the hatchery program.

However, if reinstatement of out-of-basin coho is needed to meet harvest needs, it would result in an increase for fish pathogen transfer or amplification risk. Some coho production would shift to the Klickitat Hatchery, but additional juveniles may continue to be reared out-of-basin at Washougal Hatchery and this action would have an impact similar to the current condition.

Spring Chinook Program

The existing spring Chinook program would be converted from a segregated to an integrated program by replacing the existing hatchery-reared broodstock with natural-origin recruits returning to the Klickitat subbasin. The pace of broodstock conversion would depend on the size of the spring Chinook run, which is expected to vary over time. To reduce impacts to the wild spring Chinook population, no more than 25 percent of the wild run would be taken for broodstock in any year. In addition, no wild spring Chinook would be taken for broodstock if run sizes drop below 400 adults.

Under this alternative, there is an increase in the number of smolts released under the existing program (from 600,000 to 800,000). As such, there is a slight increase in the potential for predation and competition resulting from smolt releases associated with releases under this alternative when compared to existing conditions.

Steelhead Program

Under this alternative, continuation of a segregated summer steelhead program would require the use of 100 percent hatchery-origin fish. The proposed program would utilize the Skamania stock returning to the Klickitat River. This stock is segregated from native Klickitat steelhead by early run and spawning timing. Adult trapping at Lyle Falls and broodstock collection at Klickitat Hatchery would provide the summer steelhead each year for the segregated Klickitat Hatchery program.

Historical hatchery releases of steelhead in the Klickitat have consisted of summer steelhead smolts derived from the Skamania-origin steelhead reared at both the Skamania and Vancouver hatcheries. Under this alternative, broodstock would be collected in the Klickitat subbasin and juveniles would be reared and released from the Klickitat Hatchery. The elimination of out-of-basin rearing would reduce the potential for introduction of fish pathogens from outside the subbasin.

The Yakama Nation would continue to monitor the level of genetic introgression between the hatchery and native stocks. Currently, genetic introgression is reported at 4-5 percent (Narum et al. 2006, Sharp 2010b), which is an acceptable level; however, if introgression increases, the segregated steelhead program at the Klickitat Hatchery may be adaptively managed by modification to an integrated program,.

Acclimation of steelhead should result in improved fidelity to the Klickitat River Subbasin, specifically to the Klickitat Hatchery. This should improve broodstock collection success for the segregated steelhead hatchery program, and improve adult returns for the conservation program at McCreedy Creek, should it be implemented. As such, the resultant removal of hatchery fish from the system will reduce, though not eliminate, the potential for hatchery-origin fish to spawn with native fish in the wild. Under an integrated steelhead program (if implemented in the future), adverse effects related to the interbreeding of hatchery and wild fish would be reduced as the genetic composition of hatchery and wild fish would become similar over time. Under this alternative, the smolt-release goal for the summer steelhead program would be 130,000 acclimated smolts under the segregated program. This a change from the existing condition of a 120,000 release goal. The integrated upper river steelhead program would release an additional 70,000 fish from McCreedy Creek.

Release of Hatchery Steelhead Smolts at McCreedy Creek

If natural recolonization of the upper watershed by native summer steelhead is not occurring, an integrated conservation program with acclimation and releases at McCreedy Creek would be implemented utilizing 100 percent natural-origin fish. These fish would be collected at the Castile Falls Fishway and would not exceed 25 percent of total returns.

If implemented, the McCreedy Creek facility would release 70,000 steelhead smolts into the upper Klickitat River watershed. Steelhead smolts would be released from the McCreedy Creek facility from April to June (Yakama Nation 2008d). The later release timing at this location compared to the release period at the Klickitat Hatchery could result in increased predation on native steelhead fry that are present in the system. Native fish in the upper watershed below McCreedy Creek that are less than 73 mm in size would be susceptible to potential predation by these smolts. The HSRG reports that releasing rapidly migrating smolts (rather than fry) reduces negative ecological interactions in the freshwater environment. Smolts are typically highly motivated to outmigrate from natal tributaries, and this limited period of residency should reduce possible competition and predation effects in the subbasin. Further, as part of proposed monitoring and evaluation studies associated with the overall Klickitat hatchery program, the YN will radio-tag a portion of steelhead juveniles released from hatchery and acclimation sites, including McCreedy Creek, and track them to determine migration travel time in the subbasin (YN 2008c, YN 2011). This data will provide valuable insight relative to the residency time of hatchery steelhead smolts released into the subbasin.

Coho Program

The proposed shift in coho release location from the Klickitat Hatchery (RM 42) to the Wahkiacus site (RM 17) would reduce the potential for competition with and predation on fish over a greater spatial and geographic scale. Shifting coho smolt releases downstream approximately 25 RMs would essentially remove the potential for predation on or competition with native juvenile stocks that occupy habitats upstream of the proposed Wahkiacus facility including listed steelhead, as steelhead spawning is concentrated between RMs 5 and 50 (Yakama Nation 2008d). As such, the implementation of this alternative is anticipated to result in long-term beneficial effects to native fish species utilizing the reach between the Klickitat Hatchery and the proposed Wahkiacus facility. Further, smolts typically outmigrate rapidly from natal tributaries. This limited period of residency in the subbasin minimizes the potential for predation and competition. Based on data collected in the Cowlitz River (Harza 1998), coho smolts are likely to migrate approximately 25 kilometers per day. At this migration rate, coho should take from 1 to 7 days to migrate out of the Subbasin. The small amount of time the hatchery fish are present in the Klickitat River should reduce possible competition and predation effects to listed fish species. Also, as part of proposed monitoring and evaluation studies associated with this program, the YN plans to radio-tag a portion of coho juveniles released from hatchery and acclimation sites. Tagged individuals will be tracked using antennae arrays located at several sites in the subbasin to determine migration travel time from the point of release to the mouth of the Klickitat River (YN 2008c, YN 2011). This data will provide insight regarding the residency time of hatchery coho smolts released into the subbasin.

Currently, all of the coho juveniles released in the subbasin are obtained outside the subbasin. Transfer of fish between subbasins increases the risk of introducing or amplifying fish pathogens in the receiving subbasin, which may reduce the survival and productivity of native fish species. Under Alternative 2, transfer of coho juveniles from outside the subbasin could continue to occur; therefore, the risk of fish pathogen transfer between subbasins would remain the same. As stated in Section 2.4.1, eggs from adults spawned at the Wahkiacus Hatchery would continue to be transported for incubation and rearing at the out-of-basin Washougal Hatchery due to space and water limitations at Wahkiacus.

It should be noted that a portion of coho smolts reared outside of the basin are currently direct-released into two locations in the lower Klickitat subbasin, at Horseshoe Bend Bridge (RM 17.1) and Pitt Bridge (RM 10.3). This alternative has the potential to end direct releases. However, as stated in Chapter 2, if harvest objectives are not met under this alternative, direct release of coho could be re-implemented. If direct release locations result in reduced instream residency, competition and predation would be reduced. However, without acclimation, imprinting would be reduced, which could negatively affect adult returns.

NMFS (2002) noted that “where interspecific populations have evolved sympatrically, Chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon” (Nilsson 1967, Lister and Genoe 1970, Taylor 1991). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that “juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates.” These differences in behavior and preferred microhabitats, combined with the probability that the majority of coho smolts would rapidly migrate from the subbasin, minimizes the potential for predation and competition effects downstream of the Wahkiacus facility. Although such ecological effects would be ongoing, the proposed release of coho lower in the subbasin would reduce the spatial and temporal presence of nonnative coho, effectively reducing the level of ecological interactions with native fish species.

Improved adult collection (through imprinting to the Klickitat River and the release facility) of the nonnative coho would also reduce the potential production of offspring that may compete with native juveniles in the river. Under this alternative, coho would be collected for broodstock at Lyle Falls, Wahkiacus, and the Klickitat Hatchery.

Fall Chinook Program

Of the 4 million fall Chinook subyearlings produced under this alternative, 2 million would be released at the proposed Wahkiacus facility and 2 million would be released at the Klickitat Hatchery. Moving 50 percent of the juvenile release to the Wahkiacus facility is expected to reduce competition with other juvenile salmonids inhabiting the

Klickitat River between RM 17 and RM 42, resulting in beneficial effects to native fish species. Competition for resources would still be possible downstream of the proposed Wahkiacus facility. Because subyearling fall Chinook are released at an average length of about 82 mm, predation rates on spring Chinook or steelhead juveniles are expected to be low (Yakama Nation).

Acclimation of fall Chinook at the proposed Wahkiacus facility, and collection of returning adults at the Wahkiacus facility fish ladder would reduce the potential for fall Chinook to spawn naturally in stream reaches above the Wahkiacus facility, thereby reducing potential degradation of spring Chinook redds in upstream reaches. Improved adult collection of the nonnative fall Chinook would also reduce the potential production of offspring that may compete with native juveniles in the river. Under this alternative, about 2,500 local fall Chinook would be collected for broodstock at Lyle Falls, Wahkiacus, and the Klickitat Hatchery.

Currently, all of the fall Chinook juveniles released in the subbasin are obtained outside the subbasin as eyed eggs. Egg transfers have a greatly reduced risk of transferring fish pathogens than do juvenile fish transfers, as the eggs can be disinfected on arrival at the receiving hatchery. However, a minor risk remains for the introduction or amplification of fish pathogens in the receiving subbasin, which may reduce the survival and productivity of native fish species. Under Alternative 2, eyed-egg transfers of fall Chinook from outside the subbasin would be eliminated. This action should reduce the risk of fish pathogen transfer between subbasins.

Fishery and Harvest Effects

Steelhead Harvest

This alternative potentially has two components of steelhead production: a hatchery-based harvest component (segregated) and a conservation component (integrated). The conservation component would be implemented in the future if natural steelhead repopulation in the upper watershed does not occur, or if an increased level of genetic introgression occurs between the native population and the segregated program. Sport harvest would continue to be managed to target adipose-clipped hatchery fish to minimize the impacts to natural-origin summer and winter steelhead. Natural-origin steelhead would not be targeted for harvest, except by the Yakama Nation fishery at Lyle Falls. The implementation of this alternative is anticipated to improve adult returns to the Klickitat River since smolts released from Klickitat Hatchery would be fully acclimated to the Klickitat River. Over time, transitioning to local broodstock should benefit the fishery as juveniles reared in the Klickitat program would be more adapted to local conditions. This could improve fitness and result in higher adult returns over time and is applicable to steelhead, spring and fall Chinook, and coho.

In years of strong hatchery returns, the daily bag limit may be increased for the purpose of removing surplus hatchery fish. It is assumed that some hatchery fish that escape the fishery would not return to the hatchery and may spawn in the river. A standard of 5 percent hatchery-origin spawners to 95 percent natural-origin spawners (i.e., pHOS $\leq$ 0.05) is recommended by the HSRG to minimize impacts to the natural reproducing population. If the removal of hatchery fish is inadequate to meet the 5 percent hatchery-origin spawner standard during the regular scheduled fishery and/or an excessive number of hatchery adults are observed during the winter trapping months (November through April), an emergency fishery may be opened that would target the removal of hatchery fish.

Spring Chinook

Harvest management provisions may be designed to maximize harvest of adipose-clipped hatchery-origin fish. Sport and tribal terminal fisheries would be modified if estimated natural-origin adult escapement to the subbasin falls below 400.

The daily bag limit of two hatchery-origin adults may be increased to facilitate reduction of the proportion of hatchery-origin fish spawning in the wild. It is anticipated that implementing and maintaining a selective sport fishery in the Klickitat River would reduce the harvest effects on the natural population by approximately 15 percent, primarily due to fishers releasing adipose fin intact natural-origin adults.

Coho

Once the Wahkiacus facility is operational, coho fisheries would be managed in a manner that ensures that the 750 hatchery adult escapement target is met each year.

Fall Chinook

Under Alternative 2, fisheries would be managed to consistently meet hatchery broodstock needs.

3.4.2.3 Alternative 3 – Klickitat Hatchery Buildout

As described in Chapter 2, hatchery program modifications (including infrastructure improvements) would occur entirely at the existing Klickitat Hatchery under this alternative. The Wahkiacus facility would not be constructed; however, an acclimation facility would be constructed at McCreedy Creek, if a conservation program for steelhead is determined to be necessary. Facility development at the Klickitat Hatchery location would be the same as that described under Alternative 2, with the exception that an additional set of rearing raceways would also be constructed in uplands. The general construction effects of the development at the Klickitat Hatchery site would be the same as described under Alternative 2. Compared to Alternative 2, however, Alternative 3 would result in less construction along the mainstem Klickitat River riparian corridor and would have no effect on the Swale Creek corridor because the Wahkiacus facility would not be constructed. Compared to Alternative 2, Alternative 3 would result in much less in-water construction because Wahkiacus would not be constructed.

The effects of the elements unique to this alternative or operational effects differing from those of Alternative 2 are described below.

Wahkiacus Study Area

No changes to fish habitat, production, or harvest would occur in the Wahkiacus study area as a result of Alternative 3.

Klickitat Hatchery Study Area

Construction

Upland and Riparian Actions

Direct and indirect effects to the Klickitat River riparian corridor in the Klickitat Hatchery study area are anticipated to be minor and would be the same as those described under Alternative 2.

In-stream Actions

In-stream actions under Alternative 3 would have the same effects on fish as described under Alternative 2 and would be minor. No additional impacts are associated with Alternative 3.

Hatchery Operations

Surface Water Intake

Effects due to operation of the new intake at the Klickitat Hatchery would be minor and similar to those described under Alternative 2.

Effects of Changes to Water Quantity and Quality

The amount of water used at the Klickitat Hatchery under Alternative 3 would be the same as proposed under Alternative 2. As such, the effects of water quantity on fish would be the same as described for Alternative 2. However, because more fish (2 million fall Chinook) would be reared on-station at the Klickitat Hatchery under Alternative 3 compared to Alternative 2, increased effluent loadings would be anticipated to occur under Alternative 3. An analysis of anticipated effluent discharges is presented in Section 3.3. It is expected that effluent discharged from the renovated Klickitat Hatchery under Alternative 3 would comply with WAC pollutant limits. As such, adverse effects to water quality would be minor and limited to the waters in the immediate vicinity of the hatchery outfall structure. No direct, measurable impact to fish species is anticipated from these minor changes to water quality in the immediate vicinity of the hatchery facilities.

Fish Ladder

Under this alternative, potential effects to aquatic habitat and associated species due to construction of a new fish ladder at the Klickitat Hatchery would be minor and similar to those described previously under Alternative 2.

McCreedy Creek Study Area

No change from Alternative 2.

Ecological Interactions and Impacts Resulting from Alternative 3 Fish Production Program

The main objective of implementing Alternative 3 is to reduce potentially negative interactions between native (spring Chinook, steelhead, and bull trout) and nonnative (coho and fall Chinook) salmonids.

A detailed description of the proposed fish production program changes for the Klickitat Hatchery Complex Program was presented in Chapter 2. In summary, proposed changes under Alternative 3 include:

- Conversion to an integrated hatchery program for spring Chinook.
- Development of a locally-adapted segregated summer steelhead program (potentially integrated in the future) to release 130,000 juveniles from the Klickitat Hatchery.
- Segregated programs using locally derived broodstock for fall Chinook and coho.
- Reduction of coho smolt releases from current levels (3.5 to 3.7 million) to 1 million if harvest goal can be met; otherwise direct releases in the lower river would be continued to meet the goal.
- Out-of-basin rearing for coho would be necessary.
- Production numbers of fall Chinook may be reduced due to limited capacity at the Klickitat Hatchery.
- Acclimation and release of coho and fall Chinook production at the Klickitat Hatchery.
- Employ volitional release.
- Implementation of an integrated conservation program for steelhead at McCreedy Creek, if needed.

General Hatchery Production Actions

<u>Acclimation</u>

Due to potential space limitations at the Klickitat Hatchery under this alternative, rearing may be required at other hatcheries. However, all releases would be acclimated to the Klickitat Hatchery.

<u>Out-of-basin Rearing</u>

Production of one million of the coho and all of the fall Chinook smolts would be completely transferred to the Klickitat Hatchery, reducing out-of-basin rearing. A portion of the coho production may still be necessary at out-of-basin hatcheries since some coho salmon pre-smolts may continue to be imported from the Washougal hatchery to meet harvest goals. The out-of-basin rearing would require transport of fish to the Klickitat Hatchery for final rearing and release. Transfer of fish from out-of-basin hatcheries would increase the level of risk for transfer of fish pathogens between basins. Effects of hauling would include increased stress levels in the fish, potentially leading to decreased survival.

Volitional Release

Volitional release strategies (and resultant effects to fish) proposed under Alternative 3 would be identical to those discussed under Alternative 2.

Broodstock Collection

Under Alternative 3, broodstock collection facilities at Klickitat Hatchery would be the same as Alternative 2. However, with Alternative 3, fall Chinook and coho broodstock would only be collected at Lyle Falls and the Klickitat Hatchery because the Wahkiacus facility would not be developed.

Competition and Predation

Under Alternative 3, approximately 6 million hatchery fall Chinook, coho, steelhead, and spring Chinook would be released from the Klickitat Hatchery between April and early July. These fish would outmigrate through the Klickitat River at the same time as natural-origin spring Chinook juveniles (subyearling fry and yearling smolts) and steelhead juveniles (newly emergent fry in June, as well as year 1-3 fish and steelhead smolts). Currently, some hatchery fish are direct-released into lower portions of the mainstem Klickitat River. This alternative would eliminate direct releases into lower portions of the river, and subsequently increase residency time for fish released from the Klickitat Hatchery due to the longer migration route. As such, competition and predation risks to native fish downstream of the Klickitat Hatchery would increase compared to existing conditions.

As stated under Alternative 2, hatchery fish provide an additional food source for natural predators that might otherwise consume native fish. Aquatic species that consume salmonids would benefit from the continued release of fish from this program.

Potential Residualism of Hatchery-Released Smolts

To minimize residualism, the Yakama Nation would continue to adhere to a combination of acclimation, volitional release strategies, size, and time guidelines as described in the HGMPs prepared in support of the *Klickitat River Anadromous Fisheries Master Plan* (Yakama Nation 2008b).

Disease

Disease risks to aquatic species due to implementation of production programs associated with this alternative would be similar to those described for Alternative 2.

Spring Chinook Program

No change from Alternative 2.

Steelhead Program

No change from Alternative 2.

Coho Program

Similar to Alternative 2, this alternative would implement a local broodstock segregated hatchery program for coho salmon. Under Alternative 3, production of one million coho smolts would shift to the Klickitat Hatchery, where they would be acclimated and volitionally released. This would result in similar rates of competition and predation in the Klickitat River compared to baseline conditions since about one million coho smolts are currently reared and released from the Klickitat Hatchery. Additional coho salmon pre-smolts may continue to be imported from the Washougal Hatchery and direct released in the lower Klickitat River to meet production goals. Because coho smolts are currently direct-released into the Klickitat River, rates of competition and predation would likely remain similar to baseline levels if direct-planting becomes necessary to meet production goals under this alternative.

NMFS (2002) noted Chinook salmon and steelhead have evolved slight differences in habitat use patterns and foraging behavior. These differences combined with the probability that the majority of coho smolts would rapidly migrate from the subbasin, minimizes the potential for predation and competition effects downstream of the Klickitat Hatchery.

Under Alternative 3, adult coho would be collected and spawned at the Klickitat Hatchery, and eggs would be incubated, hatched and reared there for acclimation and volitional release in May. The coho program proposed under Alternative 3 would not spatially separate a large proportion of hatchery releases within the key 25-mile reach of the Klickitat River, which is a goal of the Master Plan. Similar to Alternative 2, and baseline conditions, if the harvest goal cannot be met with this program, up to 2.5 million Washougal River stock smolts would be imported and direct released in the lower Klickitat River as needed to meet the goal.

Improved adult collection (through imprinting to the Klickitat River and the release facility) of the nonnative coho would reduce the potential production of offspring that may compete with native juveniles in the river. Under this alternative, coho would be collected for broodstock at Lyle Falls and the Klickitat Hatchery. Currently, all of the coho juveniles released in the subbasin are obtained outside the subbasin. Transfer of fish between subbasins increases the risk of introducing or amplifying fish pathogens in the receiving subbasin, which may reduce the survival and productivity of native fish species. Under Alternative 3, some transfer of coho juveniles from outside the subbasin may continue.

Fall Chinook Program

Similar to Alternative 2, this alternative would implement a segregated hatchery program for four million fall Chinook subyearlings (see Alternative 2). Production numbers may be lower based on capacity at Klickitat Hatchery. If production is reduced due to facility capacity, then reductions in competition and predation may occur. However, similar to the coho program, this alternative would not accomplish the spatial separation of hatchery releases provided under Alternative 2. About 2,500 adult fall Chinook would be collected for broodstock at Lyle Falls and the Klickitat Hatchery.

Fishery and Harvest Effects

Fishery and harvest effects would be the same as Alternative 2. The production programs may be achieved differently under each alternative, but the harvest objective remains the same.

3.4.3 Mitigation Measures

The following measures have been incorporated and analyzed in project planning to avoid, minimize, or offset potential adverse effects, both direct and indirect, to aquatic resources:

- In-water work would adhere to NMFS or WDFW-approved in-stream work windows, as appropriate to each site, to minimize disturbance when the majority of juvenile salmon and steelhead would be moving past the project site.
- If an integrated summer steelhead program is implemented, in an effort to minimize physiological stress on fish sampled during steelhead broodstock collection activities, a nonlethal black-out tube would be employed for handling the fish. This equipment allows for sampling while the head of the fish is kept in a dark environment and reduces stress.
- In-water work effects on fish would be minimized by using erosion control measures, and by implementing BMPs to limit water quality degradation during construction. Such measures may include:
  - Hydraulically operated equipment that may work below the OHWM would be retrofitted with vegetable-based fluid in the hydraulic system.
  - Existing riparian vegetation would be protected to the extent possible. Impacts to waters of the U.S. would be permitted as required under Section 404 of the Clean Water Act, as administered by the U.S. Army Corps of Engineers. To minimize effects of ground disturbance during construction, weed-free straw matting, silt fences, or other materials would be used to reduce the opportunity for soil erosion into the stream channel. All disturbed areas would be revegetated upon project completion using native plant species. Some annual grasses may be used for short term erosion control and cover.
  - Installation and removal of the cofferdams would be accomplished over several hours to allow streamflow to be reduced and rewatered gradually. Immediately prior to initiating construction activities, qualified fisheries biologists would remove all fish species present from the immediate area where the cofferdams would be installed.
- Cofferdams or flumes would temporarily isolate the area required to construct new or improved in-water elements at each site and for modifications to the existing concrete weir at the Klickitat Hatchery.

- During dewatering of work areas, a qualified fish biologist or natural resources specialist working with experienced fisheries support would be present to conduct salvage operations for any fish that become stranded in the dewatered zone.
- Sumps would be created as necessary within each coffered work area to capture any seepage flow. All seepage flow would be pumped to an on-site detention pond that would percolate water into the ground, or be allowed to settle prior to discharge to the Klickitat River. Discharged water would not be turbid or sediment laden.
- Use sediment barriers such as fences, weed-free straw matting/bales, or fiber wattles as necessary in all work areas sloping toward waterbodies to intercept any surface flow that might transport sediment to the stream channel.
- Staging construction equipment and materials would occur away from waterbodies. Fuel storage and refueling would occur away from the river or creek corridor. Fuel storage and refueling areas would be operated using BMPs (such as use of catch basins and sediment berms) and would be equipped with an appropriate spill containment system. Absorbent pads to soak up leaks and a fuel spill response kit of appropriate size for the equipment used would be readily available throughout the construction period.
- Trees that are required to be removed for construction and are suitable for LWD (typically conifers), would be removed with root wads intact and stockpiled for use in local in-stream restoration projects conducted by the Yakama Nation.
- Construction would be managed to minimize impacts by the use of erosion control devices, removal of the least amount of vegetation possible, and revegetation of the site with native grasses, shrubs, and trees following disturbance.
- Revegetation of disturbed habitats with native species is intended to offset potential adverse effects to fish and their habitat. Further, following disturbance of the riparian corridor, the Yakama Nation would revegetate all disturbed soils with native grasses, as well as native understory and canopy-forming species. Such plantings would re-establish natural shoreline shading.
- A spill prevention, containment, and control plan would be prepared for this action.
- Five large engineered woody debris jams would be constructed and placed in Swale Creek to protect the stream bank, improve fish habitat, and deepen the channel adjacent to the Swale Creek intake. The placement of the log jams would be conducted during pre-established in-water work windows, and portions of the anchored logs would be buried in the streambank.

3.5 Vegetation

3.5.1 Affected Environment

The three project sites were visited by project biologists on August 5, 2009, and an additional site visit to the Wahkiacus project site was made on September 15, 2009. During the August site visit, project biologists documented the overall type and condition of vegetation and habitat resources within the study areas.

Due to the timing of the site visits, surveys for rare plants were not conducted, but general observations of vegetation, overall level of disturbance, and the presence of potential habitat for listed rare plants were noted. In addition, Yakama Nation biologists provided information on vegetation and rare plant occurrences for the Klickitat and McCreedy Creek sites.

Project biologists (Wahkiacus project site) and tribal staff (Klickitat and McCreedy Creek sites) also documented occurrence of noxious weeds, as listed by the Washington State Noxious Weed Control Board at each study site during the site visits. Noxious weed populations that covered more than 50 percent for an area larger than 200 square feet were noted. Vegetation types and habitats (including noxious weeds) within the study areas were digitized on aerial images and incorporated into geographic information system (GIS) data. Proposed project design elements for each alternative were superimposed on the vegetation information so project biologists could quantify vegetation and habitat impacts within each study area.

The Klickitat River Subbasin is located at the western edge of the Columbia Basin ecological province (Franklin and Dyrness 1988) in a transition zone between cool, moist forests of the Cascade Mountains and dry, warm sagebrush steppe and grasslands to the east. Typical vegetation consists of ponderosa pine and Oregon white oak habitat with shrubs scattered in the understory. Douglas fir is also common in this habitat (Johnson and O'Neil 2001). Along the Klickitat River, riparian vegetation is present along narrow bands that follow the stream corridor. Dominant vegetation includes stands of mountain alder and willows (Johnson and O'Neil 2001).

3.5.1.1 Wahkiacus Study Area

The Wahkiacus study area includes existing structures and maintained areas coupled with relatively undisturbed stands of Oregon white oak to the east of the existing structures. In cleared areas, Idaho fescue dominates interspersed with forbs and grasses. The small forested area near the confluence of Swale Creek and the Klickitat River contains ponderosa pine, willows, Oregon white oak, and quaking aspen. Very little riparian vegetation grows along the Klickitat River at the Wahkiacus site, except in small patches where sediments have accumulated in pockets between rock outcrops and boulders, although recent plantings of Scouler's willow, coyote willow, and red osier dogwoods are present.

One wetland was identified at the site north of Horseshoe Bend Road near the bridge over the Klickitat River. This small wetland is primarily emergent with dominant species of soft rush, panicled bulrush, and reed canarygrass. A scrub-shrub component at the east end of the wetland consists of red osier dogwood, coyote willow, and Himalayan blackberry. Section 3.8 further discusses the identified wetland at the Wahkiacus site.

Priority Habitats

In its Priority Habitats and Species program, the WDFW has designated several habitats and species as management priorities. Priority habitats are those that have unique or significant value to a diverse assemblage of wildlife species and are based on vegetative composition and/or a dominant species such as Oregon white oak. Priority habitats in the Wahkiacus study area include oak woodlands, wetlands, and riparian habitats (BPA 2009). WDFW requires that impacts to priority habitats from the proposed project be avoided, minimized, or mitigated.

Oregon White Oak Woodlands

Oregon white oak is Washington's only native oak species. The WDFW defines priority Oregon white oak woodlands in eastern Washington as either pure or mixed associations where canopy cover of the oak component is at least 25 percent, or where total canopy coverage of the stand is less than 25 percent, but oak accounts for at least 50 percent of the canopy coverage present and the patch size is 5 acres or greater (Larsen and Morgan 1998). The Wahkiacus study area east of the existing driveway into the facility and north of Horseshoe Bend Road meets the latter criteria as priority habitat. See Section 3.6 for information on wildlife species associated with this habitat.

Wetlands

WDFW's designation of wetlands as priority habitats requires no specific size or type criteria as long as the wetland consists of hydrophytic vegetation, hydric soils, and wetland hydrology (WDFW 2008). The small, permanent wetland in the study area would be considered a priority habitat. Wetlands are a transitional area between terrestrial and aquatic systems and provide habitat for numerous species (see Section 3.8) as well as provide hydrologic and water quality functions (see Section 3.3).

Riparian

Riparian areas are defined as "the area adjacent to aquatic systems with flowing water (e.g., rivers, perennial or intermittent streams, seeps, springs) that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other" (Knutson and Naef 1997). Riparian habitats are especially important in arid environments where water sources are limited and these habitats play a vital role in the overall ecosystem. It is estimated that approximately 85 percent of terrestrial species in Washington use riparian habitat for portions of their life cycle and the density of wildlife in riparian areas is comparatively high relative to other habitats (Knutson and Naef 1997).

Riparian habitat in the Wahkiacus study area occurs along the Klickitat River and Swale Creek. Along the Klickitat River, vegetation is mostly herbaceous with a small forested area located near Swale Creek dominated by ponderosa pine, willows, Oregon white oak, and quaking aspen. Stands of Oregon white oak form the riparian area along Swale Creek. These streamside areas have been disturbed in the past by flooding and minor development activities. These past and perhaps ongoing disturbances limit the habitat functions of the area and its ability to provide habitat connectivity, vegetation diversity and composition, structural diversity, and microclimates needed to support a large array of species.

Rare Plants

WDNR maintains a state list of plants that meet specific criteria as sensitive, threatened, or endangered within the State of Washington. These species are not provided the same protection as federally-listed species; however, the potential effects on these species are a consideration in state and local planning. Appendix C provides the state-listed species that are known or suspected to occur in Klickitat County (WDNR 2010). Federally-listed species are addressed in Section 3.7.

No rare plant species are mapped in the study area (WDNR 2009) and no rare plant species were observed during field investigations conducted in September 2009; however, the surveys were conducted outside the expected flowering periods for the plant species listed. Project biologists made an assessment of the overall habitat and determined whether rare plant species were likely to be present based on the typical habitat for the rare plant species listed in Appendix C. Species that have primary habitat associations with riparian areas, open woodlands, moist or wet areas, mineral soils, that occur on nearly flat terrain at low to mid elevations may be present. Table 3-20 identifies the rare plant species whose habitat requirements are present and may occur on site: however, it is unlikely these rare plant species are present given the development of the site and ongoing activities associated with existing hatchery facilities.

Table 3-20: State Rare Plant Species that May be Present in Wahkiacus Study Area

Common Name	Scientific Name
Chaffweed	*Anagallis minima*
Palouse milk vetch	*Astragalus arrectus*
Ames' milk-vetch	*Astragalus pulsiferae var.suksdorfii*
Douglas' draba	*Cusickiella douglasii*
Clustered lady's-slipper	*Cypripedium fasciculatum*
Diffuse stickseed	*Hackelia diffusa var. diffusa*
Nuttall's quillwort	*Isoetes nuttallii*
Kellogg's rush	*Juncus kelloggii*
Inch-high rush	*Juncus uncialis*
Smooth goldfields	*Lasthenia glaberrima*
Awned halfchaff sedge	*Lipocarpha aristulata*
Suksdorf's desert-parsley	*Lomatium suksdorfii*
Cusick monkeyflower	*Mimulus cusickii*
Pulsifer's monkey-flower	*Mimulus pulsiferae*
Suksdorf's monkey-flower	*Mimulus suksdorfii*

Table 3-20: State Rare Plant Species that May be Present in Wahkiacus Study Area

Common Name	Scientific Name
Coyote tobacco	*Nicotiana attenuate*
Adder's-tongue	*Ophioglossum pusillum*
Western yellow oxalis	*Oxalis suksdorfii*
Persistent sepal yellowcress	*Rorippa columbiae*
Soft-leaved willow	*Salix sessilifolia*
Oregon white-top aster	*Sericocarpus oregonensis ssp. oregonensis*
Pale blue-eyed grass	*Sisyrinchium sarmentosum*
Western ladies-tresses	*Spiranthes porrifolia*
Flat-leaved bladderwort	*Utricularia intermedia*

Noxious Weeds

Noxious weeds are nonnative species that contribute to the loss of agricultural production or ecological diversity (WNWCB 2010). The Board maintains a list of plant species considered to be noxious (WNWCB 2010) and classifies them as Class A, B, or C. Class A weeds are nonnative species that are limited in distribution in Washington. State law requires that these weeds be eradicated. Class B weeds are nonnative species that are either absent from or limited in distribution in some portions of the state but very abundant in other areas. The goals are to contain the plants where they are already widespread and prevent their spread into new areas. Class C weeds are nonnative plants that are already widespread in Washington State. Counties can choose to enforce control, or educate residents about controlling Class C noxious weeds.

Noxious weeds were found in the Wahkiacus study area during field investigations in September 2009 and include reed canarygrass (Class C) and wild carrot (Class B). Other species may be present but were not observed. Noxious weeds can enter the study area from several sources, including vehicles on adjacent roads, pedestrians, and river flows that continually move seeds from upstream locations.

3.5.1.2 Klickitat Hatchery Study Area

The Klickitat Hatchery study area lies in a small canyon adjacent to the Klickitat River. The hatchery site has been largely modified (i.e., native vegetation removed) to accommodate the hatchery facilities and on-site housing. Adjacent to the facilities are relatively undisturbed stands of Douglas fir and ponderosa pine with an understory of snowberry and oceanspray. Riparian vegetation along the river that has been left intact is a narrow band of primarily Douglas fir with a limited understory. Within the facility complex there is a maintained yard of native and nonnative grass species. On the north side of the Klickitat River, there are several springs. Section 3.8 further discusses the springs at the proposed project.

Priority Habitats

WDFW priority habitats in the Klickitat Hatchery study area include wetlands and riparian habitats (BPA 2009).

Wetlands

The springs located to the north of the Klickitat River would be considered a priority habitat. Wetlands are discussed further in Section 3.8.

Riparian

Riparian habitat in the Klickitat Hatchery study area is disturbed along the Klickitat River from the development and maintenance of the existing facilities. Along the Klickitat River, vegetation is mostly herbaceous with small forested patches dominated by ponderosa pine. The lack of an undisturbed riparian area limits the functions of the area and its ability to provide habitat connectivity, vegetation diversity and composition, structural diversity, and microclimates needed to support a large array of species. Section 3.6 provides additional descriptions of wildlife species present.

Rare Plants

No rare plant species are documented in the study area. The presence of rare plant species in the Klickitat Hatchery study area is based on an assessment of the overall habitat in the study area and the typical habitat for state-listed species (see Appendix C). Species with habitat requirements in riparian areas, conifer forests, moist or wet areas, mineral soils, and nearly flat terrain at low to mid elevations may be present. Table 3-21 identifies the rare plant species whose habitat requirements are present and may occur on-site.

Table 3-21: State Rare Plant Species That May Be Present in Klickitat Hatchery Study Area

Common Name	Scientific Name
Chaffweed	*Anagallis minima*
Douglas' draba	*Cusickiella douglasii*
Clustered lady's-slipper	*Cypripedium fasciculatum*
Diffuse stickseed	*Hackelia diffusa var. diffusa*
Gooseberry-leaved alumroot	*Heuchera grossulariifolia var. tenuifolia*
Nuttall's quillwort	*Isoetes nuttallii*
Smooth goldfields	*Lasthenia glaberrima*
Awned halfchaff sedge	*Lipocarpha aristulata*
Suksdorf's desert-parsley	*Lomatium suksdorfii*
Cusick monkeyflower	*Mimulus cusickii*
Pulsifer's monkey-flower	*Mimulus pulsiferae*
Suksdorf's monkey-flower	*Mimulus suksdorfii*
Adder's-tongue	*Ophioglossum pusillum*
Western yellow oxalis	*Oxalis suksdorfii*
Fuzzytongue penstemon	*Penstemon eriantherus var. whitedii*
Persistent sepal yellowcress	*Rorippa columbiae*
Soft-leaved willow	*Salix sessilifolia*
Oregon white-top aster	*Sericocarpus oregonensis ssp. oregonensis*
Western ladies-tresses	*Spiranthes porrifolia*
California compassplant	*Wyethia angustifolia*

Noxious Weeds

No field surveys have been conducted to determine the presence or absence of noxious weeds in the Klickitat Hatchery study area. Reed canarygrass (Class C) is known to be present at the site. Other noxious weed species may also be present on the site. Noxious weeds could be transported to the study area from vehicles traveling to and from the site, pedestrians, and river flows that continually move seeds from upstream locations.

3.5.1.3 McCreedy Creek Study Area

The McCreedy Creek site is primarily undisturbed mature Douglas fir and western red cedar forest with an understory of thimbleberry, kinnikinnick, twinberry, snowberry, and Oregon grape. Red alder, LWD, and other habitat features are also present in the wide riparian area. The wide riparian corridor and intact forest habitat provide numerous habitats to support a diversity of terrestrial and aquatic species (see Section 3.6).

Priority Habitats

The McCreedy Creek study area is located on tribal land and is not subject to state law; therefore, priority habitats, governed by the WDFW, were not assessed for the site.

Rare Plants

The McCreedy Creek study area is located on tribal land and is not subject to state law; therefore, state-listed rare plants, governed by the WDNR, were not assessed for the site. Federally-listed plant species are addressed in Section 3.7.

Noxious Weeds

Noxious weed species may be present on the site; however, no field surveys have been conducted to verify their presence or absence. Noxious weeds could be transported to the study area from vehicles along the adjacent access road, pedestrians, and river flows that continually move seeds from upstream locations.

3.5.2 Environmental Consequences

For purposes of this EIS, the intensity of impacts to vegetation are categorized as follows:

> ***Minor:*** Impacts to native vegetative communities would be small and localized with little consequence to the surrounding communities, which would be left unaffected. Rare plants would not be affected. The overall viability of individual plant species would not be affected.
>
> ***Moderate:*** Impacts to native vegetative communities would occur locally (i.e., at the project site). Individual rare plants would be affected but large populations in the project area would remain intact. The viability of individual plant species could be affected, but the species would not be lost.

> ***Major:*** Impacts to native vegetative communities would be irreversible and the potential spread of invasive species is high. Rare plant populations would be highly disturbed or eliminated in the project area. Specific species would be permanently lost.

3.5.2.1 Alternative 1 – No Action Alternative

Under Alternative 1, no new construction would occur in the study areas of the three project sites; therefore, no vegetation would be removed. Natural succession, flood events, and fire suppression efforts may cause changes in vegetation composition over time at these locations. Noxious weeds, if not managed, may spread at the sites and lower overall diversity of plant species.

3.5.2.2 Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

Construction

Construction would temporarily impact approximately 8.8 acres of vegetation. Disturbed areas would be replanted with native woody and herbaceous vegetation where appropriate and managed to replace lost roadside and environmental function, including soil stabilization, water quality protection, restoration of native vegetation, and noxious weed reduction. Accidental fuel and oil tank leaks and improperly disposed stormwater could enter the vegetated areas and damage plants and wildlife. These direct impacts would be moderate, short term, adverse, and limited to the area of disturbance. Implementing BMPs would minimize adverse effects.

Completion of the project would result in permanent vegetation removal of approximately 2.2 acres of vegetation. Most of this long-term, adverse, minor direct impact would be from the conversion of vegetated areas to impervious surface in the form of new buildings and structures.

Temporary and permanent vegetation removed would be primarily herbaceous and scrub shrub with roughly 2.5 acres of forest (0.5 acres permanent and 2.0 acres temporary). Of the 2.5 acres of forested habitat proposed for permanent and temporary removal, approximately 1.2 acres is Oregon white oak woodland, considered a priority habitat under the WDFW Priority Habitats and Species program. Approximately 0.2 acre of the Oregon white oak woodland would be permanently removed. No state-listed rare plant species are known to occur within the study area, although habitat is present for several listed species. If species are present, construction activities would result in removal of these species from the study area. It is recommended that a rare plant survey be conducted prior to construction activities to verify the absence of rare plants.

Operational

Routine maintenance of the facility would include mowing grass around the structures and maintaining trees and shrubs. Maintenance may also include removal of trees that are a hazard (e.g., branches, dead trees). Routine maintenance would have a minor, long-term adverse direct effect on vegetation due to the removal of woody debris that would otherwise provide nutrients to surrounding vegetation and potential habitat to wildlife. In addition, vehicle use of the area may aid in dispersion of nonnative species within the study area.

Indirect

Indirect impacts to vegetation would include a decrease in vegetation or changes to vegetative communities as a result of increased runoff or disturbance of soils from vehicle and foot traffic. These impacts would be minor, short term and localized, occurring adjacent to the construction zone.

Klickitat Hatchery Study Area

Construction

Construction would have a short-term impact on 15.0 acres of vegetation at the Klickitat Hatchery site, 5.3 acres of which would be forested areas. Disturbed areas would be replanted with native woody and herbaceous vegetation where appropriate and managed to replace lost environmental function, including soil stabilization, water quality protection, restoration of native vegetation, and noxious weed reduction. Accidental fuel and oil tank leaks and improperly disposed stormwater could enter the vegetated areas and damage plants and wildlife. These direct impacts would be moderate, short term, and adverse and limited to the area of disturbance. Implementing BMPs would minimize these effects.

Alternative 2 would result in permanent vegetation removal of approximately 2.3 acres of vegetation. Vegetation removed would be primarily herbaceous and scrub shrub. Most of this long-term, adverse, minor direct impact would be from conversion of vegetated areas to impervious surface.

No state-listed rare plant species are known to occur within the study area, although habitat is present for several species. If species are present, construction activities would result in removal of these species from the study area. It is recommended that a rare plant survey be conducted prior to construction activities to verify the absence of rare plants.

Operational

Routine maintenance of the study area would include mowing grass around the structures and maintaining trees and shrubs. Maintenance may also include removal of trees that are a hazard. Routine maintenance would have a minor, long-term adverse direct effect on vegetation due to the removal of woody debris that would otherwise provide nutrients to surrounding vegetation and potential habitat to wildlife. In addition, vehicle use of the area may aid in dispersion of nonnative species within the study area.

Indirect

Indirect impacts to vegetation would include a decrease in vegetation or changes to vegetative communities as a result of increased runoff or disturbance of soils from vehicle and foot traffic. These impacts would be short term and localized, occurring adjacent to the construction zone.

McCreedy Creek Study Area

Construction

Construction would temporarily impact approximately 0.7 acre of vegetation. Disturbed areas would be replanted with native woody and herbaceous vegetation where appropriate. Accidental fuel and oil tank leaks and improperly disposed stormwater would enter the vegetated areas and damage plants and wildlife. These direct impacts would be moderate, short term, adverse, and limited to the area of disturbance. Implementing BMPs would minimize these effects.

Implementation of Alternative 2 would result in 1.4 acres of permanent vegetation removal. Vegetation removed would be primarily forested habitat. The areas cleared could be converted to pervious surfaces such as gravel; the mobile acclimation facilities would not constitute impervious surface because their presence on the site is of short duration (March to May). The pervious surfaces that are not graveled may be replanted with vegetation or colonized with nearby native species, which can provide some of the same functions as the current vegetation. The long-term adverse direct effect on vegetation would be site-specific and minor because the acreage of vegetation permanently removed is relatively small compared to the surrounding forest.

Operational

Routine maintenance of the study area would be minimal and would include removing trees, shrubs, and tall herbaceous species from the acclimation facilities. Maintenance may also include removal of trees that are a hazard. Routine maintenance would have a minor, long-term adverse direct effect on vegetation due to the removal of woody debris that would otherwise provide nutrients to surrounding vegetation and potential habitat to wildlife. In addition, vehicle use of the area may aid in dispersion of nonnative species within the study area.

Indirect

Indirect impacts to vegetation would include a decrease in vegetation or changes to vegetative communities as a result of increased runoff or disturbance of soils from vehicle and foot traffic. These impacts would be short term and localized, occurring adjacent to the construction zone.

3.5.2.3 Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

No construction would occur at the Wahkiacus study area under this alternative; therefore, no impacts to vegetation would occur.

Klickitat Hatchery Study Area

Alternative 3 would have the same impacts on vegetation at the Klickitat Hatchery site as described for Alternative 2.

McCreedy Creek Study Area

Alternative 3 would have the same impacts on vegetation at the McCreedy Creek site as described for Alternative 2.

3.5.3 Mitigation Measures

To minimize and mitigate the effects of vegetation removal, the project would implement the following measures:

- Conduct a rare plant survey prior to construction during the appropriate growing season to verify presence or absence of potential state rare plant species.
- Minimize the areas of disturbance to only those that are necessary.
- Dispose of excavated noxious weeds in a manner that prevents reestablishment.
- Minimize the area of soils exposed at any one time and use dust abatement measures when necessary to reduce dust that can bury native plants.
- Implement a revegetation plan to minimize erosion during construction, restore native plant communities, provide wildlife habitat, and reduce the risk of weed introduction and establishment.
- Implement a spill containment and countermeasures plan during operations and construction to avoid and minimize affects from spills on surrounding vegetation.

3.6 Wildlife

3.6.1 Affected Environment

In general, the study area for the assessment of potential impacts on wildlife is defined as the area of potential project disturbance, including construction access and staging areas and areas potentially affected by noise generated during construction and operations (see Section 3.6.2 for calculations). At all three sites, the construction noise results in the largest study area defined as a one mile radius from the approximate center of the area of disturbance at each site.

The three project sites were visited by project biologists on August 5, 2009, and an additional site visit to the Wahkiacus project site was made on September 15, 2009. During the site visits, project biologists documented the habitat resources and species observations within the study areas.

No species-specific wildlife surveys or habitat surveys were conducted for this project. General habitat and species observations were noted during site visits and transferred onto recent aerial images. In addition, Yakama Nation biologists provided habitat information and wildlife use for Klickitat Hatchery study area and McCreedy Creek study area. Vegetation types determined in Section 3.5, were digitized on aerial images and incorporated into GIS data. Proposed project design elements for each alternative were superimposed on the vegetation information so project biologists could quantify habitat losses and potential effects to wildlife within the study area.

3.6.1.1 Wahkiacus Study Area

The Klickitat Subbasin Plan identified 365 wildlife species occurring in the Klickitat River Subbasin. These include amphibians, birds, mammals, and reptiles (Yakama Nation 2004b). The Wahkiacus study area is a small subset of the Klickitat River Subbasin comprised predominantly of Oregon white oak woodland with a small coniferous forest area near Swale Creek's confluence with the Klickitat River as well as open meadow areas, maintained lawns, a wetland, and riparian areas. Wetland and riparian habitat provide opportunities for forage, nesting, and cover habitat for species adapted to dry, ponderosa pine and Oregon white oak habitat (i.e., western gray squirrel and acorn woodpeckers) and other common species (Yakama Nation 2004b). Yakama Nation staff familiar with the Wahkiacus site have observed wild turkey, double crested cormorant, bobcat, belted kingfisher, western gray squirrel, bald eagle, black tail deer, and numerous bird species (HDR 2009). Other species that may occur in the study area and are dependent on this habitat type include white-headed woodpecker, Lewis' woodpecker, flammulated owl, pygmy nuthatch, western wood-peewee, red-breasted nuthatch, hermit thrush, western tanager, chipping sparrow, Cassin's finch, red crossbill, evening grosbeak, Clark's nutcracker, and brown creepers, Nashville warbler, lazuli bunting, ash-throated flycatcher, spotted towhee, blackheaded grosbeak, American robin, blackthroated gray warbler, MacGillivray's warbler, California Mountain king snake, sharptail snake, western rattlesnake, southern alligator lizard, and the western skunk (Yakama Nation 2004b).

Existing habitat quality at the Wahkiacus site is limited by historic and ongoing human disturbance, broken links to other habitats and migratory corridors, and the limited number and types of habitats present. The Wahkiacus site contains several buildings and is used daily by tribal staff. The level of human activity is low but would be sufficient to deter sensitive wildlife species. Other species have adapted to the activity and use the site. Horseshoe Bend Road is used daily and, although traffic volumes are low, the presence of the road likely disrupts movements of wildlife from the study area to the south. There are no barriers for wildlife moving northward from the study area. This creates a large migratory corridor along the riparian area and into the uplands for both small and large wildlife species.

Federal Bald and Golden Eagle Protection Act

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act, which prohibits the taking of eagles, including their parts, nests, or eggs. Protection of eagles is defined through buffers around nests that extend either 660 feet or 330 feet from the nest tree (depending on activity type) or within line of site of a nest. Activities are restricted in these buffers during various times of the year but primarily during the nesting season (USFWS 2007). There are no documented nest sites within line of site or within a mile of the study area; therefore, no restrictions on activities at the site will be required under the Bald and Golden Eagle Protection Act.

State Bald Eagle Protection Law

In the state of Washington, bald eagles are protected under the Bald Eagle Protection Law (RCW 77.12.655) and the Bald Eagle Protection Rule (WAC 232-2-292). Similar to the federal law, the state law establishes buffer zones around nest and roost sites and requires preparation of a management plan for projects within these buffer zones (Rodrick and Blatz 2008). Bald eagle communal night roosts are important winter habitat. Eagles use night roosts as protection from inclement weather and temperature extremes. These roosts are usually associated with large, salmon-bearing rivers such as the Klickitat River, and are typically on forested slopes. Activities within 800 feet of a nest or 0.25 mile of communal roosts are restricted (Larsen et al 2004). Yakama Nation staff working at the Wahkiacus field office have observed bald eagles in the study area (HDR 2009); however, there are no documented nest sites within line of site or within 800 feet of the study area and the nearest communal bald eagle roosts are approximately 2 miles upstream of the study area (BPA 2009). No restrictions under the Bald Eagle Protection Law or Bald Eagle Protection Rule would apply.

Priority Species

There are 55 WDFW priority species that could occur within Klickitat County (WDFW 2008). Priority species require protective measures for their survival due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. Appendix D lists these species and associated habitats. WDFW requires impacts to priority species from the proposed project be avoided, minimized, or mitigated. Federally-listed species are addressed in Section 3.7.

During the August 2009 site visit, project biologists made an assessment of the overall habitat in the Wahkiacus study area. Based on these observations, priority species likely to be present are those species with habitat requirements in riparian areas, open woodlands, moist or wet areas, in nearly flat terrain at low to mid elevations. These species are listed in Table 3-22. Of these species, wild turkeys, western gray squirrel, bald eagle, and Columbian black tail deer have been observed on site by Yakama Nation staff.

Table 3-22: State Priority Species That May Be Present in the Wahkiacus Study Area

Common Name	Scientific Name
Northern Leopard Frog	*Rana pipiens*
Western Toad	*Anaxyrus boreas*
Sharptail Snake	*Contia tenuis*
Vaux's Swift	*Chaetura vauxi*
Black-crowned Night-heron	*Nycticorax nycticorax*
Great Blue Heron	*Ardea herodias*
Cavity-nesting ducks	—
Bald Eagle	*Haliaeetus leucocephalus*
Golden Eagle	*Aquila chrysaetos*
Mountain Quail	*Oreortyx pictus*
Ring-necked Pheasant	*Phasianus colchicus*
Wild Turkey	*Meleagris gallopavo*
Yellow-billed Cuckoo	*Coccyzus americanus*
Roosting Concentrations of: Big-brown Bat, Myotis bats, Pallid Bat	—
Townsend's Big-eared Bat	*Corynorhinus townsendii*
Western Gray Squirrel	*Sciurus griseus*
Columbian Black-tailed Deer	*Odocoileus hemionus columbianus*
Elk	*Cervus elaphus*

In addition to the individual priority species potentially occurring at the Wahkiacus site in Table 3-22, the WDFW also identifies areas that priority species occupy for important aspects of their life cycle (e.g., breeding areas) or areas that support relatively high numbers of individuals (e.g., regular large concentrations). The Wahkiacus study area includes areas mapped by WDFW as habitat for Klickitat River bald eagles (regular concentrations), Columbian black tail deer winter range, and western gray squirrel nest areas (WDFW 2010a).

Klickitat River Bald Eagle Habitat

The riparian areas along the Klickitat River are important for bald eagles for foraging, roosting, and nesting. However, as previously noted, there are no known roosts or nests in the study area (HDR 2009). Bald eagles have been observed in the study area by Yakama Nation staff working at the Wahkiacus field office, and WDFW has mapped the area as a regular concentration area for Klickitat River bald eagles.

Columbian Black Tail Deer Winter Range

Columbian black tail deer are managed as game species by the WDFW. They prefer brushy, logged lands and coniferous forests (WDFW 2010a). During the winter, they move to lower elevation areas where cover can prevent snow from accumulating beyond 12 inches, although they can cope with snow up to 24 inches if not dense or crusty (Snyder 1991). The Wahkiacus study area is located at a lower elevation where snow levels are moderated by the proximity to the Klickitat River, making the study area acceptable winter range for Columbian black tail deer.

Western Gray Squirrel Nest Areas

The WDFW identifies the study area as a western gray squirrel nesting area. There are no documented western gray squirrel nests in the area of disturbance (e.g., area proposed for temporary and permanent grading and clearing) but there are approximately sixteen documented nests in the study area (BPA 2010). In Klickitat County, the highest concentration of squirrels is along the Klickitat River in areas where oak woodlands and pine forests converge. The squirrels in the Klickitat River Subbasin prefer nesting in pines but have been found nesting in fir and oaks (Linders and Stinson 2007). As the primary habitat in the study area is Oregon white oak with a few pines, the study area is suitable for this species.

3.6.1.2 Klickitat Hatchery Study Area

The Klickitat Hatchery study area includes open maintained lawns with a narrow sparsely forested riparian area and forested edge habitat adjacent to a mature Douglas fir forest. Small seeps are present on the north side of the Klickitat River. The riparian areas in the study area and the adjacent mature forest are important habitat types in the Klickitat River subbasin and provide opportunities for forage, nesting, and cover habitat for ponderosa pine and Oregon white oak habitat and common species (Yakama Nation 2004b). Common species that may occur in the Klickitat Hatchery study area are similar to those described previously for the Wahkiacus study area. In addition, mountain lions have been observed denning on the north side of the river (HDR 2009). Tribal biologists have documented numerous species at the site, including rough skinned newt, coastal tailed frog, western toad, pacific tree frog, cascades frog, several bat species, including myotis species, black bear, coyote, bobcat, wolverine, striped skunk, river otter, mule deer, elk, mountain goat, Douglas squirrel, Northern flying squirrel, Townsend’s chipmunk, porcupine, bushy tailed woodrat, snowshoe hare, pika, rubber boa, gopher snake, and garter snakes. Numerous bird species have also been observed, including sharp-shinned hawk, Cooper’s hawk, northern goshawk, red-tailed hawk, blue grouse, several owl species, Vaux’s swift, hairy woodpecker, pileated woodpecker, northern red shafted flicker, several jay species, raven, songbird species, bald eagle, golden eagle, killdeer, spotted sandpiper, common nighthawk, and belted kingfisher (Nuetzmann 2010).

The Klickitat Hatchery Complex contains several buildings and other hatchery facilities that are used daily by tribal staff, which affects habitat quality at the Klickitat Hatchery Complex. The level of human activity is moderate but would be sufficient to deter sensitive wildlife species. Other species have adapted to the activity and use the site. The habitat at the Klickitat Hatchery Complex lacks structural diversity and plant species richness to support an array of wildlife. Traffic on the site access roads is minimal and may deter some species from migrating, but most species would continue to migrate through the adjacent habitat areas. The site is connected on all sides to undisturbed, primarily forest habitats. This creates a large migratory corridor along the riparian area and into the uplands for both small and large wildlife species.

No bald or golden eagle nests are documented within 660 feet or line of site of the study area; therefore, no restrictions on activities will be required under the Bald and Golden Eagle Protection Act. Nor would there be restrictions under Washington's Bald Eagle Protection Law because there are no bald eagle nests or communal roosts within 0.25 mile of the study area.

Priority Species

WDFW priority species and associated habitats in Klickitat County are listed in Appendix D (WDFW 2008). Federally-listed threatened and endangered species are addressed in Section 3.7.

Tribal biologists have observed western toad, big brown bat, myotis bat, marten, wolverine, Rocky Mountain mule deer, elk, northern goshawk, spotted owl, Vaux's swift, pileated woodpecker, bald eagle, and golden eagle in the Klickitat Hatchery study area (Nuetzmann 2010). Based on observations of habitat in the study area during the August 2009 site visit, priority species likely to be present are those species with habitat requirements in riparian areas, mature conifer forests, and nearly flat terrain at low to mid elevations. These species are listed in Table 3-23.

Table 3-23: State Priority Species That May Be Present in the Klickitat Hatchery Study Area

Common Name	Scientific Name
Northern Leopard Frog	*Rana pipiens*
Western Toad	*Anaxyrus boreas*
Black-crowned Night-heron	*Nycticorax nycticorax*
Great Blue Heron	*Ardea herodias*
Cavity-nesting ducks	----
Harlequin Duck	*Histrionicus histrionicus*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Goshawk	*Accipiter gentilis*
Peregrine Falcon	*Falco peregrinus*
Spotted Owl	*Strix occidentalis*
Flammulated Owl	*Otus flammeolus*
Vaux's Swift	*Chaetura vauxi*
Mountain Quail	*Oreortyx pictus*
Ring-necked Pheasant	*Phasianus colchicus*
Wild Turkey	*Meleagris gallopavo*
Lewis' Woodpecker	*Melanerpes lewis*
Pileated Woodpecker	*Dryocopus pileatus*
White-headed Woodpecker	*Picoides albolarvatus*
Black-backed Woodpecker	*Picoides arcticus*
Roosting Concentrations of: Big-brown Bat, Myotis bats, Pallid Bat	----
Townsend's Big-eared Bat	*Corynorhinus townsendii*
Columbian Black-tailed Deer	*Odocoileus hemionus columbianus*

Table 3-23: State Priority Species That May Be Present in the Klickitat Hatchery Study Area

Common Name	Scientific Name
Elk	*Cervus elaphus*
Marten	*Martes americana*
Fisher	*Martes pennanti pacifica*
Wolverine	*Gulo gulo*
Rocky Mountain Mule Deer	*Odocoileus hemionus hemionus*
Western gray squirrel	*Sciurus griseus*

The Klickitat Hatchery study area includes areas mapped by WDFW as habitat for Klickitat River bald eagles (regular concentrations), black tail deer winter range, and Rocky Mountain and Roosevelt elk winter range (BPA 2010).

Klickitat River Bald Eagle Habitat

The Klickitat Hatchery study area is mapped by WDFW as a regular concentration area for Klickitat River bald eagles. Bald eagles likely use the area for foraging. There are no known nests or communal roosts present in the study area. Roosting and nesting habitat is present in the study area but the Klickitat Hatchery Complex itself lacks the necessary large diameter trees and mature forest.

Columbian Black Tail Deer Winter Range

Columbian black tail deer prefer brushy, logged lands, and coniferous forests and move to lower elevation areas in winter. The Klickitat Hatchery Complex is an open area with daily human activity that would deter use by Columbian black tail deer. The adjacent forest is located at a lower elevation where snow levels are moderated by the proximity to the Klickitat River, which would make it suitable for winter foraging.

Rocky Mountain Elk and Roosevelt Elk Winter Range

Rocky Mountain Elk and Roosevelt Elk are managed as game species by the WDFW. Ideal elk habitat includes productive grasslands, meadows, or clearcuts, interspersed with closed-canopy forests. They are hardy animals and typically choose cover only during extreme weather. During the winter months, elk eat primarily grasses that are available and not covered by deep snow but will also gnaw on aspen or other deciduous tree trunks (WDFW 2005). They typically move into lower valleys and denser vegetation, such as mature forests, during the winter months (Blejwas 2008). The study area's lower elevation and proximity to the Klickitat River moderate the effects of winter relative to surrounding habitat at higher elevations. The open habitat and human activity at the Klickitat Hatchery Complex do not make it ideal for winter range for elk; however, the adjacent mature forest areas would provide winter range for the species.

3.6.1.3 McCreedy Creek Study Area

The McCreedy Creek study area is located in a mature Douglas fir forest in the upper reaches of the Klickitat River subbasin. The riparian areas in the study area, forested wetlands, and the adjacent mature forest are important habitat types in the Klickitat River subbasin and provide opportunities for forage, nesting, and cover habitat for Douglas fir habitat and common species (Yakama Nation 2004b). Common species that may occur in the study area are similar to those described for the Wahkiacus and Klickitat Hatchery study areas.

Tribal biologists have documented numerous species at the site, including rough skinned newt, coastal tailed frog, western toad, pacific tree frog, cascades frog, several bat species including myotis species, black bear, coyote, bobcat, mountain lion, striped skunk, river otter, mule deer, elk, Douglas squirrel, Northern flying squirrel, Townsend’s chipmunk, porcupine, bushy tailed woodrat, snowshoe hare, rubber boa, gopher snake, and garter snakes. Wolverine, mountain goat, and pika have also been observed near the site. Numerous bird species have also been observed, including sharp shinned hawk, Cooper ’s hawk, northern goshawk, red tailed hawk, blue grouse, several owl species, Vaux’s swift, hairy woodpecker, pileated woodpecker, northern red shafted flicker, several jay species, raven, songbird species, bald eagle, golden eagle, killdeer, spotted sandpiper, common nighthawk, and belted kingfisher (Nuetzmann 2010).

The site of the proposed facilities is used infrequently by humans and is primarily undisturbed habitat. The adjacent gravel road is used daily by tribal members and provides an impediment to migratory species, but the study area is connected both up and downstream of the Klickitat River to a wide riparian corridor that provides connectivity between terrestrial and aquatic habitats for a multitude of wildlife species. Vegetation and habitat types are diverse and the study area contains large woody debris and other features that contribute to structural diversity able to support a multitude of wildlife species.

No eagle nests are documented within 660 feet or line of site of the study area; therefore, no restrictions on activities under the Bald and Golden Eagle Protection Act will be required. The McCreedy Creek study area is located on tribal land and is not subject to state law; therefore, the state Bald Eagle Protection Law does not apply.

Priority Species

The McCreedy Creek study area is located on tribal land and is not subject to state law; therefore, priority species governed by the WDFW were not assessed for the site.

3.6.2 Environmental Consequences

For purposes of this EIS, the intensity of impacts to wildlife resources are categorized as follows:

> ***Minor***: Impacts to native wildlife, their habitats, or the natural processes sustaining them would occur on the project site. Small changes to population numbers, population structure, and other demographic factors might occur. Sufficient habitat would remain functional to maintain viability of all species.
>
> ***Moderate***: Impacts to native wildlife, their habitats, or the natural processes sustaining them would occur on the project site and possibly in the surrounding area. Changes to population, population structures, genetic variability, and other demographic factors would occur, but species would remain stable and viable.

Sufficient habitat would remain functional to maintain viability of all native species.

Major: Impacts on native wildlife, their habitat, or the natural processes sustaining them would occur. Population numbers, population structure, genetic variability, and other demographic factors would experience large changes that could affect species viability. Loss of habitat might affect the viability of at least some native species.

3.6.2.1 Alternative 1 – No Action Alternative

Under Alternative 1, no new construction would occur in the study areas of the three project sites and habitats or vegetation would not be altered. Natural succession would continue in areas not maintained. Existing human disturbance would continue but species that have adapted to these disturbances would continue to use the study area.

3.6.2.2 Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

Construction

Vegetation will be permanently removed (i.e., area paved over), thereby removing 2.2 acres of habitat for local wildlife species described in the affected environment and further disturbing and fragmenting habitat corridors. The result would be a decrease in available habitat to support wildlife species, creating a direct, adverse, minor, long-term effect on wildlife species occurring at the project site. Most individuals would be displaced locally, making use of adjacent similar habitat in the immediate vicinity. Long term operation of the facility would result in increased daily activity levels; however, species use in the study area is not expected to change from current levels as those species tolerant of daily disturbance would continue to use the site if habitat remains or is replaced, and more sensitive species would avoid the area.

The direct effects of project construction on wildlife would be short term and would vary by species. Wildlife that is highly mobile, such as deer and birds, would likely avoid the site during construction, experiencing only minor adverse effects in the local area of construction. Less mobile species, such as amphibians and reptiles, would potentially experience major site-specific adverse effects from construction. Accidental fuel and oil tank leaks and improperly disposed stormwater would enter vegetated areas and damage plants and wildlife for minor, indirect, short-term local adverse impacts. Implementing BMPs would minimize these effects.

Construction effects on resident wildlife would be caused by noise associated with construction activities (e.g., clearing and grading, excavation) and noise associated with construction equipment moving to and from the project site. Ambient noise levels for this site were not measured but are estimated to be 35 to 40 decibels (dB), which is typical for a rural area (see Section 3.11.2). The sound produced by typical construction equipment ranges from 80 to 90 dB at 50 feet. Sound from a point source attenuates by about 7.5 dB as distance doubles (WSDOT 2010). Based on this formula, construction noise would be heard above ambient noise levels within a mile of the site (Table 3-24). Topography and vegetation absorb sound; therefore, the extent of construction noise impacts would likely be reduced because of the dense vegetation surrounding the site. However, for purposes of this analysis, the calculated mile distance is used. The effects of construction noise would result in avoidance of the site by wildlife. Wildlife displaced during construction would likely return and use the site on completion of construction, as vegetation is re-established. Construction noise is expected to have direct moderate, short-term, local adverse effect on wildlife.

Table 3-24: Noise Attenuation

Distance (feet)	Construction Noise (-7.5 dB)	Existing Ambient Sound (dB)
50	90	40
100	82.5	40
200	75	40
400	67.5	40
800	60	40
1,600	52.5	40
3,200	45	40
6,400	37.5	40

The potential project effects described for common species would be similar for priority species. Based on the analysis, the overall project construction at Wahkiacus would have a minor effect on wildlife species.

Operational

During operations of the facility, wildlife sensitive to human disturbance would avoid the site. As the existing facility is currently used daily, wildlife that use this part of the site are adapted to daily activities. Overall operations are not expected to disrupt critical foraging, roosting, or nesting behaviors. As a result, direct impacts from operations at Wahkiacus would have a minor, long-term, local adverse impact on wildlife species.

The potential project effects described for common species would be similar for priority species. Based on the analysis, the overall project operations at Wahkiacus would have a minor effect on wildlife species.

Indirect impacts during operations would also include accidental fuel and oil tank leaks that could enter vegetated areas and damage plants and wildlife for minor, short-term local adverse impacts.

Klickitat Hatchery Study Area

Construction

Vegetation will be permanently removed (i.e., area paved over), thereby removing 2.3 acres of habitat for local wildlife species described in the affected environment and further disturbing and fragmenting habitat corridors. The result would be a decrease in available habitat to support wildlife species, creating a direct, adverse, minor, long-term effect on wildlife species occurring at the project site. Most individuals would be displaced locally, making use of adjacent similar habitat in the immediate vicinity. Long term operation of the facility would result in increased daily activity levels; however, species use in the study area is not expected to change from current levels as those species tolerant of daily disturbance would continue to use the site if habitat remains or is replaced, and more sensitive species would avoid the area.

The direct effects of project construction on wildlife would be short term and would vary by species. Wildlife that is highly mobile would likely avoid the site during construction, experiencing only minor adverse effects in the local area of construction. Less mobile species would potentially experience major site-specific adverse effects from construction. Accidental fuel and oil tank leaks and improperly disposed stormwater could enter vegetated areas and damage plants and wildlife for minor, indirect, short-term local adverse impacts. Implementing BMPs would minimize these effects.

Construction effects on resident wildlife would be caused by noise associated with construction activities and construction equipment moving to and from the project site. As described for the Wahkiacus site, ambient noise levels are estimated to be 35 to 40 dB. Construction equipment is expected to produce sound from 80 to 90 dB at 50 feet. This results in noise levels above ambient levels within a mile of the site (Table 3-24). The effects of construction noise would result in avoidance of the site by wildlife. Wildlife displaced during construction would likely return and use the site on completion of construction, as vegetation is re-established. Construction noise is expected to have direct moderate, short-term, local adverse effect on wildlife.

Operational

During operations of the facility, wildlife sensitive to human disturbance would avoid the site similar to current conditions. As the Klickitat Hatchery Complex is currently used daily, wildlife that use the site are adapted to daily activities and operations are not expected to disrupt critical foraging, roosting, or nesting behaviors. As a result, direct impacts from operations would have a minor, long-term, local adverse impact on wildlife species.

The potential project effects described for common species would be similar for priority species. Based on the overall analysis, project operations at the Klickitat Hatchery would have a minor effect on wildlife species.

Indirect impacts during operations could also include accidental fuel and oil tank leaks that would enter vegetated areas and damage plants and wildlife for minor, short-term local adverse impacts.

McCreedy Creek Study Area

Construction

Vegetation will be permanently removed, thereby removing 1.4 acres of habitat for local wildlife species described in the affected environment and further disturbing and fragmenting habitat corridors. The result would be a decrease in available habitat to support wildlife species, creating a direct, adverse, minor, long-term effect on wildlife species occurring at the project site. Most individuals would be displaced locally, making use of adjacent similar habitat in the immediate vicinity. As with the other sites, the direct effects of project construction on wildlife would be short term (less than 6 months) and would vary by species. Wildlife that is highly mobile would likely avoid the site during construction, experiencing only minor adverse effects in the local area of construction. Less mobile species would potentially experience major site-specific adverse effects from construction. Accidental fuel and oil tank leaks and improperly disposed stormwater could enter vegetated areas and damage plants and wildlife for minor, indirect, short-term local adverse impacts. Implementing BMPs would minimize these effects.

Construction effects on resident wildlife would be caused by noise associated with construction activities and construction equipment moving to and from the project site. As described for the Wahkiacus site, ambient noise levels are estimated to be 35 to 40 dB. Construction equipment is expected to produce sound from 80 to 90 dB at 50 feet. This results in noise levels above ambient levels within a mile of the site (Table 3-24). The effects of construction noise would result in avoidance of the site by wildlife. Wildlife displaced during construction would likely return and use the site on completion of construction, as vegetation is re-established. Construction noise is expected to have direct moderate, short-term, local adverse effect on wildlife.

Operational

During operations of the facility in March through May, wildlife sensitive to human disturbance would avoid the site and return following operations. As a result, direct impacts from annual operations at the McCreedy Creek site would have a minor, short-term, local adverse impact on wildlife species.

Based on the analysis, the overall project operations at the McCreedy Creek site would have a minor effect on wildlife species. Indirect impacts during operations could also include accidental fuel and oil tank leaks that would enter vegetated areas and damage plants and wildlife for minor, short-term local adverse impacts.

3.6.2.3 Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

No construction of facilities or other disturbances would occur in the Wahkiacus study area as a result of Alternative 3; therefore, no impacts to wildlife would occur.

Klickitat Hatchery Study Area

Impacts resulting from Alternative 3 would be the same as those described for Alternative 2.

McCreedy Creek Study Area

Impacts resulting from Alternative 3 would be the same as those described for Alternative 2.

3.6.3 Mitigation Measures

To further minimize and mitigate for impacts to wildlife, the project would incorporate the following measures:

- Clean work areas would be maintained with proper litter control and sanitation to prevent wildlife attraction.
- A revegetation plan would be developed for the site to restore native plant communities, provide wildlife habitat, and reduce the risk of weed encroachment.

3.7 Threatened and Endangered Species

3.7.1 Affected Environment

3.7.1.1 Columbia River Bull Trout

The USFWS issued a final rule listing the Columbia River and Klamath River populations of bull trout as a threatened species under the ESA on June 10, 1998 (63 FR 31647). Bull trout were estimated to historically occupy about 60 percent of the Columbia River Basin, and presently occur in 45 percent of their historical range (63 FR 31647). The Klickitat River and all its tributaries are identified as a core area within the Lower Columbia River unit.

Bull Trout in the Klickitat River Subbasin

Bull trout have been documented to occur in the Klickitat River mainstem downstream Castile Falls and, therefore, downstream of McCreedy Creek; however, their occurrence is infrequent. Most of the confirmed captures of bull trout in the Klickitat River subbasin are resident fish in the West Fork (RM 63) and its tributaries. Not far up the West Fork is a series of waterfalls, which is an impassible barrier to upstream migration for most of the summer, but may not be impassible year round. Resident fish may be flushed out of the upper West Fork to live in the mainstem or, with high fall freshets, mainstem fish may access the upper basin to spawn and return later in winter or spring (Byrne 2010).

With the exception of a resident West Fork bull trout population, only a few bull trout (less than 20) have been reported in the Klickitat River and only about half of these were reported below the confluence of the West Fork and the mainstem Klickitat River at RM 63.

Gray (2006, 2010) compiled all known references to bull trout in the Klickitat River and reported that the presence of relatively large bull trout suggests that some individuals identified in the Klickitat River subbasin may exhibit a migratory life history, either fluvial (i.e., migrations within the Klickitat system), or adfluvial (i.e., migrations to Bonneville Reservoir from the Klickitat River). Another possibility is that the few larger and potential migratory bull trout observed in the lower Klickitat River may actually be from other nearby local populations, such as from the Hood River subbasin where migratory bull trout have been documented (USFWS 2002). It is feasible that Hood River fish could also be accessing the Klickitat River as a foraging area (Byrne 2010).

Bull trout timing and use of the Klickitat River is shown in Table 3-25. The mainstem Klickitat River primarily serves as a migratory corridor for adult and subadult bull trout (Byrne 2010, WDFW 2010).

Table 3-25: Typical and Approximate Timing of Bull Trout Occurrence in the Klickitat River Subbasin

Species/Migration	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Adult migration[1]												
Spawning[2]												
Juvenile Rearing												

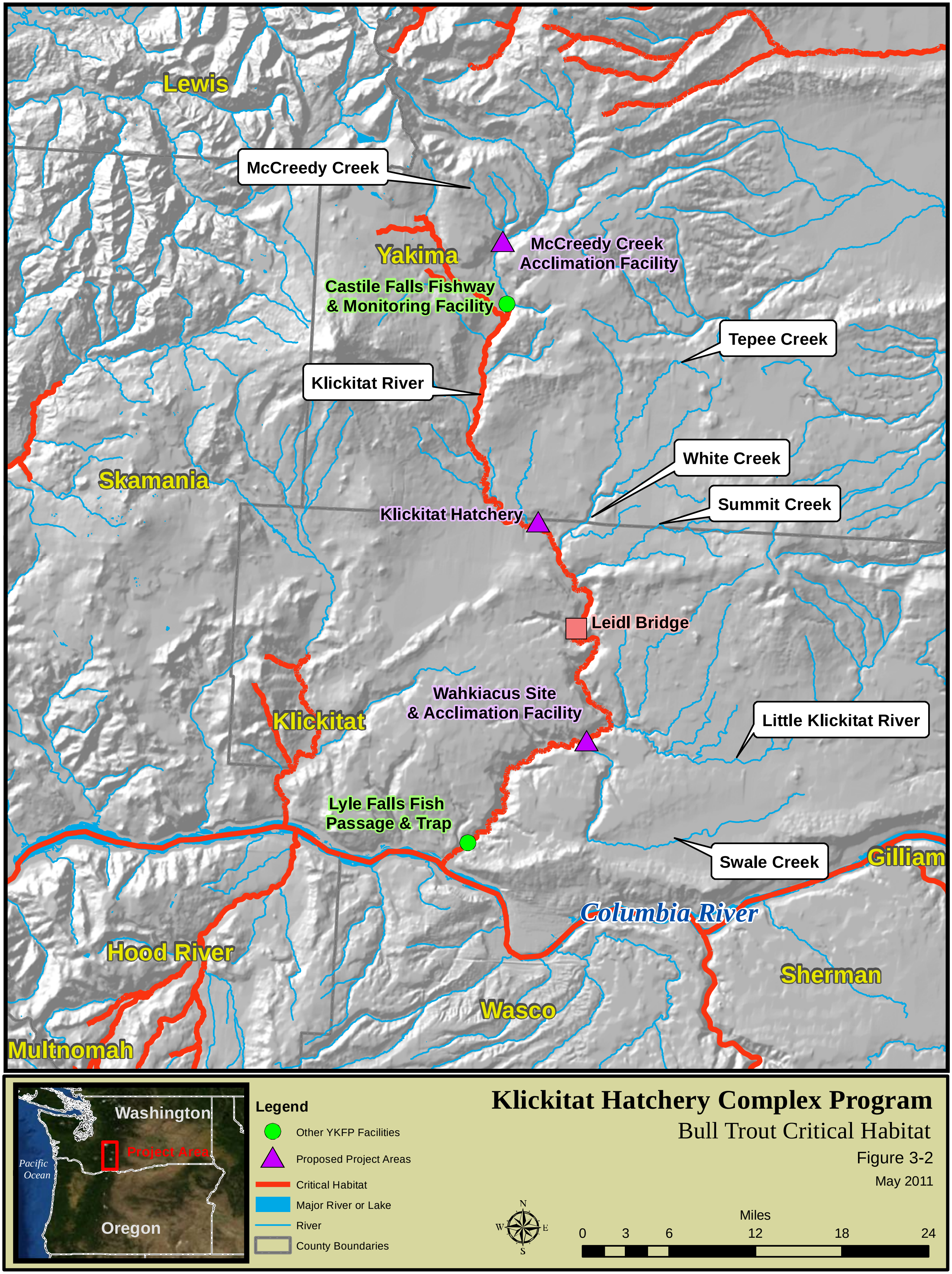
[1] *Resident bull trout occur primarily in West Fork; likely use the mainstem Klickitat River as a migration corridor.*

[2] *Information based on Yakima River stocks. Timing specific to Klickitat River is unavailable. Most Yakima River stocks migrate to their spawning grounds between June and July with spawning beginning as early as late August and extending to as late as mid-December (USFWS Recovery Plan 2002, Wydoski & Whitney 2003).*

Bull Trout Critical Habitat in the Subbasin

Within the Klickitat River subbasin, designated critical habitat includes the mainstem from its confluence with the Columbia River up to Castile Falls at RM 64, portions of the West Fork Klickitat River, Fish Lake Stream, and an unnamed tributary, Two Lakes Stream, Little Muddy Creek, and Trappers Creek (Figure 3-2). These areas were deemed to be the only areas that contain physical and biological features considered essential to the conservation of the species (USFWS 2010a).

The Klickitat River is essential to bull trout conservation because the headwater resident population represents a possible refugium for the species in the lower Columbia region. The Klickitat River is the only undammed system with access for fluvial bull trout (USFWS 2010b). The West Fork Klickitat River and its tributaries within the Yakama Indian Reservation support the only known bull trout local population in the Klickitat drainage (USFWS 2010b).


Lewis
McCreedy Creek
Yakima
McCreedy Creek
Acclimation Facility
Castile Falls Fishway
& Monitoring Facility
Tepee Creek
Klickitat River
White Creek
Summit Creek
Skamania
Klickitat Hatchery
Leidl Bridge
Wahkiacus Site
& Acclimation Facility
Klickitat
Little Klickitat River
Lyle Falls Fish
Passage & Trap
Swale Creek
Gilliam
Columbia River
Hood River
Sherman
Wasco
Multnomah
Washington
Project Area
Pacific
Ocean
Oregon
Legend
Other YKFP Facilities
Proposed Project Areas
Critical Habitat
Major River or Lake
River
County Boundaries
Klickitat Hatchery Complex Program
Bull Trout Critical Habitat
Figure 3-2
May 2011
N
W
E
S
Miles
0 3 6 12 18 24

3.7.1.2 Middle Columbia River Steelhead

The MCR steelhead DPS was federally listed as threatened in 1999, and this status was reaffirmed in 2006 (71 FR 834). The MCR steelhead DPS includes all naturally-spawned anadromous steelhead populations (summer and winter) below natural and manmade impassable barriers in streams that include the Klickitat River. Natural steelhead production in the Klickitat River subbasin is severely reduced due to harvest (which on average takes about 76 percent of returning adults between the sport and tribal fisheries; Yakama Nation 2004a) and tributary habitat degradation by land uses, such as grazing and water withdrawals (WSCC 1999). Hatchery summer steelhead in the Klickitat subbasin are not included in the listed DPS.

Steelhead in the Klickitat River Subbasin

The Klickitat River supports both summer and winter steelhead native stocks (WDFW 2002). Steelhead returning from November through April are classified as winter stock (peak returns are typically Jan/Feb); steelhead returning from May through October are summer stock (peak returns are typically June and July). This determination is primarily based on thermal water regimes of the Klickitat River and scale analysis of fish sampled at the Lyle Falls fishway (Gray 2007). The run-timing of naturally-produced summer steelhead is extensive in the Klickitat River subbasin, and at least a few adult fish enter the river every month of the year (Yakama Nation 2004b). Table 3-26 depicts the timing of various life history stages for natural-origin summer and winter steelhead in the Klickitat River subbasin.

Table 3-26: Typical and Approximate Timing of Specific Life Stages of Natural-Origin Summer and Winter Steelhead in the Klickitat River Subbasin

Species/Migration		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Steelhead – Middle Columbia DPS													
Summer Steelhead (native)	Adult Migration												
	Holding												
	Spawning												
	Juvenile Migration												
	Juvenile Rearing												
Winter Steelhead (native)	Adult Migration												
	Holding												
	Spawning												
	Juvenile Migration												
	Juvenile Rearing												

Source: Run timing based on Gray (2006); BPA 2008; and Costello (2011)

Summer steelhead typically spawn in the mainstem Klickitat River between RM 5 and RM 50 (Yakama Nation 2004a), and redds have been documented in tributaries, including Tepee Creek, White Creek, Dead Canyon Creek, Summit Creek, Little Klickitat River, Swale Creek, and Snyder Creek (Yakama Nation 2009a). It is believed that winter steelhead spawn in the lower mainstem, perhaps as far upstream as Castile Falls (RM 64) (WDFW 2002). With the exception of 2005 when two redds were observed, no steelhead redds were observed during Yakama Nation steelhead spawning surveys conducted from 1990 to 2009 in the upper Klickitat River subbasin, from Castile Falls to McCormick Meadows (RM 85) (Sharp 2010a). Recent years of observations show that mainstem steelhead spawning is concentrated between the Little Klickitat (RM 20.44) and Leidl Bridge (RM 32); however, it is difficult to differentiate between the spawning distributions of the two populations (NMFS 2008b).

Steelhead fry typically emerge from April through mid-June (Myers et al. 2003), and migrate to the ocean from early spring through June after 2 to 3 years of rearing in freshwater. Juvenile steelhead are assumed to rear in all areas where spawning occurs (WSCC 1999). Smoltification and outmigration in the Klickitat River occurs from March through June (Yakama Nation 2008d), peaking in May (WICK 1999).

Hatchery-origin summer steelhead (Skamania stock) juveniles have been released into the Klickitat River annually since 1960. Concerns exist regarding potential genetic introgression between hatchery and natural-origin fish (WDFW 2002). Hatchery summer steelhead abundance exceeds that of natural-origin fish.

Potential effects to natural steelhead populations associated with the current hatchery production program include:

- Genetic mixing.
- Reduction in natural population genetic diversity.
- Alteration of juvenile and adult run-timing and age structure.
- Direct juvenile competition and predation (hatchery predation on wild juveniles).
- Competition and predation on other anadromous species.
- Increased disease risks to native fish stocks from importation of stocks from outside the Klickitat Subbasin.

The HSRG (2009a) determined there is currently insufficient information to determine the effects of ongoing hatchery releases on the natural steelhead population and, while it is likely that hatchery hybridization of Skamania stock with wild steelhead has occurred in the Klickitat subbasin (Yakama Nation 2004b), the level of impact on the natural population is unknown. The ICTRT (2007) reported that it is very likely that the hatchery contribution rate to natural steelhead spawning in the Klickitat subbasin has exceeded 5 percent for more than four generations. However, Narum et al. (2006) argued that about 4 percent of the naturally-produced steelhead could be attributed to the hatchery stock, and that genetic integrity and variation of native Klickitat River steelhead have been maintained despite long-term hatchery introductions. Berejikian and Ford (2004) estimated that the nonlocal Skamania Hatchery summer steelhead are less than 30 percent as effective as the naturally-produced steelhead in producing returning adults.

Steelhead Critical Habitat in the Klickitat River Subbasin

The Klickitat River, Swale Creek, and McCreedy Creek are included in the critical habitat designation as part of the Klickitat River subbasin (70 FR 52630). Important elements of designated critical habitat that are present in the subbasin include spawning sites, rearing sites, and migration corridors. Critical habitat for MCR steelhead in the Klickitat River and associated tributaries is defined by the ordinary high water mark of the wetted channel.

3.7.1.3 Wahkiacus Study Area

In general, the study area for the assessment of potential impacts on terrestrial threatened and endangered (T&E) species is defined as the area of potential project disturbance, including construction access and staging areas.

The USFWS has identified several terrestrial T&E species that may occur in Klickitat County (USFWS 2008b). Of those species, only one has the potential to occur in the Wahkiacus study area: Ute ladies'-tresses. No critical habitat has been designated.

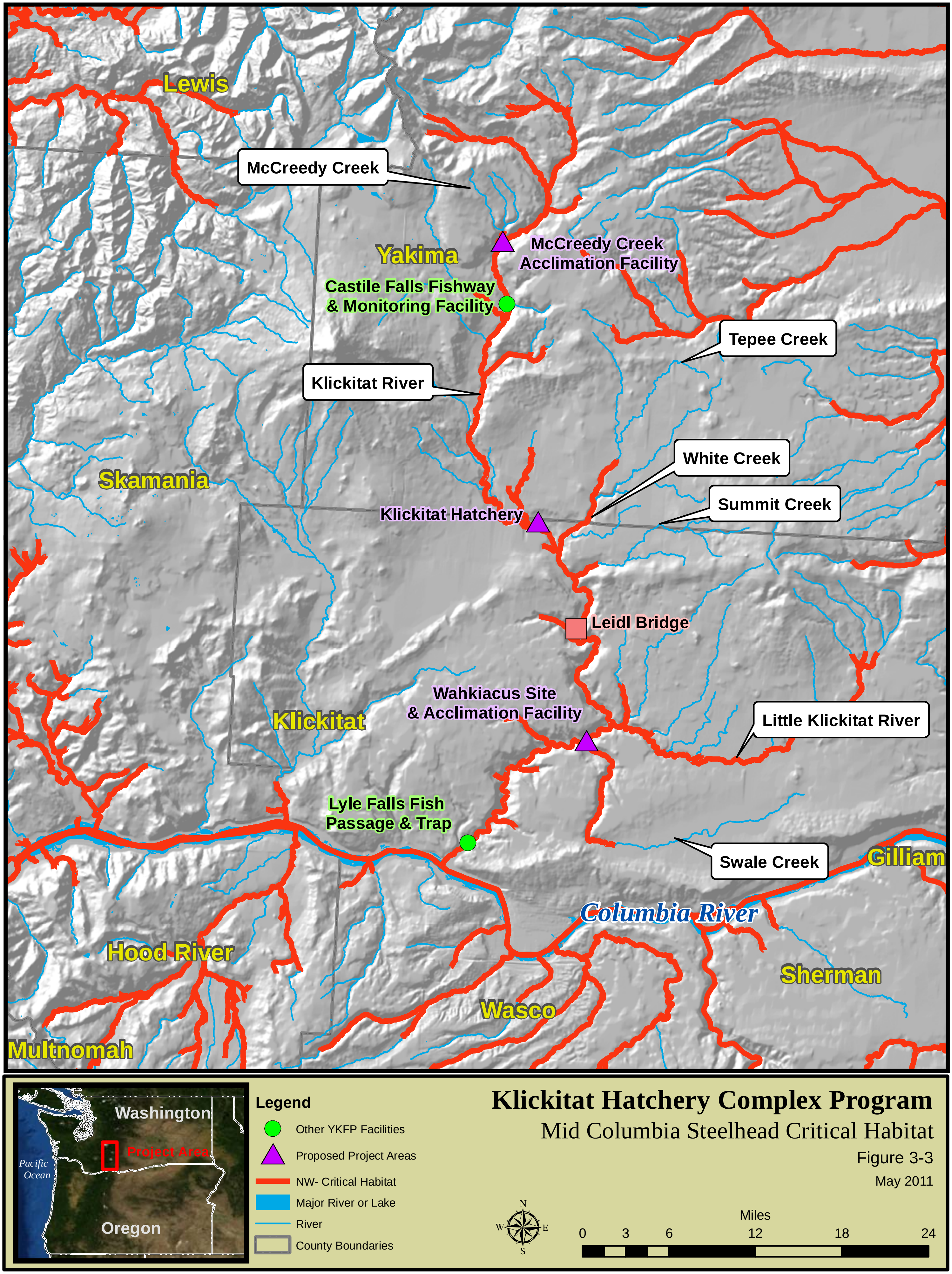
The project study area at this location for site-specific habitat effects analysis on aquatic T&E species encompasses the mainstem Klickitat River from approximately 500 feet downstream of the Horseshoe Bend Road bridge to the confluence with Swale Creek. The study area also includes Swale Creek from the confluence with the Klickitat River upstream to approximately RM 0.5.

Columbia River Bull Trout

Jim Byrne (2010) stated there are documented captures of bull trout adults in the Leidl Bridge area (RM 32), as well as the reach of the mainstem downstream of the Klickitat Hatchery to the Wahkiacus project site. Collected fish have typically been relatively large in size (indicating fluvial or adfluvial life histories), although it is unknown if they are Klickitat River natives, or out–of-basin fish that are foraging in the Klickitat River mainstem. These captures appear to be infrequent, though the potential presence of adult bull trout in the Wahkiacus study area cannot be discounted. Bull trout young of the year would occupy the smaller headwater streams of the subbasin, and are not likely present in the mainstem Klickitat River (Byrne 2010).

Middle Columbia River Steelhead

In April and May, steelhead occasionally spawn in the Klickitat River at the Wahkiacus study area. Steelhead holding occurs there in the summer and fall months (Sharp 2010a), and juvenile steelhead rearing occurs there year-round. SalmonScape (2010) indicates that steelhead spawn in Swale Creek, which is designated as Critical Habitat (Figure 3-3), and identified as minor spawning habitat for MCR steelhead. Low flow may limit the duration and extent of usage in the creek as portions are partially or completely dry in most years during low flow summer periods. Portions of the creek upstream of proposed project activities are listed on WDOE's 303d list for temperature, which exceeds the 18^{o}C temperature criterion for steelhead critical habitat (NMFS 2009). Degraded habitat quality and quantity, altered sediment routing, disease, competition, predation, and degraded channel structure and complexity are also potential limiting factors within Swale Creek (NMFS 2009).



Klickitat Hatchery Complex Program

Mid Columbia Steelhead Critical Habitat

Figure 3-3

May 2011

Ute ladies' tresses

Ute ladies'-tresses is a perennial orchid that is listed as threatened by the USFWS and endangered by WDNR. This species occurs along riparian edges, gravel bars, old oxbows, high flow channels, and wet-to-moist meadows near perennial streams, and prefers moist soil conditions in low vegetation areas. To date, surveys have observed this species between 720 to 1,830 feet elevation in Washington and in higher elevations in other states. The species has been documented in the Okanogan area and along the Columbia River in north central Washington but not in Klickitat County (Fertig et al 2005). The Wahkiacus study area is below 720 feet elevation but does contain a wetland that provides nearly year round hydrology that would possibly support this species. Site investigations conducted in late summer did not observe this species but did observe hooded ladies'-tresses, a common species of this genus.

3.7.1.4 Klickitat Hatchery Study Area

In general, the study area for the assessment of potential impacts on terrestrial T&E species is defined as the area of potential project disturbance, including construction access and staging areas.

At the Klickitat Hatchery site, the study area is defined by the potential project disturbance, including construction access and staging areas, as well as the extent of noise impacts for northern spotted owls. As a result of construction noise, the study area is a radius of 3,200 feet from the approximate middle of the area of disturbance.

Two terrestrial T&E species under the jurisdiction of USFWS have the potential to occur in the Klickitat Hatchery study area: northern spotted owl and gray wolf.

The project study area at this location for site-specific habitat effects analysis for aquatic species encompasses the mainstem Klickitat River from approximately 100 feet upstream of the existing gravity river water intake to approximately 300 feet downstream of the outfall for the Wonder Springs Pond.

Columbia River Bull Trout

Jim Byrne (2010) reported that large bull trout were fairly consistently observed by Yakama Nation staff at a screw trap positioned at Klickitat Hatchery in 1999 and 2000. Apparently, the fish would forage on captured fish from the trap during the smolt outmigration season from spring to early summer. These fish are likely fluvial or adfluvial individuals from outside of the Klickitat River subbasin. Use of mainstem habitat in the vicinity of the Klickitat Hatchery is primarily limited to migratory movements, though it is apparent they take advantage of a seasonal foraging opportunity at the hatchery screw trap. Juvenile rearing in mainstem habitat adjacent to the hatchery is unlikely.

Middle Columbia River Steelhead

In the diversion reach from the intake to outfall at the Klickitat Hatchery, steelhead do not typically spawn from June 15 to August 15, though a few steelhead occasionally spawn in these reaches during April and May. Juvenile steelhead rearing occurs in the study area year-round. This area is designated critical habitat (Figure 3-3).

Northern Spotted Owl

The northern spotted owl is listed as threatened by USFWS and endangered by WDFW, and critical habitat has been designated for the species. Northern spotted owls prefer older forested habitats because they contain the structures and characteristics required for nesting, roosting, and foraging. Spotted owls prefer moderate to high canopy closure (60 to 90 percent) with a multilayered canopy and large overstory trees (with diameter at breast height of greater than 30 inches). Forested areas with large trees with deformities (large cavities, broken tops, and mistletoe infections), large snags, or LWD are preferred as well as open space within and below the upper canopy for owls to navigate through the forest.

Northern spotted owl nests have not been documented in the Klickitat Hatchery study area. The nearest critical habitat is located in the Gifford Pinchot National Forest south of Mount Adams 20 miles west of the study area (USFWS 2010c). The Klickitat Hatchery study area is predominantly open, maintained herbaceous areas with patches of forested riparian areas and mature Douglas fir forest. The Douglas fir forest area is contiguous to a larger forest complex that contains many of the preferred habitat features; however, owls generally avoid edge habitat and would be unlikely to use the mature Douglas fir forest in the study area or immediately adjacent to the study area.

Gray Wolf

Gray wolf are listed as endangered by USFWS and WDFW. Sightings of single wolves and single breeding packs have been documented in Pend Oreille and Okanogan Counties, as well as in the Blue Mountains in southeast Washington (Wiles and Allen 2009). Tribal members using the study area have reported sightings of gray wolves but their presence has not been confirmed (Nuetzmann 2009). Gray wolves thrive in a variety of habitats if prey is abundant but they avoid contact with humans (Nature Serve 2010). The study area is open, maintained herbaceous areas with patches of forested riparian areas and mature Douglas fir forest adjacent to a larger forest complex. The adjacent habitat would be suitable for gray wolf but the study area would not be suitable due to the daily use by humans and lack of site use by prey species.

3.7.1.5 McCreedy Creek Study Area

At McCreedy Creek the study area is defined by the potential project disturbance, including construction access and staging areas, as well as the extent of noise impacts for northern spotted owls. As a result of construction noise, the study area is a radius of 3,200 feet from the approximate middle of the area of disturbance.

Of the T&E species likely to occur in Klickitat County, three species have the potential to occur in the McCreedy Creek study area: northern spotted owl, gray wolf, and grizzly bear.

The project study area at this location for site-specific aquatic habitat effects analysis encompasses the mainstem Klickitat River at the confluence with McCreedy Creek. Additionally the study area encompasses McCreedy Creek from the mouth to approximately 850 feet upstream.

Columbia River Bull Trout

Although bull trout use of McCreedy Creek is possible, it has not been documented. In September 2000, WDFW night-snorkeled 200 meters of McCreedy Creek and did not observe bull trout (Byrne et al. 2001). During surveys conducted in 2000, WDFW did not observe any bull trout above Castile Falls; however, recent improvements at the Castile Falls ladder may facilitate upstream passage at the falls, which may contribute to bull trout colonization or re-colonization in the upper Klickitat River subbasin (Byrne 2010). McCreedy Creek was not included in the final designated critical habitat for bull trout.

Middle Columbia River Steelhead

In 2000, WDFW/Yakama Nation conducted snorkel surveys in McCreedy Creek and reported 79 rainbow/steelhead trout. Due to the inherent difficulties in distinguishing between juvenile rainbow trout and steelhead, it is unknown if the juveniles occupying McCreedy Creek in 2000 eventually exhibited the anadromous life history form of steelhead; therefore, the abundance and distribution of federally-listed steelhead in McCreedy Creek is unknown. For the purposes of this analysis, steelhead are assumed to be present in McCreedy Creek. McCreedy Creek is listed as critical habitat (Figure 3-3) and is identified as a major spawning area in the upper mainstem; however, a partial barrier occurs on McCreedy Creek near the mouth of the creek (NMFS 2009).

Northern Spotted Owl

Northern spotted owl nests have been documented in the study area 0.65 miles downstream and 1.2 miles upstream (Nuetzmann 2009). The nearest critical habitat is located in the Gifford Pinchot National Forest south of Mount Adams 25 miles southwest of the study area (USFWS 2010c). The McCreedy Creek study area is mature riparian and Douglas fir forest. It does contain suitable nesting and roosting habitat for Northern spotted owl as well as foraging and dispersal habitat. Spotted owls have been documented in the project area, likely using the site for foraging (Nuetzmann 2009).

Gray Wolf

Tribal members using the study area have reported sightings of gray wolves but their presence has not been confirmed (Nuetzmann 2009). The study area is a forested riparian area within a larger forested ecosystem that would provide habitat for gray wolf. In the winter months, the site is nearly inaccessible to humans, but during late spring to early fall the site is used frequently. The frequent disturbance by humans would deter gray wolves from using the site regularly late spring through early fall.

Grizzly Bear

Grizzly bear are listed as threatened by USFWS and endangered by WDFW. The population in the north cascades recovery zone of north central Washington is estimated at less than 20 bears (USFWS 2010d). Tribal members using the study area have reported sightings of grizzly bears, but these have not been formally documented (Nuetzmann 2009). Grizzly bears use a variety of habitats but are typically found in mountainous and rural areas in the contiguous United States. The study area is a forested riparian area and is part of a larger forested ecosystem that could provide habitat for grizzly bears. The site is used regularly by humans during late spring to early fall when bears would be active. The frequent disturbance by humans would deter the bears from using the site and make the study area unsuitable for grizzly bears. Therefore, grizzly bears are not expected to occur in the study area.

3.7.2 Environmental Consequences

Thresholds of significance include potential take of listed fish resources or impacts to their associated critical habitat in quantities that could result in jeopardy to the species. These thresholds are unlikely to occur associated with this action; however, potential actions that would result in take include fish salvage operations during in-water work, operation and use of proposed fish ladders at the Wahkiacus and Klickitat facilities (delays to upstream migrants if they enter the facility), loss of aquatic habitat due to new in-water elements, significant loss of LWD or shading along riparian corridor, and the operation of the surface water intake structures at Wahkiacus and Klickitat facilities. Additionally, the potential establishment of the McCreedy Creek facility could result in effects to native fish due to competition for resources and potential predation during smolt outmigration in areas not currently included in the hatchery program.

For purposes of this EIS, the intensity of impacts to threatened and endangered species are categorized as follows:

> ***Minor:*** This impact intensity would equate to a determination of “not likely to adversely affect” under section 7 of the Endangered Species Act.
>
> ***Moderate:*** This impact intensity would equate to a determination of “likely to adversely affect” under section 7 of the Endangered Species Act.
>
> ***Major:*** This impact intensity would result in the “take” of individuals of a listed species to the extent that it would require additional protections.

3.7.2.1 Alternative 1 – No Action Alternative

Wahkiacus Study Area

Under Alternative 1, no new construction would occur in the Wahkiacus study area and habitats or vegetation used by threatened or endangered species would not be altered. Natural succession would continue in areas not maintained. Existing human disturbance would continue but species that have adapted to these disturbances would continue to use the study area. Therefore, no impacts to threatened or endangered species would occur.

Klickitat Hatchery Study Area

Under Alternative 1, no new construction would occur in the Klickitat Hatchery study area and habitats or vegetation used by threatened or endangered species would not be altered. Natural succession would continue in areas not maintained. Existing human disturbance would continue but species that have adapted to these disturbances would continue to use the study area. Therefore, no impacts to terrestrial threatened or endangered species would occur.

Potential effects of Alternative 1 to bull trout and steelhead, and associated critical habitat in the Klickitat Hatchery study area are discussed below.

Columbia River Bull Trout

Under Alternative 1, no new facilities would be built, and fish production programs conducted at the Klickitat Hatchery would continue, including direct releases of hatchery fish from outside the subbasin without the benefit of acclimation. No impacts to bull trout would occur under this alternative.

Middle Columbia River Steelhead

Naturally produced juvenile steelhead present in the mainstem Klickitat River downstream of the Klickitat Hatchery would continue to be vulnerable to predation and competition effects from hatchery coho and fall Chinook salmon releases from the Klickitat Hatchery. Weber and Fausch (2003) indicate that competition from hatchery outplants has potentially decreased the productivity of the juvenile life stages and increased predation of wild juvenile steelhead.

Releases of nonnative Skamania stock hatchery fish in the Klickitat River may be affected and may continue to affect the Klickitat native populations. More data are needed to determine the effects of these hatchery fish on the productivity of the Klickitat populations. The Yakama Nation is conducting research and monitoring to determine these effects. Under this alternative, no adverse effects would occur to steelhead.

McCreedy Creek Study Area

Under Alternative 1, no new construction would occur in the McCreedy Creek study area and habitats or vegetation used by threatened or endangered species would not be altered. Natural succession would continue in areas not maintained. Existing human disturbance would continue but species that have adapted to these disturbances would continue to use the study area. Therefore, no impacts to threatened or endangered species would occur.

3.7.2.2 Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

No terrestrial threatened or endangered species are known to occur at the Wahkiacus Hatchery study area. Federally-listed fish species (bull trout and steelhead) are present in the Wahkiacus Hatchery study area. Potential effects to bull trout and steelhead, and associated critical habitat, are discussed below as related to construction and operation of elements proposed under Alternative 2 in the Wahkiacus Hatchery study area.

Construction

Columbia River Bull Trout

Due to limited abundance of bull trout in the mainstem Klickitat River, it is unlikely that bull trout would be present in the vicinity of in-stream work at the proposed Wahkiacus site during the in-water work window. Potential direct effects to bull trout, if present during in-stream work, could include displacement of individual fish during in-water work, upstream migratory delay, harassment or disorientation associated with increased turbidity, temporary reduction of available in-stream habitat, and potential handling during fish salvage operations associated with in-water work. These effects would be similar to those described for fish and their associated aquatic habitat (see Section 3.4). However, due to the unlikely occurrence of bull trout in the study area during in-stream work, the potential for minor direct adverse effects is unlikely.

In-stream work proposed under Alternative 2 at Wahkiacus site has the potential to affect designated critical habitat, primarily the migratory corridor habitat function. If migratory bull trout are present at the project locations during construction, in-stream work would not prohibit passage around the construction area, but could cause minor, temporary, direct adverse effects due to displacement and migratory delay. Post-construction habitat modification resulting from actions proposed under Alternative 2 is unlikely to result in measurable changes to the migratory corridor in the Klickitat River mainstem. Overall, the construction of Alternative 2 would result in minor direct adverse effects to bull trout.

Middle Columbia River Steelhead

Temporary construction effects to juvenile and adult steelhead associated with the implementation of Alternative 2 would be similar to those described above for bull trout and those described in Section 3.4.

In the Wahkiacus study area, the Klickitat River and Swale Creek are designated as critical habitat for MCR steelhead. Habitat functions that may be affected by in-stream work proposed under Alternative 2 in the study area include spawning, rearing, and migration. Because in-stream work would not take place during steelhead spawning periods, it is likely that habitat utilized for spawning would return to the preconstruction condition prior to the next spawning event. The loss of a minor amount of juvenile rearing habitat would occur due to installation of the surface water intake and facility outfall on the Klickitat River resulting in a minor direct adverse effect to MCR steelhead.

At Swale Creek, a rock chevron or barb would span the channel to route water to the intake structure. Placement of the rock weir would result in the habitat disturbance and effective removal of a small amount of potential steelhead spawning substrate. Direct effects to steelhead critical habitat due to the proposed Swale Creek intake and rock weir would be moderate. Because instream features would be installed in the dry during low flow summer periods, fish salvage may not be necessary. However, if flow is sufficient to support rearing juveniles during construction, fish salvage would result in moderate to major (i.e., take) direct effects to federally-listed individuals.

Operational

Columbia River Bull Trout

If bull trout are present in the Wahkiacus study area, direct operational effects could include: minor disruptions to migration or foraging behavior associated with noise from operation of the screen-cleaning systems at the intake structure; minor and likely immeasurable loss of in-stream habitat on the Klickitat River associated with water diversions; and potential avoidance of, or attraction to, the facility outfall location due to minor increased temperatures or modifications to water quality. If bull trout adults or subadults ascend the facility fish ladder, they would be subjected to holding and sorting procedures (maximum of 24 hours), and handling as they are returned back to the river. These activities could result in injury or increased stress to individuals. However, the potential for these effects is limited as bull trout are relatively uncommon in the study area. If present, individuals could experience minor to moderate direct adverse effects due to operation of the fish ladder.

Middle Columbia River Steelhead

The implementation of this alternative could affect adult MCR steelhead during spawning (April – May) and juveniles as year-round rearing is documented to occur in the mainstem Klickitat River near the proposed Wahkiacus facility, and within Swale Creek. Direct and indirect effects similar to those discussed above for bull trout and in Section 3.4, could occur to steelhead. As described in Section 3.4, water withdrawals from Swale Creek could result in minor to moderate adverse effects to designated critical habitat for steelhead, including primary constituent elements related to spawning and rearing.

The diversion of up to 12 cfs November to May could result in a moderate direct loss of in-stream habitat in Swale Creek. If baseline flows are low, this loss of habitat could affect critical habitat for steelhead, and could potentially reduce available spawning and rearing habitat for steelhead and coho, and rearing habitat for spring and fall Chinook. However, the Swale Creek intake would only be used when adequate flows are available to support use and maintain adequate instream flows for passage and rearing of anadromous salmonids. The use of an adaptive management strategy for withdrawals on Swale Creek should minimize the loss of instream habitat associated with operation of the intake. Flow quantities required for maintenance of instream flow and habitat would be determined during future permitting process, and evaluated in the ESA consultation document to be prepared for this project relative to listed steelhead and critical habitat.

Klickitat Hatchery Study Area

Of the terrestrial listed species that could occur in the Klickitat Hatchery study area (i.e., gray wolf or Northern spotted owl); none are known or have been documented to occur there. There is no suitable habitat or designated critical habitat for gray wolf or Northern spotted owl in the study area; therefore, no impacts to these species are anticipated.

Federally-listed fish species (bull trout and steelhead) are present in the Klickitat Hatchery study area. Potential effects to bull trout and steelhead, and associated critical habitat, are discussed below as related to construction and operation of elements proposed under Alternative 2 in the Klickitat Hatchery study area.

Construction

Columbia River Bull Trout

Bull trout use in the Klickitat Hatchery study area is primarily migratory in nature, though foraging adults are present during the spring/early summer hatchery smolt migration period. The presence of bull trout during the later summer in-stream work window is likely limited. Potential direct effects to bull trout, if present during in-stream work, could include displacement of individual fish during in-water work, upstream migratory delay, harassment or disorientation associated with increased turbidity, temporary reduction of available in-stream habitat, and potential handling during fish salvage operations associated with in-water work. These effects would be similar to those described for fish and their associated aquatic habitat (see Section 3.4).

Middle Columbia River Steelhead

In the Klickitat Hatchery study area, the Klickitat River is designated as critical habitat for MCR steelhead. Habitat functions that may be affected by in-stream work proposed under Alternative 2 in the study area include spawning, rearing, and migration. Because in-stream work would not take place during steelhead spawning periods, it is likely that habitat utilized for spawning would return to the preconstruction condition prior to the next spawning event. A permanent (long-term) loss of a minor amount of juvenile rearing habitat would occur due to installation of the surface water intake and facility outfall on the Klickitat River. Removal of the weir plate and modifications to the weir at the Klickitat Hatchery may improve migration during low flow periods and, therefore, result in minor direct beneficial effects to steelhead and associated critical habitat over the long term.

Operational

Columbia River Bull Trout

Potential effects to bull trout due to operations in the Klickitat Hatchery study area would be similar to those described above for the Wahkiacus study area and include: minor disruptions to migration or foraging behavior associated with noise from operation of the screen-cleaning systems at the intake structure; minor and likely immeasurable loss of in-stream habitat on the Klickitat River associated with water diversions; and potential avoidance of, or attraction to, the facility outfall location due to minor increased temperatures or modifications to water quality. If bull trout adults or subadults ascend the facility fish ladder, they would be subjected to holding and sorting procedures (maximum of 24 hours), and handling as they are returned back to the river. These activities could result in injury or increased stress to individuals. However, the potential for these effects is limited as bull trout are relatively uncommon in the study area. If present, individuals could experience minor to moderate direct adverse effects due to operation of the fish ladder.

In addition, compared to existing conditions, beneficial effects to bull trout would occur associated with proposed NMFS-compliant screening of a new intake facility. Bull trout passage during low flow conditions would also be improved following the proposed modification to the existing channel-spanning concrete weir. Bull trout entering the bypass facility associated with the Klickitat Hatchery intake structure would temporarily be displaced from the mainstem, but would be returned to the river channel downstream.

<u>Middle Columbia River Steelhead</u>

The implementation of this alternative could affect adult MCR steelhead during spawning (April – May) and juveniles as year-round rearing is documented to occur in the mainstem Klickitat River near the Klickitat Hatchery facility. Direct and indirect effects similar to those discussed above for bull trout and in Section 3.4). However, due to the unlikely occurrence of bull trout in the study area during in-stream work, the potential for adverse effects is unlikely.

McCreedy Creek Study Area

Construction

<u>Columbia River Bull Trout</u>

Although data for McCreedy Creek is limited, use of the system by bull trout is possible, though likely low. If present, effects to bull trout due to in-stream construction associated with development of the McCreedy Creek facility would be similar to those described previously for the Wahkiacus study area. Bull trout critical habitat is not designated in McCreedy Creek.

<u>Middle Columbia River Steelhead</u>

Temporary construction effects to juvenile and adult steelhead associated with the implementation of Alternative 2 would be similar to those described above for bull trout and those described in Section 3.4. McCreedy Creek is designated as critical habitat for MCR steelhead. Habitat functions that may be affected by in-stream work proposed under Alternative 2 in the study area include spawning, rearing, and migration. Because in-stream work would not take place during steelhead spawning periods, it is likely that habitat utilized for spawning would return to the preconstruction condition prior to the next spawning event. A minor, long-term loss of potential spawning and rearing habitat would occur due to placement of in-stream structures.

Northern Spotted Owls

Construction of Alternative 2 could affect Northern spotted owls. Accidental fuel and oil tank leaks and improperly disposed stormwater could enter vegetated areas and damage plants or individuals. Implementing BMPs would minimize these effects. Impacts from construction activities would be contained within established staging and construction limits.

Construction noise associated with clearing and grading, excavation, and site preparation would affect the Northern spotted owls foraging in the area. Owls may also be affected by construction equipment moving to and from the project site. As discussed in Wildlife, Section 3.6, calculated noise attenuation is used for this analysis (Table 3-24).

The USFWS recognizes that individuals as well as species react differently to noises and noise levels. To assess the effects of noise on a species, the USFWS categorizes sounds into disturbance and harassment. Disturbance is potential auditory and visual stimuli that a species can detect and possible react to. Noise levels that significantly disrupt normal behavior patterns are considered harassment (USFWS and NMFS 2004). For Alternative 2, disturbances are *sound-only detectable* and *sound-only disturbance* noises.

- ***Sound-only detectable noises*** are defined as the sound level where a species detects the sound but does not react to it. Based on the USFWS Olympic National Forest Biological Assessment, sound-only detectable noises for Northern spotted owl occur when sound levels are 4 dB above the baseline levels (WSDOT 2010). For this project, that would be 44 dB and roughly a distance of 3,200 feet from the area of disturbance. The nearest documented nest (0.65 mile downstream) would experience sound-only detectable noises.
- ***Sound-only disturbances*** are defined as the sound level where a species would show avoidance of the sound through hiding, defending itself, moving the wings or body, or postponing a feeding. Based on the USFWS Olympic National Forest Biological Assessment, the threshold level for owls is 70 dB (USFWS 2003). For this project, that noise level would be detected within 300 feet of the area of disturbance. Neither documented nest site would experience sound-only disturbances.
- ***Harassment noise*** is the zone in which noise levels cause an incidental take of a species. For Northern spotted owl, harassment would occur from sound-only injury, which is defined as the sound level at which an adult would be flushed from the nest, roosting site, or foraging area. This type of harassment may lead to reduced productivity and survival of young or physical injury or death of an adult, hatchling, or egg that would equate to incidental take (USFWS 2003). Based on the results of several studies, the sound-only injury threshold for spotted owls is 92 dB (USFWS 2003). Construction noise levels for Alternative 2 are not anticipated to exceed this threshold.

Based on potential construction-related noise impacts that exceed the sound-only disturbance threshold, there may a direct, short-term, moderate, local, adverse effect on Northern spotted owls at the nearest documented nest location 0.65 mile downstream.

As with auditory harassment, visual harassment is defined as those visual activities that would cause an adult to be flushed from the nest, roosting site, or foraging area, which may lead to reduced productivity and survival of young, or physical injury or death of an adult, hatchling, or egg that would equate to incidental take (USFWS 2003). Visual harassment is primarily in the form of human presence and activity; however, visual screening of human activities can reduce these disturbances. In general, USFWS restricts activities within 0.5 mile of a nest to outside the breeding season. As the nearest documented nest is over 0.5 mile from the site, no restrictions on activities would apply.

As described in Vegetation (Section 3.5), 1.4 acres of primarily forested habitat would be removed during construction of the project. The habitat proposed for removal is not designated critical habitat but does contain suitable habitat, including abundant dead and down woody material, medium to high canopy closure, and multiple canopy layers. Removal of these habitat elements as part of construction for the project would result in a moderate, long-term, local adverse impact to Northern spotted owl habitat.

<u>Gray Wolves</u>

Tribal members using the study area have reported sightings of gray wolves but their presence has not been formally documented. As the study area is not located within gray wolf territory, does not contain any den or rendezvous sites, and has continual human activities during the breeding season, it is expected the project would have no effect on gray wolves.

<u>Grizzly Bears</u>

Tribal members using the study area have reported sightings of grizzly bears but their presence has not been formally documented. Because the study area is used regularly by humans during late spring to early fall when bears would be active, grizzly bears are not expected to occur in the study area. Therefore the project would have no effect on grizzly bears.

Operational

<u>Columbia River Bull Trout</u>

In the McCreedy Creek study area, because surface water withdrawals could result in reduction of habitat in the diversion reach between the intake and outfall (see Section 3.4 for more information), bull trout may avoid the reach during the steelhead acclimation period. This could result in minor adverse effects to foraging and rearing opportunities; however, the occurrence of bull trout in McCreedy Creek is likely low and infrequent.

<u>Middle Columbia River Steelhead</u>

MCR steelhead occurrence in McCreedy Creek is likely, though the extent of use and timing is currently unknown. If present during acclimation periods at McCreedy Creek (April - May), steelhead would experience a temporary loss of in-stream habitat due to facility water withdrawals. Facility withdrawals may result in a measurable reduction in the wetted channel during operational periods, which could reduce available rearing habitat if occupied during acclimation periods. Steelhead would experience minor delays in upstream and downstream movement due to the presence of the Denil fishway. Removal of the culvert on McCreedy Creek would improve access to upstream habitats. Impacts to designated critical habitat for MCR steelhead would be similar to those described above for the Klickitat Hatchery study area. Operation of the McCreedy Creek acclimation facilities would result in minor to moderate direct adverse effects to steelhead and critical habitat.

<u>Northern Spotted Owl</u>

As with construction, operation of the facility would not occur within 0.5 mile of a documented nest; therefore, no visual harassment of Northern spotted owls would occur. Operational sound levels would not exceed 60 dBs and would occur annually for a short duration between March and May. Using the formula for construction noises (described in the construction section above), operational sound levels would attenuate to background levels at a distance of 800 feet from the area of disturbance. No documented nests would be affected by noise from operation of the facility.

Aquatic Species Ecological Interactions – All Study Areas

Columbia River Bull Trout

General effects to fish resulting from ecological interactions under Alternative 2 were described in detail in Section 3.4; that discussion is applicable to federally-listed bull trout. The impacts of hatchery salmon and steelhead in the mainstem Klickitat River on bull trout are not known (Yakama Nation 2008a). Released hatchery smolts may compete with and prey on juvenile bull trout that are approximately 33 percent of smolts body length or smaller (for proposed smolt releases approximately 1.8 to 2.3 inches, or smaller). Coho are believed to be capable of consuming an even greater proportion of their body size (up to 75 percent), and could consume bull trout juveniles up to approximately 4 inches. Potential predation pressures on bull trout from coho hatchery smolts would be reduced under this alternative due to the release of fish lower in the river at the Wahkiacus facility. However, the reach of the Klickitat River downstream of the Klickitat Hatchery or Wahkiacus Hatchery does not likely support rearing bull trout juveniles. Therefore, direct beneficial effects to bull trout, if any, would likely be minor under implementation of this alternative.

Although hatchery steelhead smolts released from the proposed McCreedy Creek Acclimation Facility would not be released into primary bull trout habitats (West Fork Klickitat River), it is possible, though unlikely, that smolts may encounter juvenile bull trout during their outmigration from the subbasin as the West Fork is located downstream of McCreedy Creek.

Generally, in drainages colonized by anadromous salmon and steelhead, bull trout successfully coexist by occupying a different ecological niche. Adult and subadult bull trout that may be present in the mainstem in the vicinity of Castile Falls may benefit from the construction of an acclimation facility at McCreedy Creek as smolts released from the facility may provide a food source for adult and subadult bull trout.

If acclimation results in improved adult returns to the subbasin, the carcasses of naturally spawning adults may increase stream productivity through the addition of marine-derived nutrients. Increased productivity may result in beneficial effects to both juvenile and adult bull trout in the form of increased food availability.

Middle Columbia River Steelhead

General effects to fish resulting from ecological interactions under Alternative 2 were described in detail in Section 3.4, and that discussion is directly applicable to federally-listed steelhead.

The coho smolt program proposed under Alternative 2 would release smolts in May, which could overlap with the period when newly emerged, or older, listed steelhead juveniles are present. Predation concerns as discussed above for bull trout would also be applicable to the MCR steelhead, with a coho smolt being able to consume up to a 4 inch steelhead. However, acclimation and release of coho into the lower subbasin at the Wahkiacus site would significantly reduce the stretch of river where hatchery coho and natural-origin steelhead would encounter each other. Because subyearling fall Chinook are released at an average length of about 3.2 inches, predation rates on listed steelhead juveniles are expected to be negligible (Yakama Nation 2005), and, therefore, direct effects would be minor. Hatchery steelhead smolts would be released from the Klickitat Hatchery from April 1 to May 1, prior to the majority of native fry emergence. No changes are proposed to the timing or release of hatchery spring Chinook smolts, and, therefore, they may encounter listed steelhead juveniles during outmigration. Competition with larger listed steelhead smolts that outmigrate during April and May would be unlikely as all hatchery stocks would be volitionally released and would be actively migrating out of the subbasin. Similar to baseline conditions (Alternative 1), if coho harvest goals cannot be met with this program, up to 2.5 million Washougal River stock smolts would be imported and direct released in the lower Klickitat River as needed to meet the goal. This would effectively maintain current competition and predation rates due to on-going direct releases of coho into the system.

Under Alternative 2, a locally-adapted segregated steelhead program is proposed that would include acclimation and release of hatchery steelhead and elimination of direct planting of hatchery smolts throughout the subbasin. Direct release results in a significantly lowered imprinting of juveniles to a specific water source, which reduces fidelity to the release location. As a result, hatchery adults that return to the river may not return to the hatchery and would likely spawn with natural-origin steelhead, creating the potential for genetic introgression and reduced fitness of natural steelhead in the basin. The implementation of acclimated releases is intended to minimize straying as fish would seek out their natal rearing waters and ascend the Klickitat Hatchery ladder. Acclimation should reduce, though not eliminate, the potential for hatchery-origin fish to spawn with native fish in the wild. As such, moderate beneficial effects are anticipated for native fish species in the Klickitat River.

An integrated steelhead hatchery program may also be implemented if recolonization of the upper watershed by native populations does not occur or genetic introgression of the segregated hatchery population with the native population increases above an acceptable level. Section 2.3.1 discusses the adaptive management for the steelhead program. If an integrated program is implemented at the hatchery (replacing the segregated program), adverse effects to listed steelhead due to hatchery steelhead adults spawning in natural waters would not be considerable as the genetic composition of the hatchery program and the natural-origin fish would be the same.

The intent of the integrated program at McCreedy Creek is to enhance recolonization of habitat by native steelhead and would result in beneficial effects on the listed population. Juveniles would be acclimated to McCreedy Creek water and would be volitionally released. The returning adults would return to the upper watershed as a result of releases from the McCreedy Creek facility.

3.7.2.3 Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Under this alternative, no construction would occur in the Wahkiacus study area; therefore, no construction-related impacts to T&E species would occur in the study area.

Klickitat Hatchery Study Area

As with Alternative 2, construction and operation of elements proposed under Alternative 3 in the Klickitat Hatchery study area would have no effect on terrestrial T&E species (gray wolf or Northern spotted owl). Potential construction and operational effects to federally-listed fish species, including bull trout and steelhead, are discussed below as related to elements proposed under this alternative in the Klickitat Hatchery study area.

Construction

Columbia River Bull Trout

Construction effects under this alternative would be the same at these two locations as discussed above for Alternative 2 and within Fisheries, Section 3.4.

Under Alternative 3, effects to designated critical habitat for bull trout would occur associated with in-stream construction at the Klickitat Hatchery. Potential adverse effects would be minor and similar to those described under Alternative 2 and would primarily include temporary reduction in available migratory habitat due to the presence of in-water cofferdams. Removal of the weir plate and modifications to the weir at the Klickitat Hatchery would result in minor, direct, long-term beneficial effects relating to improved migration during low flow periods.

Middle Columbia River Steelhead

Under Alternative 3, construction effects to federally-listed steelhead would be similar to those described under Alternative 2 for the Klickitat Hatchery study area. See discussion above for Alternative 2 and within Fisheries, Section 3.4.

The Klickitat River is designated as critical habitat for MCR steelhead and habitat that may be affected by in-stream work proposed under Alternative 3, which includes spawning sites, rearing sites, and migration corridors. Potential effects would be similar to those described under Alternative 2 for the proposed activities at the Klickitat Hatchery.

Operational

Columbia River Bull Trout

General effects to fish species due to operation of facilities proposed under Alternative 3 were discussed in detail in Section 3.4, and discussed for Alternative 2, above, with the exception of no effects at the Wahkiacus site.

Middle Columbia River Steelhead

The effects to listed steelhead due to the operation of facilities proposed under Alternative 3 are discussed in detail in Section 3.4, and above under Alternative 2, with the exception of no effects at the Wahkiacus site.

McCreedy Creek Study Area

The effects of Alternative 3 on T&E species in the McCreedy Creek study area would be the same as those described for Alternative 2.

Aquatic Species Ecological Interactions – All Study Areas

Columbia River Bull Trout

Potential ecological interactions due to implementation of Alternative 3 and effects on native fish were thoroughly described in Fisheries, Section 3.4 and above under Alternative 2. In summary, the release of coho and Chinook smolts from the Klickitat Hatchery would result in continued levels of predation and competition between hatchery-released fish and bull trout that may be present downstream of the Klickitat Hatchery. However, bull trout young of the year that may be susceptible to smolt predation should be high up in the smaller headwater streams of the subbasin, and it is unlikely they would be present in the mainstem along the smolt outmigration route. Therefore, predation on juvenile bull trout by hatchery smolts is likely very limited in the mainstem Klickitat River. The need for out-of-basin rearing would maintain the potential for pathogen transfer from these fish.

Middle Columbia River Steelhead

Under Alternative 3, effects to federally-listed steelhead due to ecological interactions would occur over the long-term. Effects would be similar to those described for Alternative 2 and Section 3.4; however, Alternative 3 would have no spatial segregation between hatchery-released smolts and juvenile steelhead rearing in the mainstem Klickitat River between the Klickitat Hatchery and the Wahkiacus facility. Under Alternative 3, natural-origin juvenile steelhead would be subject to predation by hatchery reared coho smolts and fall Chinook released from the Klickitat Hatchery. In comparison to Alternative 2, this increased exposure to hatchery-released fish would occur over

25 river miles in the mainstem Klickitat River from the Klickitat Hatchery (RM 42) downstream to the Wahkiacus site (RM 17). This reach of the river is likely occupied by high numbers of natural-origin juvenile steelhead as spawning is concentrated between RM 5 and 50 (Yakama Nation 2008d). Other effects would be similar to those described above for bull trout, though steelhead would experience greater effects on a population scale as bull trout are somewhat uncommon in the lower portion of the subbasin.

Similar to Alternative 2, and baseline conditions, if coho harvest goals cannot be met with this program, up to 2.5 million Washougal River stock smolts would be imported and direct released in the lower Klickitat River as needed to meet the goal. This would effectively maintain current competition and predation rates due to on-going direct releases of coho into the system.

3.7.3 Mitigation Measures

The following mitigation measures have been incorporated in project planning to avoid, minimize, and offset potential adverse effects to listed fish, wildlife, and plant species:

- Mitigation measures to protect federally listed steelhead and bull trout are the same as those identified in Section 3.4.3 to protect other aquatic resources.
- All in-water construction would comply with applicable federal, state, and local permits or authorizations, as appropriate.
- Consultation would be undertaken with NMFS and USFWS prior to construction to ensure that appropriate measures are implemented to protect any listed species in the project area.

3.8 Wetlands

3.8.1 Affected Environment

In general, the study area for the assessment of potential impacts on wetlands is defined as the area of potential project disturbance, including construction access and staging areas as well as areas that would be indirectly affected by the project.

3.8.1.1 Wahkiacus Study Area

The National Wetland Inventory (NWI) maps identify two wetland features within the Wahkiacus study area (USFWS 2010e): 1) a riverine upper perennial, unconsolidated bottom, permanently-flooded wetland that roughly corresponds to the Klickitat River riparian zone; and 2) a palustrine scrub shrub, broad leaved deciduous, seasonally-flooded wetland located near the confluence of Swale Creek and the Klickitat River. Site investigations completed in 2009 confirm that wetland conditions are not present along the Klickitat River riparian zone or at the confluence of Swale Creek and the Klickitat River. Based on observations made during 2009 site visits, both of these areas lack wetland conditions and contain large deposits of river rock.

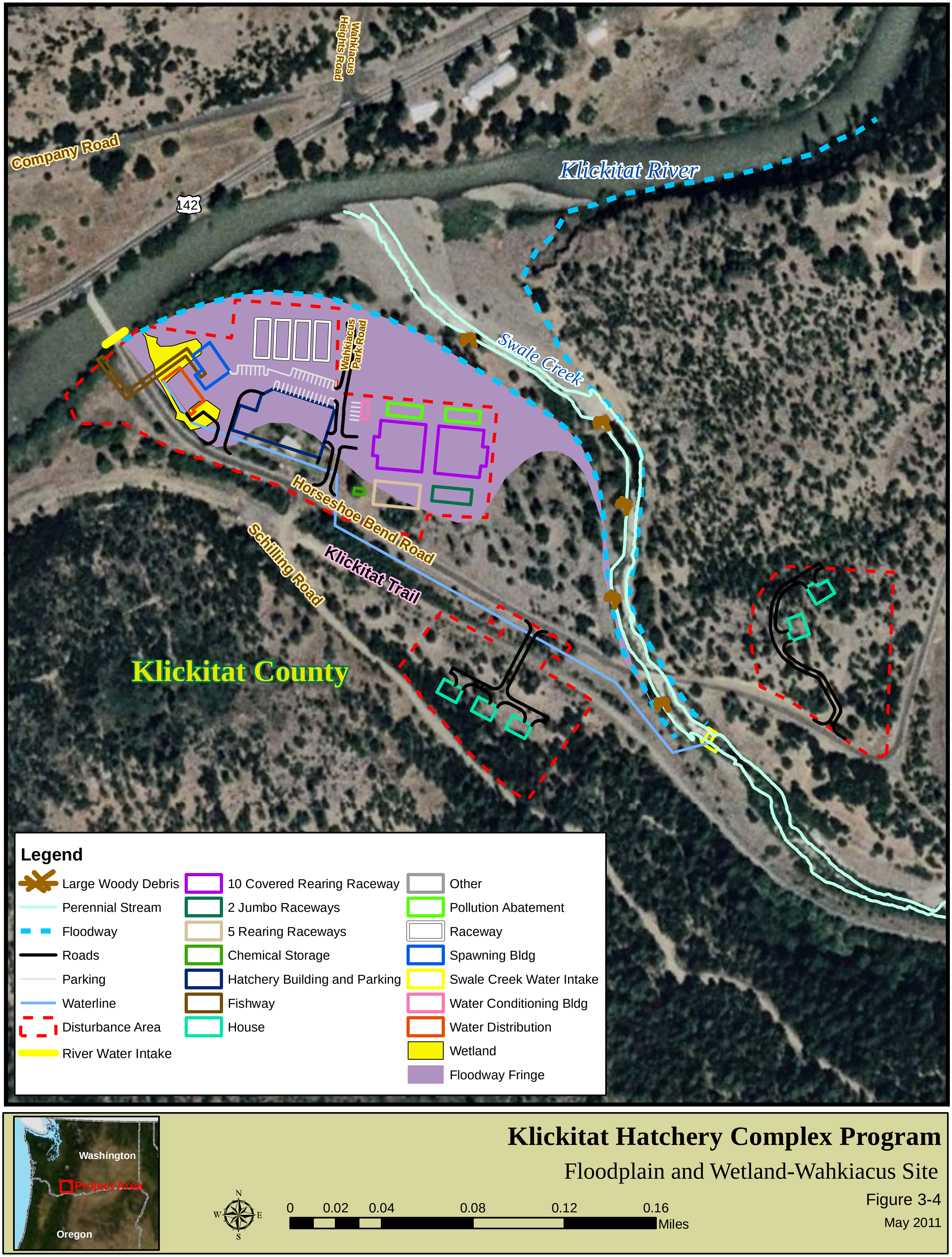
Project biologists identified one wetland at the project site in September 2009, Wetland A (Figure 3-4). It is located north of Horseshoe Bend Road near the bridge over the Klickitat River. This wetland is 0.29 acres in size and is primarily an emergent wetland (palustrine emergent, permanently flooded). The wetland hydrology is supplied by an artesian well at the southeast end. The well is located in a small, shallow depression where water ponds year-round. The outflow of water from the pond flows toward the Klickitat River and maintains wetland hydrology nearly year-round. The open water area is marginally vegetated while the remaining wetland has emergent and scrub shrub vegetation, including soft rush, panicled bulrush, reed canarygrass, red osier dogwood, and Coyote willow.

Activities such as grading and excavation occurring within a wetland require a permit from the Corps, under Clean Water Act Section 404, and Klickitat County, under the Klickitat County Critical Areas Ordinance. The County uses WDOE's rating system (Hruby 2004) to evaluate and categorize wetlands on a scale of 1 to 4 based on rarity, sensitivity to disturbance, and function. Wetland A at the Wahkiacus project site is a Category 3 under the wetland rating system and would be classified as a depressional and slope wetland.

Wetland A primarily functions as a filter for runoff that eventually drains into the Klickitat River. The emergent vegetation and depressional nature of the open water area slow water velocities and allow sediments, nutrients, and pollutants to settle in the wetland prior to entering the river, benefitting downstream water quality.

Because of its size and location, the wetland would not likely function effectively as a sediment and pollutant filter during storm or flood events. In terms of habitat functions, the wetland provides limited vegetation structure and plant species richness, and interspersion of habitats is low. The wetland is connected to adjacent riparian and upland areas to the north through an undisturbed vegetated corridor and provides migration corridors for aquatic and terrestrial species.

In addition, the Klickitat County Critical Areas Ordinance regulates wetland buffers. Activities occurring within the buffer would also require a permit from Klickitat County. Category 3 wetlands require a buffer of 75 feet under the ordinance. The buffer associated with Wetland A is truncated to the south by Horseshoe Bend Road. The remaining buffer is primarily herbaceous grasses and forbs that provide water quality functions but limited habitat value.



Klickitat Hatchery Complex Program

Floodplain and Wetland-Wahkiacus Site

Figure 3-4

May 2011

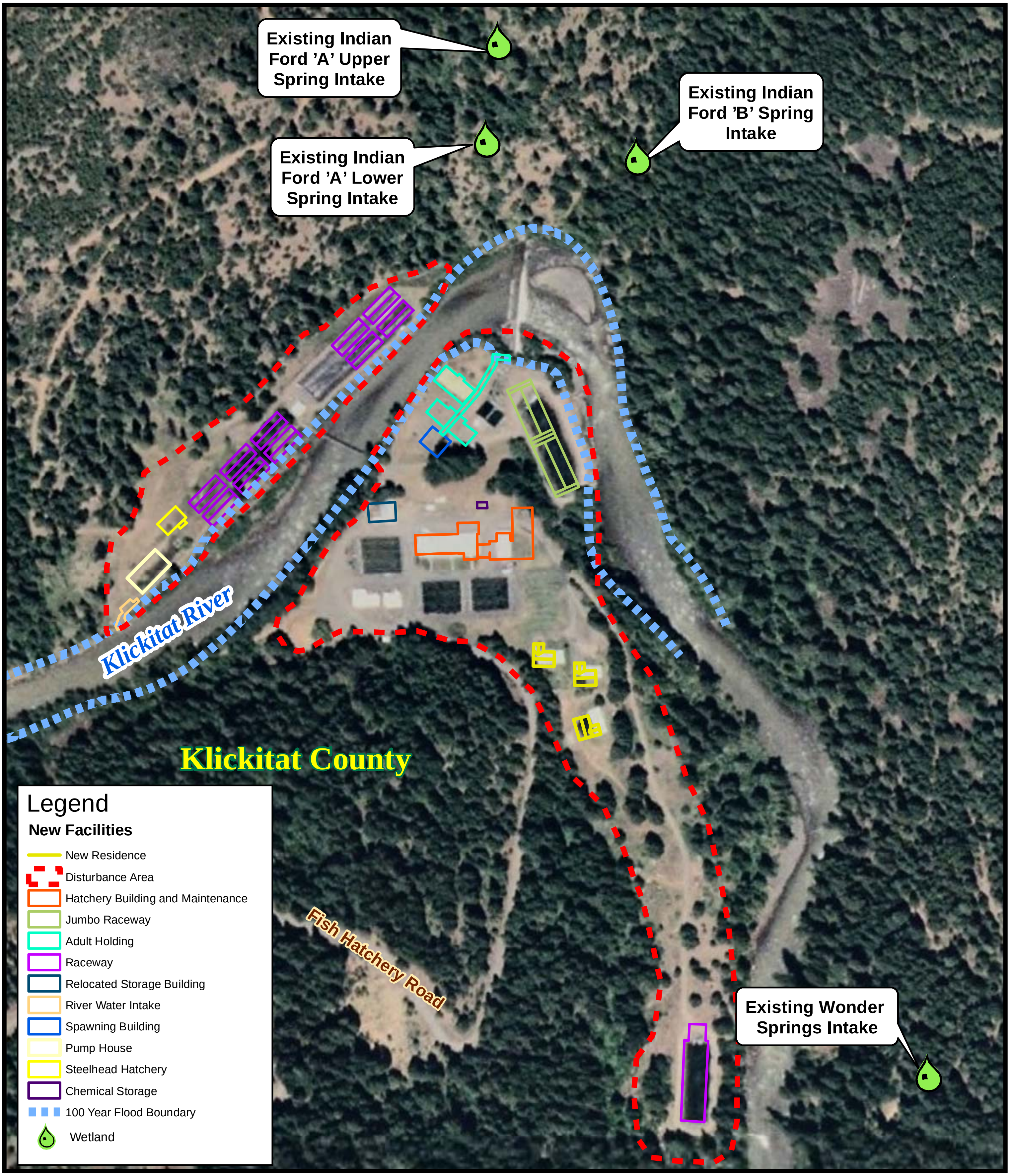
3.8.1.2 Klickitat Hatchery Study Area

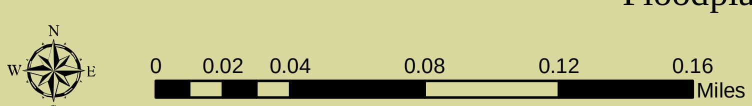
The NWI maps identify five wetland features within the Klickitat Hatchery study area (USFWS 2010e): 1) two palustrine unconsolidated bottom, permanently-flooded, excavated areas that correspond to two ponds located near the main cluster of facilities; 2) a palustrine unconsolidated bottom, permanently-flooded pond located at the southern end of the study area; 3) a riverine upper perennial, unconsolidated bottom, permanently-flooded area mapped at the downstream end of the study area that correlates to the Klickitat River; and 4) a lacustrine, limnetic, unconsolidated bottom, permanently-flooded, diked/impounded area that correlates to the Klickitat River at the upstream end of the study area and appears to be a mapping error as this reach of the river is not impounded or associated with a lake. The three ponds near the main facility and at the southern extent of the study area are concrete-lined and have a paved bottom and are not vegetated or considered jurisdictional wetlands by federal, state, or tribal law. Of the five NWI wetlands, none are considered jurisdictional wetlands.

On the south side of the Klickitat River no wetlands have been documented within the study area on the NWI maps and conversations with tribal staff indicate no wetlands are present (Sharp 2009). To the north, tribal staff have indicated there are several springs located on the hillside on a gradient of one to two percent that creates slope wetlands (Sharp 2009). These springs are known as the Indian Ford Springs (Figure 3-5). Another hillside spring known as Wonder Springs (Figure 3-5) is located southeast of the study area. The springs are supplied by high groundwater levels and hydrology is maintained throughout the year. These springs supply water to the Klickitat Hatchery Complex (see Section 3.3). The springs would be classified as palustrine, forested, permanently-flooded wetlands as well as slope wetlands. The slope wetlands are vegetated, thereby allowing them to filter out sediments, nutrients, and pollutants in runoff, but slope wetlands generally do not provide a great deal of water quality treatment. The slope wetlands provide limited vegetation structure and plant species richness, and interspersion of habitats is low to moderate. The wetlands are connected through an undisturbed and relatively wide corridor of riparian and upland vegetation and provide migration corridors for species utilizing aquatic and terrestrial systems.

3.8.1.3 McCreedy Creek Study Area

The NWI maps do not identify any wetland features within the McCreedy Creek study area (USFWS 2010). Tribal staff conducted a wetland determination of the study area in 2010 and identified one wetland (Wetland B). It is an approximately 3-acre palustrine, forested, seasonally-inundated wetland (also classified as a riverine wetland) located on the north side of McCreedy Creek (Sharp 2010a). The forested wetland is dominated by cottonwood, willow, red alder, and western red cedar and hydrology is supplied by both McCreedy Creek and the Klickitat River. The forested nature of this wetland would allow for filtration of sediments, nutrients, and pollutants in runoff, thereby benefiting downstream water quality. The wetland is fairly large relative to the width of both McCreedy Creek and Klickitat River. Coupled with the extent of forested vegetation, this wetland is able to retain and slow overbank flows from storm and flood events.





Klickitat Hatchery Complex Program

Floodplain and Wetland-Klickitat Site

Figure 3-5

May 2011

The wetland contains many habitat features that contribute to the habitat functions, including a diversity of vegetation structure, richness of plant species, and special habitat features that provide a unique opportunity for species such as amphibians and other aquatic-dependent species. The wetland is connected through an undisturbed and relatively wide corridor of riparian and upland vegetation and provides migration corridors for aquatic and terrestrial species.

3.8.2 Environmental Consequences

For purposes of this EIS, the intensity of impacts to wetlands are categorized as follows:

> ***Minor:*** Impacts to wetland area and function would be measurable but of little consequence. No wetland functions would be affected.
>
> ***Moderate:*** Impacts would result in decreased wetland area or function. Wetland functions could recover to pre-project conditions.
>
> ***Major:*** Impacts would result in the elimination of wetland area or function.

3.8.2.1 Alternative 1 – No Action Alternative

Under Alternative 1, no new construction would occur in the study area at any of the three project sites; therefore, no wetlands would be affected. Wetlands would continue to undergo natural processes and succession over time due to flood events and changes in vegetation and hydrologic conditions.

3.8.2.2 Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

Construction

Under Alternative 2, Wetland A would be eliminated in its entirety. This would result in the loss of 0.29 acres of Category 3 wetland. This loss would be considered a major, long-term adverse direct impact to this on-site resource caused by construction.

<u>Operational</u>

Although the wetland would be eliminated, the artesian well (i.e., water source for the wetland) would remain and an intake structure would be put in place to use well water for nonfish production purposes at the site. The water needs are not yet determined but would be within the water rights for the well. It is anticipated that since the well would include a water intake structure it would no longer provide hydrology for downstream resources. The effect of redirecting this water source to consumptive use on site would be a minor, long-term adverse direct impact to downstream resources.

Klickitat Hatchery Study Area

Construction

Construction of staging areas and access roads for upgrade activities at the water intake structures at Indian Ford Springs, as well as vegetation removal, would lead to erosion and increased sedimentation to the slope wetlands associated with the springs, resulting in temporarily decreased water quality and reduced habitat availability. Construction at Wonder Springs is limited to fence installation and routine maintenance and no short-term, direct impacts to the springs would occur. Accidental fuel and oil tank leaks and improperly disposed stormwater could enter the wetlands at Indian Ford Springs and Wonder Springs and impair water quality and damage wetland plants and wildlife. Implementing BMPs would minimize these effects. Construction noise and increased human activity would temporarily disrupt wildlife associated with the wetlands.

Most construction effects to the wetlands would be temporary, causing a short-term loss of wetland functions. These short-term, adverse, direct impacts would be limited to the site and would be minor. They are not expected to result in any permanent impacts once the project is completed and areas that are disturbed are revegetated. Once construction is complete, the temporarily affected wetlands would be restored to preconstruction conditions. It is anticipated that all wetlands temporarily affected would return to a functioning state within 5 years.

Operational

The upgrades to the existing intakes at Indian Ford Springs would result in alterations to surface and near surface water movement that would result in changes to drainage patterns, as well as fluctuations in inundation frequency, depth, and duration that can result in vegetative composition changes in downstream wetlands. Slope wetlands that formed as a result of the springs may become drier over time and would be converted to upland, resulting in indirect loss of approximately 0.5 acres of slope wetland habitats. This would be considered a long-term, indirect, on-site, moderate, adverse impact to this resource. No operational impacts to Wonder Springs are anticipated.

McCreedy Creek Study Area

Construction

The mobile acclimation facilities would require minimal ground disturbance for development of the upgraded access road, new culvert at McCreedy Creek, and grading to accommodate the acclimation facilities. As the only wetland located at this site is northeast of the proposed area of disturbance, no direct impacts to Wetland B are anticipated.

Replacement of the culvert at the bridge over McCreedy Creek upstream of Wetland B would not result in direct impacts to the wetland but would result in short-term indirect effects. Construction of staging areas and temporary access roads, as well as vegetation removal, would lead to erosion and increased sedimentation to McCreedy Creek that would settle out in the southern portion of the wetland, resulting in temporarily decreased water quality and reduced habitat availability in the wetland. Accidental fuel and oil tank leaks and improperly disposed stormwater could enter the wetland and impair its water quality and damage wetland plants and wildlife. Implementing BMPs would minimize these effects. Construction noise and increased human activity would also temporarily disrupt wildlife associated with the wetland. Most construction effects to the wetland would result in a short-term loss of wetland functions. These impacts would be considered short-term, indirect, on-site, minor, adverse impacts to this resource.

Operational

No operational direct effects to Wetland B would occur. The location of the outfall has not yet been determined. If the outfall cannot be sited upstream of the wetland, reduced flows in the bypass reach during the acclimation months would result in minor indirect impacts the Wetland B. Although the water withdrawals are not for consumptive use, reduced flow in the creek as it passes by the wetland to the northeast would adversely affect hydrology of the wetland. The wetland is sustained from several hydrologic sources but reducing flows in the creek would result in a lowered water table at the southern end of the wetland, the zone that is most influenced by river hydrology. The lowered water table is not expected to result in a loss of wetland but would alter the hydrology enough to affect vegetative composition (transition from obligate to facultative species). This operational effect would occur only during the April to June operations of the facility, resulting in a minor site-specific, indirect, adverse wetland impact.

3.8.2.3 Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

No construction activities would occur at the Wahkiacus study area under this alternative, and no impacts to Wetland A would occur. There would be no impact to any wetland resource in this study area.

Klickitat Hatchery Study Area

No wetlands are located on the south side of the Klickitat River; therefore, no wetland impacts would occur in this area.

Impacts to the slope wetlands located on the north side of the Klickitat River would be the same as described for Alternative 2. No additional or fewer impacts to wetland resources would occur under Alternative 3 relative to Alternative 2.

McCreedy Creek Study Area

Impacts to Wetland B located near the site of the proposed acclimation facilities would be the same as described for Alternative 2. No additional or fewer impacts to wetland resources would occur under Alternative 3 relative to Alternative 2.

3.8.3 Mitigation Measures

3.8.3.1 Wahkiacus Study Area

Loss of Wetland A would require mitigation through preservation, creating new wetlands, rehabilitating degraded wetlands, and/or enhancing existing wetlands to improve their value. The Klickitat River Subbasin provides opportunities for wetland mitigation primarily for wetland creation. The amount of mitigation required would be determined by the replacement ratios in accordance with Corps, WDOE, and County guidelines and would be determined as part of the mitigation planning process. The project may use the BPA funded Habitat Enhancement Project (1997-056-00) to offset a portion of the required mitigation.

Additional avoidance and minimization measures are not proposed as no other wetlands are present on the site and no temporary wetland impacts would occur.

3.8.3.2 Klickitat Hatchery Study Area

The permanent impacts from the project on slope wetlands at Indian Ford Springs would require mitigation through creating new wetlands, rehabilitating degraded wetlands, and/or enhancing existing wetlands to improve their value. The Klickitat River Subbasin provides opportunities for wetland mitigation primarily for wetland creation. The amount of mitigation required would be determined by the replacement ratios in accordance with Corps and WDOE guidelines and would be determined as part of the mitigation planning process.

In addition to mitigation for permanent impacts, the following mitigation measures have been incorporated in project planning to avoid and minimize potential adverse effects to wetlands:

- Install temporary protective fencing around the wetland perimeter during construction.
- Dispose of excavated noxious weeds in a manner that prevents reestablishment in wetlands and adjacent areas.
- Minimize the area of soils exposed at any one time and use dust abatement measures when necessary to reduce dust that can bury wetland plants.
- Implement a revegetation plan restore wetland areas temporarily affected during construction.
- Implement a spill containment and countermeasures plan during operations and construction to avoid and minimize effects from spills to wetlands.

3.8.3.3 McCreedy Creek Study Area

If and when a decision is made to construct the McCreedy Creek site, the impact to the wetland would be evaluated and mitigation would be provided if it is determined that an impact would occur. The avoidance and minimization measures described in Section 3.8.3.2 would be implemented as mitigation measures at the McCreedy Creek study area.

3.9 Floodplains

3.9.1 Affected Environment

3.9.1.1 Wahkiacus Study Area

The Wahkiacus site is located at the confluence of Swale Creek and the Klickitat River on an existing alluvial fan in a 100-year floodplain associated with both water bodies (Figure 3-4). The Federal Emergency Management Agency (FEMA) has mapped the floodplain at the Wahkiacus site (FEMA 1981). The floodplain encompasses both the floodway and floodway fringe. The surrounding slopes consist of deeply incised bedrock and landslide deposits that limit the extent of floodplains in the area.

FEMA defines the floodway as the portion of the floodplain that is effective in carrying flow, within which this carrying capacity must be preserved and where the flood hazard is generally highest. FEMA and Klickitat County limit encroachments into the floodway that may raise the flood elevation by more than 1 foot. At the Wahkiacus site the floodway of the Klickitat River is contained by high, steep banks along the north shore and a river terrace on the south shore. The majority of the Wahkiacus site is outside of the designated floodway; however a portion of the site is within the designated floodway fringe.

Swale Creek flood elevations are not significantly affected by the backwater from the Klickitat River due to the steep stream gradient of Swale Creek above the Wahkiacus site. Flooding at the confluence would vary depend on the combination of coinciding flows, but Swale Creek flows would generally peak several hours before the Klickitat River during a major flood event. Hydrologic modeling completed by Yakama Nation indicates that Swale Creek is capable of conveying its 100-year flood flow within its existing bank and levee system (Harbor 2010c).

3.9.1.2 Klickitat Hatchery Study Area

No FEMA floodplain data is available for the Klickitat Hatchery site as it is beyond the FEMA mapped flood zone. The hatchery facilities are located on a river terrace on both the left and right banks of the Klickitat River. Yakama Nation used the Corps Hydrologic Engineering Center’s River Analysis System (HEC-RAS) methods for determining the 100-year flood elevation at the Klickitat Hatchery (Figure 3-5). The 100-year flood elevation determined by modeling was also corroborated by hatchery staff observation of the December 1996 flood, believed to be a 100-year event (Harbor 2010d).

3.9.1.3 McCreedy Creek Study Area

No FEMA floodplain data is available for Yakama Nation Reservation lands, including the McCreedy Creek site. McCreedy Creek is semi-confined with available floodplain on the left bank, and steep slopes on the right bank that restrict the floodplain.

3.9.2 Environmental Consequences

For purposes of this EIS, the intensity of impacts to floodplains are categorized as follows:

> ***Minor:*** Impacts to floodplains would be detectable but of little consequence. Impacts would not increase the risk of flood-related losses to property, impacts to human safety and welfare, or elimination of floodplain function.
>
> ***Moderate:*** Impacts to floodplains would be detectable and would increase the risk of flood-related losses to property, impacts to human safety and welfare during 100-year flood events. Floodplain function during smaller flood events would be unaffected.
>
> ***Major:*** Impacts would result in the elimination of floodplain function during almost all flood events. Impacts would result in flood-related losses to property and impact human health and welfare.

3.9.2.1 Alternative 1 – No Action Alternative

Wahkiacus Study Area

Alternative 1 would have no effect on the floodplain associated with the Klickitat River or Swale Creek. No new construction would occur at the site and there would be no change in flow characteristics to affect floodplain hydrology.

Klickitat Hatchery Study Area

Alternative 1 would have no effect on Klickitat River floodplains upstream or downstream of the site. No new construction would occur at the site and there would be no change in flow characteristics to affect river hydrology.

McCreedy Creek Study Area

Alternative 1 would have no effect on McCreedy Creek or the Klickitat River. No new construction would occur at the site and there would be no change in flow characteristics to affect floodplain hydrology at the site or at upstream and downstream locations.

3.9.2.2 Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

Construction

Proposed facilities that would be located in the floodway fringe include raceways, a fish ladder, settling basin, pump station, adult holding pond, and shop and feed house (Figure 3-4). The hatchery building and residences would be located outside the floodplain. The site elevation within the 100-year floodway fringe would be raised to accommodate hatchery operations and protect structures from periodic flooding. Klickitat County defers to FEMA for floodplain encroachment and has no additional requirements. FEMA allows development within the floodway fringe. There are no local, state or federal restrictions on development in the floodway fringe at Wahkiacus. The construction of the intake and pump station would be within the floodway as defined by FEMA. Development of facilities in the floodway need to demonstrate that there would be no net rise in the flood elevation in the floodway, or enter into a permitting process with FEMA.

The intake structure on the Klickitat River would be constructed with a deck elevation approximately equal to the 5-year recurrence flood. This would provide for a maintained scour hole while allowing large flood flows to utilize resorted overbank conveyance. Preliminary hydraulic analysis of proposed site conditions indicates a drop in water surface of approximately 1 foot can be expected at the Wahkiacus site. Additional hydraulic analysis of proposed site conditions is required to set finish grades for both Klickitat and Swale Creek facilities, and to verify that the project would result in a no net rise in flood elevations in the floodway.

No equipment or supplies would be stored on site between work periods and all disturbed areas would be stabilized; therefore, no construction-related effects on floodplains are expected.

Operational

Due to the confined nature of the floodway at the Wahkiacus site and the proposed design to construct hatchery facilities over the 100-year flood elevation, there is low risk for flooding at the proposed facilities. Residential houses and other hatchery structures are located outside of the 100-year floodplain and are not at risk of flooding. The addition of materials to the floodway fringe would have no direct long-term effect on the flood elevation.

Klickitat Hatchery Study Area

The existing water intake structure, lowest portion of the fish ladder, and the concrete weir are located in the 100-year floodplain of the Klickitat River. The only new structure to be added to the floodplain for this alternative is the new intake for the raceways on the north side of the river (Figure 3-5). This new intake would be designed to withstand high water events and is not expected to alter existing water patterns or flood elevations. Partial removal of the concrete weir may reduce flood elevations by reducing existing encroachment in the floodplain and improving channel conveyance.

McCreedy Creek Study Area

The McCreedy Creek site is located adjacent to McCreedy Creek but not located in a FEMA mapped floodplain. No impacts to floodplains are expected. Because the McCreedy Creek site is not mapped by FEMA, a site development permit is not needed.

3.9.2.3 Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Alternative 3 would not involve any construction, ground-disturbing activities, or alteration of the Wahkiacus site; therefore, no impacts to the floodplain would occur.

Klickitat Hatchery Study Area

Under Alternative 3, the Klickitat Hatchery site would be redeveloped in the same way as it would under Alternative 2. Impacts associated with the site would be the same as described under Alternative 2.

McCreedy Creek Study Area

Under Alternative 3, the McCreedy Creek site would be used as an acclimation facility in the same way as it would under Alternative 2. Impacts associated with the site would be the same as described under Alternative 2.

3.9.3 Mitigation Measures

The following measures would be incorporated and analyzed during project planning to avoid, minimize, or offset potential effects to floodplains:

- Implement an erosion and sediment control plan.
- Limit the profile of in-stream structures to affect the least surface area within the floodplain.
- Allow unimpeded flow of water through the Klickitat River, Swale Creek, and McCreedy Creek channels.
- Limit construction in floodplains to the driest part of the year (May to September) when flooding events are less likely to occur. Evacuate construction materials, equipment, and fuel from flood prone areas should flood conditions be anticipated.

3.10 Cultural Resources

Cultural resources include prehistoric and historic archaeological sites, historic structures, and traditional cultural properties (places that may or may not have human alterations but are important to the cultural identity of a community or Indian tribe). The National Historic Preservation Act of 1966, as amended, requires that these resources be inventoried and evaluated for eligibility for listing in the National Register of Historic Places and requires agencies to evaluate and consider effects. Laws and regulations protecting cultural resources are described in Chapter 4.

3.10.1 Affected Environment

The project area setting is typical of the Columbia Plateau, characterized by geological features, plant and animal communities, and waterways that are important to traditional Native American use. According to the archaeological record, people have occupied this region for approximately the last 11,500 years.

Portions of the project area are located on the Yakama Reservation. The Yakama Reservation was established by the Treaty of 1855 (12 stat., 951) between the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation) and the United States government. The reservation encompasses an area of approximately 2,151 square miles with its boundaries defined by the Cascade Mountains to the west, Yakama River to the east, Ahtanum Creek to the north, and Simcoe Mountains to the south.

The three study areas are located within the homeland of the Klickitat band, *Ichi Skiin Sinwit*, which is now part of the Yakama Nation. There are 14 bands and tribes in the Yakama confederation, including the Kah-milt-pah, Klickitat, Klinquit, Kow-was-say-ee, Li-ay-was, Oche-chotes, Palouse, Pisquose, Se-ap-cat, Shyiks, Skinpah, Wenatshapam, Wishram, and Yakama. Traditionally, Klickitat territory reached as far west as Mount St. Helens, and as far south as the Columbia near White Salmon to The Dalles. Bound by a common language, *Ichi Skiin Sinwit-nan*, the *Ichi Skiin Sinwit* made their home, hunted, fished, gathered, and practiced their way of life in this area for generations. Present within the Klickitat drainage are hunting areas, burials/cemeteries, petroglyphs (*Temani-peshwa*), fishing sites, and gathering sites.

Traditionally, people living in this area obtained resources through a practice of a seasonal round of subsistence activities that began when the snows melted in the early spring. The first salmon usually reached the interior Plateau in late February or early March. Salmon feasts were held in mid-spring, then people left their winter villages to gather edible roots and grasses in the uplands, or down to the Columbia River, Yakima River and its tributaries, or along the Klickitat, White Salmon, and Cowlitz rivers to fish. In July, as the summer heat increased, families moved to higher elevations to continue to hunt and gather wild plant foods, including camas and huckleberries (Walker 1998).

In the fall, people returned to the river valleys for the fish runs and to travel to trading locals along the Columbia. Around mid-November, families returned to winter villages bringing with them supplies of roots, salmon, berries, venison, and other food accumulated and preserved (Walker 1998).

The Wahkiacus study area is said to have been an important fishing area to Yakama Nation people and is culturally rich with resources. According to Shellenberger (2011): "The Indian word for this place describes the movement of the water at that specific location." A number of areas similar to Wahkiacus are named for the characteristics of water, many of which have a common meaning but are described in different dialects of *Ichi Skiin Sinwit-nan*. Such fishing areas are sought out for these characteristics as they have been proven advantageous fishing locales (Shellenberger et. al 2011).

3.10.2 Environmental Consequences

The assessment of impacts to cultural resources is based on preliminary investigations. Because of the preliminary nature of these investigations, characterization of impacts in by type, context, duration, and intensity was not possible. A complete effects determination will be presented in the Final EIS. For purposes of this Draft EIS, impacts are described in general terms.

3.10.2.1 Alternative 1 – No Action Alternative

Under the No Action alternative, no modifications would be made to the Klickitat hatchery other than routine maintenance. In addition, there would be no facilities constructed at either the Wahkiacus or McCreedy Creek locations. Cultural resources would remain unaffected. Salmon production would not significantly increase and tribal ceremonial and subsistence use of this traditional cultural resource would likely be unchanged from current conditions.

3.10.2.2 Alternative 2 – Full Master Plan Buildout

Under this alternative, modifications to the Klickitat hatchery would be made, as well as a new hatchery constructed at the Wahkiacus project site and a new acclimation facility along McCreedy Creek.

To determine how this alternative would affect cultural resources if present, cultural resources staff of the Yakama Nation conducted background research and pedestrian surveys of the Wahkiacus and Klickitat study areas. Research and field surveys were necessary to identify the presence of cultural materials that could be affected by proposed project actions. Additionally, Yakama Nation Cultural Resources Program Cultural Specialists who possess knowledge of Yakama culture and are trained in the recognition of Tribal historic properties, traditional cultural properties, legendary sites, and traditional resource gathering areas also provided information on the overall geographic area.

At the time this Draft EIS was prepared, a pedestrian survey of the McCreedy Creek study area had not taken place due to the presence of snow, which obstructed ground surface visibility. Once the snow has melted, a pedestrian survey of the McCreedy Creek study area will take place to determine the presence of cultural materials and evaluate the impacts of the alternatives. Findings will be addressed in the Final EIS.

Wahkiacus Study Area

Construction

The Wahkiacus study area is located within a known culturally sensitive area; therefore, in addition to a pedestrian survey, 50 auger test probes were excavated to determine if cultural materials were present below ground surface. During the course of this testing, artifacts were identified, mainly consisting of rock debris associated with the manufacturing of stone tools.

Additionally, the project area overlaps with a segment of the Columbia River – Northern Railroad. Both the railroad and the archaeological site have been determined eligible to the National Register of Historic Places. Due to the location of the study area, any ground-disturbing activities that take place within these sites will likely affect cultural resources.

Operational

Once constructed, the operation of the Wahkiacus hatchery facilities would have little to no impacts on cultural resources. Potential impacts could include vehicular traffic during daily routine operations and maintenance.

Klickitat Hatchery Study Area

Construction

During the course of the pedestrian survey, no archaeological resources or traditional cultural properties were identified. Four historic structures, including the existing hatchery building and three residences, were identified. The original fish hatchery was built in 1949, and is one of five hatcheries that WDFW built as a result of the Mitchell Act of 1938. No major alterations have been made to the hatchery since its construction that would damage its historical integrity. Minor changes have been made to the interior (i.e., new interior doors, toilets, urinals) but those elements that contribute to the facilities' historic architectural significance are retained. The three existing residences date to 1954, but did not undergo further evaluation because they were occupied at the time of the field inventory.

Due to their age and architectural style, these four structures are potentially eligible to the National Register. Under Section 106 of the National Historic Preservation Act, the modification of the existing hatchery and demolition of the residences could adversely affect the integrity of these properties.

Operational

Once constructed, the operation of facilities at the Klickitat hatchery would have no impact on cultural resources.

McCreedy Creek Study Area

Construction

At the point in time when this draft was prepared, a cultural resources inventory of the McCreedy Creek site had not yet been undertaken due to the presence of snow obstructing ground surface visibility.

Further evaluation of the proposed study area is needed prior to determining the impacts of this alternative. Because there are no existing facilities at this location, should cultural materials be identified within the McCreedy Creek study area, it is possible that the project could have an effect on them.

Operational

Once constructed, the operation of facilities along McCreedy Creek would be limited to the acclimation season and would have no impact on cultural resources.

3.10.2.3 Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Under this alternative there would be no new hatchery facilities constructed at the Wahkiacus location; therefore, cultural resources would remain unaffected.

Klickitat Hatchery Study Area

Under this alternative, hatchery and production actions would be focused at the modified Klickitat hatchery. The Klickitat Hatchery modifications would be constructed as described for Alternative 2. In addition, this alternative would include construction of a new 1,400-square-foot raceway at the Klickitat Hatchery. The impacts to historic properties would be the same as under Alternative 2.

McCreedy Creek Study Area

If necessary, an acclimation facility would be developed at McCreedy Creek as described in Alternative 2 and impacts would be the same as those under Alternative 2.

3.10.3 Mitigation Measures

Wahkiacus Study Area

Through the consultation process, BPA, the Yakama Nation, and the Washington State Historic Preservation Office will develop a mitigation strategy for the Wahkiacus study area. This could involve additional testing, monitoring during construction, or modification to design to lessen adverse effects.

Klickitat Hatchery Study Area

Through the consultation process, BPA and the Yakama Nation would develop a mitigation strategy for the Klickitat study area. In terms of the fish hatchery, the main structural elements that contribute to its unique historic architecture include the exposed beams (glu-lam trusses) and wooden interior, which is common among mid-century buildings in Washington State. The glass-block windows are a trademark of 1930's technological advances in glass exteriors and became popular in the 1930s and 40s. Alternatives 2 and 3 involve removing these windows to create a darker environment for fish rearing.

One mitigation option could involve modifying the project design to leave the glu-lam trusses and wooden interior in place and unaltered. Another option could involve thoroughly documenting the exterior and interior of the structure (photographs, drawings, narrative description) according to Historic American Buildings Survey/Historic American Engineering Record standards.

McCreedy Creek Study Area

If necessary, a mitigation strategy for the McCreedy Creek study area would be developed once the area has been evaluated for the presence of cultural resources.

3.11 Aesthetics

3.11.1 Visual Resources

3.11.1.1 Affected Environment

Wahkiacus Study Area

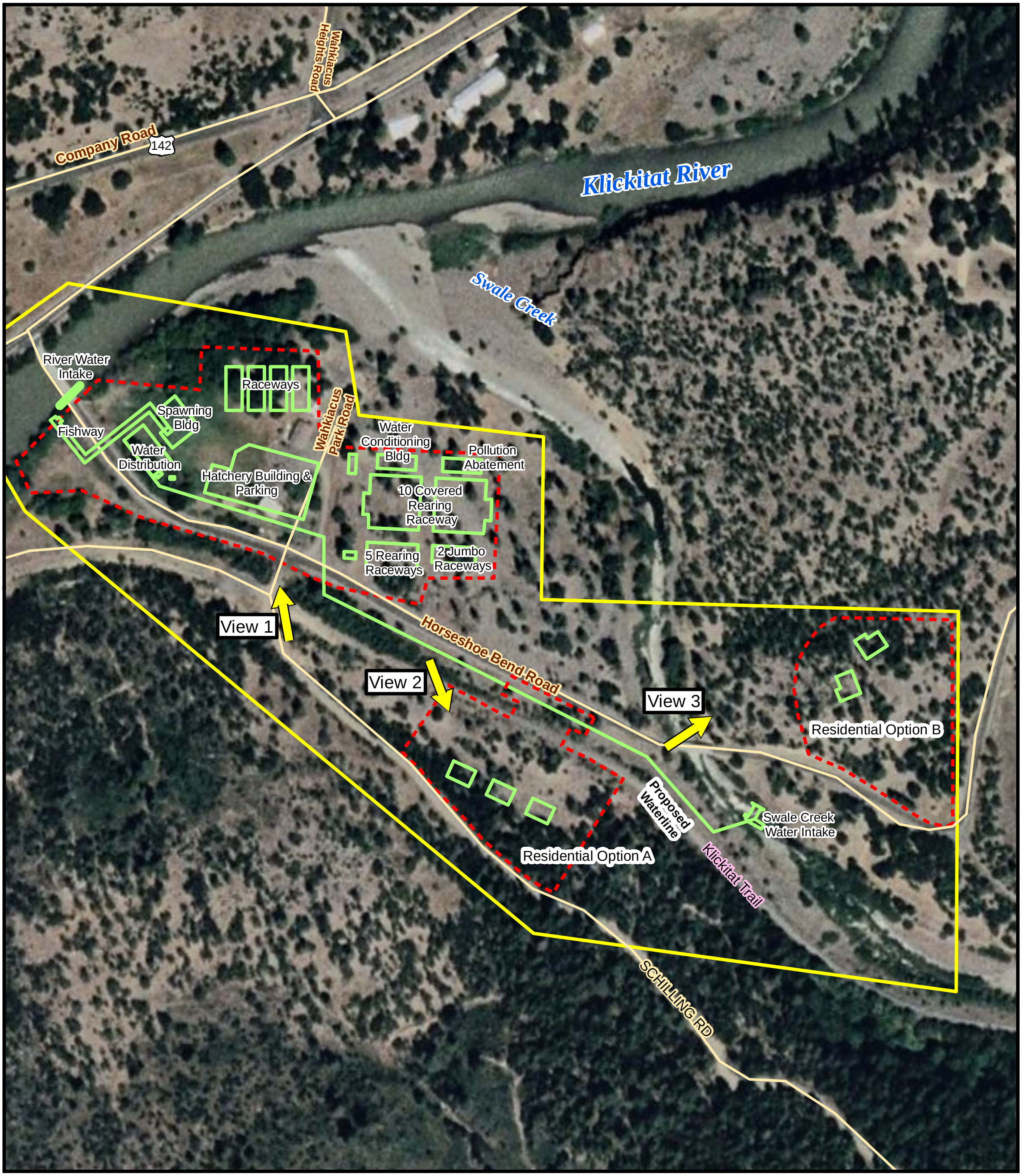
The Wahkiacus study area for determining aesthetic impacts encompasses existing facilities, approximately 2,000 feet of the Klickitat Trail, a portion of Horseshoe Bend Road (approximately 2,250 feet), and the portion of State Highway 142 immediately across the Klickitat River from the site. Schilling Road and Wahkiacus Park Road are also within the study area. The study area also includes areas of potential project disturbance during construction (i.e., the project footprint) and limits of construction access and staging areas.

The study area for the Wahkiacus project site is rural in character with very few residences or structures in the vicinity. Existing structures at the site consist of mobile offices, a maintenance building, and a house that serves as office space for Yakama Nation staff. Several low traffic transportation corridors are present within the Wahkiacus study area, including Shilling Road, Wahkiacus Park Road, Horseshoe Bend Road, and State Highway 142. The Klickitat Trail, which is managed by the Washington State Parks and Recreation Commission, parallels Horseshoe Bend Road, south of the Wahkiacus project site. The trail is used by hikers, bicyclists, and horseback riders.

Public views of the site are available from portions of the Klickitat Trail, Shilling Road, Horseshoe Bend Road, Wahkiacus Park Road, and State Highway 142. Views of the existing structures are generally limited by the presence of vegetation. Three key views of the Wahkiacus project site were identified during the inventory of existing conditions: one from the Klickitat Trail and Shilling Road viewing the existing structures (View 1), one from the Klickitat Trail viewing Residence Option A (View 2), and one view from the bridge over Swale Creek on Horseshoe Bend Road viewing Residence Option B (View 3). Figure 3-6 shows the view locations.

View 1: Klickitat Trail and Schilling Road

View 1 is at the intersection of the Klickitat Trail and Schilling Road, south of the Wahkiacus project site. From this location Schilling Road, Horseshoe Bend Road, and a house are visible from the trail. The sensitive viewers identified for this view include trail users and motorists travelling on Shilling Road. Vegetation provides a partial screen of the existing structures from the trail and Shilling Road and limits its visibility to trail users and those travelling north on Shilling Road.



Legend

- Proposed New Structure
- Study Area
- Disturbance Area

N S E W

Miles: 0 0.015 0.03 0.06 0.09 0.12

Klickitat Hatchery Complex Program

Key Views-Wahkiacus Site

Figure 3-6

May 2011

View 2: Residence Option A

View 2 is from the Klickitat Trail looking south at proposed Residence Option A area. This undeveloped site is sparsely covered with ponderosa pine, oak, and grasses. The existing vegetation provides a partial screen, restricting views of the Residence Option A area from the Klickitat Trail. The sensitive viewers identified for this view are trail users. The residence site is visible along a 500-foot-long segment of the trail.

View 3: Residence Option B

View 3 is located at the bridge crossing Swale Creek on Horseshoe Bend Road looking northeasterly at the proposed Residence Option B area. This undeveloped site is sparsely covered with ponderosa pine, oak and native grasses. The vegetation provides a partial screen, restricting views of the Residence Option B area from the road. The sensitive viewers identified for this view are eastbound travelers on Horseshoe Bend Road. The housing site is visible to eastbound travelers for less than 500 feet and is only visible for a short duration of time. Westbound viewers have a limited view of the site due to the steep topography north of Horseshoe Bend Road.

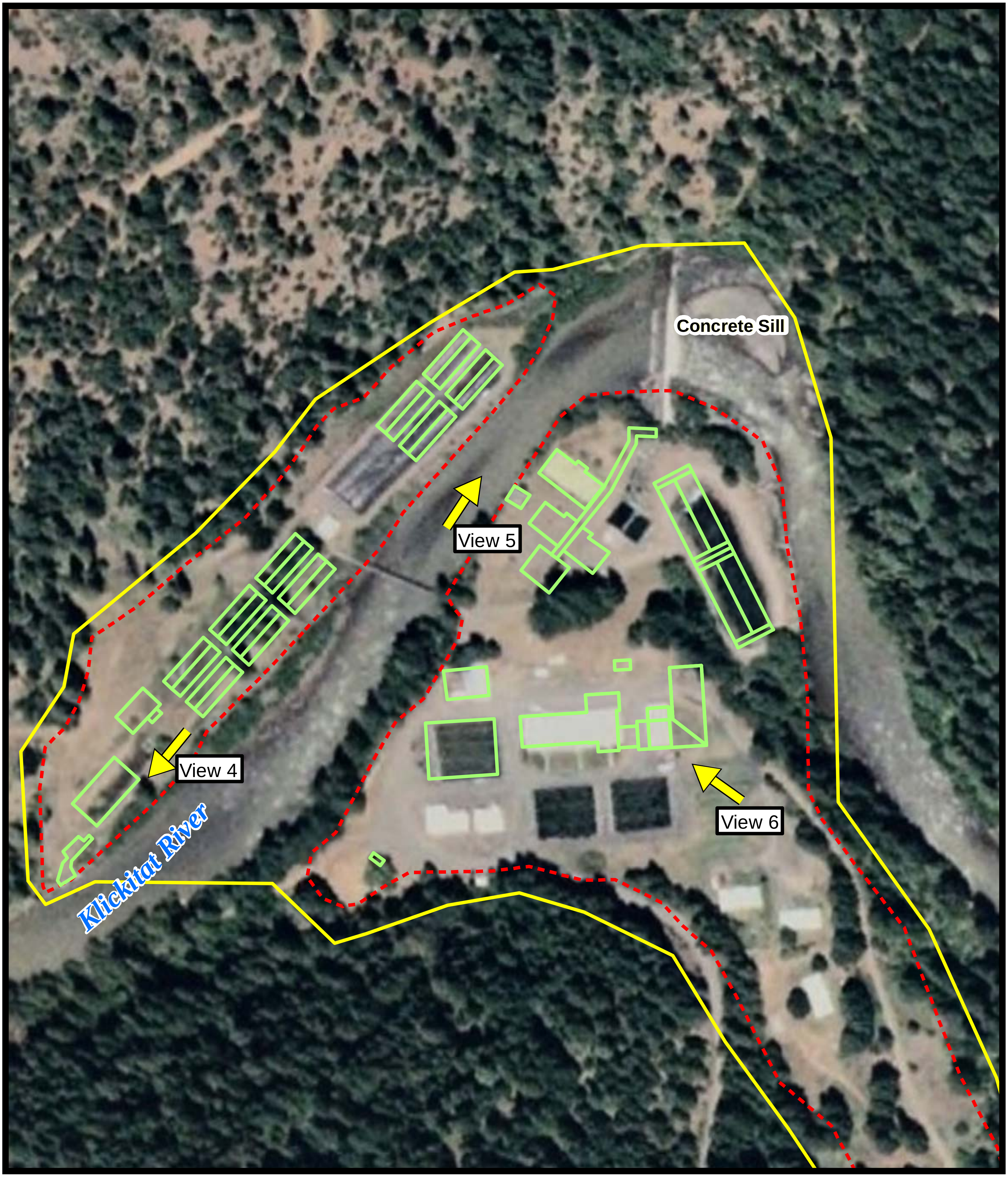
Klickitat Hatchery Study Area

The Klickitat Hatchery study area for determining aesthetic impacts encompasses the area surrounding existing facilities on both sides of the Klickitat River and extends approximately from Fish Hatchery Road to the Klickitat River on the south side of the river and approximately 300 feet from the river on the north side, and 1,200 feet upstream of the bridge and 2,200 feet downstream. The study area also includes areas of potential project disturbance during construction (i.e., the project footprint) and the limits of construction access and staging areas.

The Klickitat Hatchery study area is rural in character, with existing hatchery facilities located on terraces on either side of the river. Existing structures at the site include a main hatchery building, three residence buildings, a generator building, freezer building, energy building, concrete rearing ponds, rearing raceways, and various smaller structures (i.e., sheds, storage facilities). In addition to the existing structures, mixed conifer forest and riparian streamside vegetation frame the site. Access to the project site is via the 2.8-mile-long Fish Hatchery Road, a private two-lane gravel/dirt-surfaced county road off of the Glenwood Highway. Outside the immediate vicinity of the hatchery complex the area is largely undeveloped and there are no residences or structures.

Four key views of the Klickitat Hatchery study area were identified during the inventory of existing conditions. These four key views characterize the built features associated with the hatchery complex: gravel road and settling basin on the left bank of the Klickitat River (View 4), facility pumps visible from the Klickitat River (View 5), storage building (View 6) and the raceway (View 7). Figure 3-7 and Figure 3-8 shows the view locations.

The Klickitat Hatchery is open to the public; however, due to its remote location it receives minimal public use compared to other hatcheries. Members of the public visiting the Klickitat Hatchery or accessing the site to fish would be considered sensitive viewers. On site, views of the existing structures are limited in some areas by vegetation.



Legend

- Study Area
- Proposed New Structures
- Disturbance Area

N
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0 | 0.015 | 0.03 | 0.06 | 0.09 | 0.12

Klickitat Hatchery Complex Program

Key Views -Klickitat Site (1 of 2)

Figure 3-7

May 2011

Legend

- Study Area
- Proposed New Structures
- Disturbance Area

Klickitat Hatchery Complex Program

Key Views -Klickitat Site (2 of 2)

Figure 3-8

May 2011

Miles

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View 1. Wahkiacus Hatchery Site: Intersection of Klickitat Trail and Schilling Road, looking north at the office/residence structure.

View 2. Wahkiacus Hatchery Site: Looking south at Residence Option A from the Klickitat Trail.

View 3. Wahkiacus Hatchery Site: Looking northeasterly at Residence Option B from Horseshoe Bend Road.

View 4. Klickitat Hatchery Site: Looking southwest along gravel path leading to settling basin (to the right of the photo) and gravity intake (not visible in photo).

View 5. Klickitat Hatchery Site: Klickitat River looking downstream (northeast) at pumps associated with the Klickitat Hatchery Complex on right bank.

View 6. Klickitat Hatchery Site: Storage building within the Klickitat Hatchery Complex looking west.

View 7. Klickitat Hatchery Site: Existing raceway within the Klickitat Hatchery Complex looking south.

Individuals and groups rafting and kayaking through this stretch of river are identified as sensitive viewers. Views of the Klickitat Hatchery by river users are possible over approximately a 0.23 mile segment of the river (View 5).

McCreedy Creek Study Area

The McCreedy Creek study area for determining aesthetic impacts extends from Klickitat River Road (BIA 225) southeast of the Klickitat River and southwest 500 feet from McCreedy Creek. The study area also includes areas of potential project disturbance during construction (i.e., the project footprint) and the limits of construction access and staging areas.

The McCreedy Creek site is located on a terrace along the right bank of McCreedy Creek. It is currently a forested meadow with a gentle slope toward the Klickitat River. There are no structures on or within the immediate vicinity of the site. The surrounding area is primarily forest land with some active harvest occurring. A 2-lane gravel road providing access to the site is the only built feature present.

The McCreedy Creek site is within the "Closed Area" of the Yakama Nation Reservation, where access is limited to tribal members. The sensitive viewers identified for this site include tribal members who occasionally use the site for hunting, fishing, and as a primitive campground.

Site photos are not provided for the McCreedy site due to the sensitivity of its location within the closed area of the Yakama Nation Reservation, but the anticipated impacts are discussed below.

3.11.1.2 Environmental Consequences

For purposes of this EIS, the intensity of impacts to visual resources are categorized as follows:

> ***Minor:*** Impacts to aesthetic resources would attract attention, but would not dominate the view or detract from current user experience.
>
> ***Moderate:*** Impacts to aesthetic resources would attract attention and contribute to the viewscape. User experience would be negatively affected locally and for a brief period.
>
> ***Major:*** Impacts would result in changes to the characteristic landscape and those changes would dominate the viewscape. The majority of the user's experience in the area would be negatively affected by the change in the viewscape.

Alternative 1 – No Action Alternative

Alternative 1 would not involve any construction, other ground-disturbing activities or alteration of the Wahkiacus, Klickitat, or McCreedy sites; therefore, viewers identified above would not experience a change in site aesthetics. The sites would remain in their current state and views at each site would be unaffected by Alternative 1. No direct or indirect effects to aesthetic resources would result from Alternative 1.

Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

<u>Construction</u>

Construction-related activities, including heavy equipment operation, clearing and grading, material stockpiles, and worker presence would be visible from all three key viewpoints throughout construction. Construction activities would last approximately 18 months and take place almost year-round until completion.

Construction of the Yakama Nation's Klickitat regional fisheries office, new hatchery and acclimation facility, and other associated structures would attract attention of sensitive viewers (trail users and motorists) and alter the existing viewscape of View 1. Sensitive viewers would experience a negative effect locally from construction activities; however, this effect would only occur for a brief period of time. View 1 is partially screened by vegetation between Horseshoe Bend Road and the Klickitat Trail. This vegetation would not be removed during construction; therefore, the visibility of the construction activities from View 1 would be screened from key viewers and constitute a short-term moderate adverse direct impact to aesthetics resources.

Construction of Residence Option A or B would involve a number of construction-related activities that would attract attention of sensitive viewers (trail users at View 2 or motorists at View 3). These activities include heavy construction equipment operations, truck traffic, clearing and grading, material stockpiles, and construction worker presence. Sensitive viewers at Views 2 or 3 would experience a negative effect locally from these construction activities, depending on the selected location of the residence development; however, this effect would only occur for a brief period of time and constitute a moderate adverse direct impact to aesthetic resources.

<u>Operational</u>

The Yakama Nation's Klickitat regional fisheries office would replace the existing office and home, and would be visible from View 1 by trail users and those travelling Schilling Road (Figure 3-6). The structure and other new proposed structures (to the east of the office) would be most visible to those travelling west/northwestward on Schilling Road. The new office would be approximately six times the size of the existing structure and would be two stories tall. The new structures would be visible for a short period of time to users of the Klickitat Trail as they cross Schilling Road (less than 100 feet). Given that the new structures would be larger and taller than the existing built features, it is anticipated that they would attract attention and contribute to the viewscape. The new structures would negatively affect user experience locally for a brief period of time. Therefore, the changes to View 1 represent a long-term moderate adverse direct impact to aesthetic resources.

The greatest change at View 2 would be the addition of three visible structures and access road, introducing a contrasting element to the foreground. The existing vegetation provides only partial screening of Residence Option A from the Klickitat Trail and the addition of the structures would attract attention and would visually contrast with the relatively undeveloped setting. As a result, user experience would be negatively affected locally and for a brief period (approximately 500 feet of the trail). This change in the viewshed would represent a long-term moderate direct adverse impact to aesthetic resources.

The two structures proposed at Residence Option B would be visible by eastbound travelers on Horseshoe Bend Road, just prior to the bridge crossing of Swale Creek for a distance of approximately 500 feet. The structures would contrast with the relatively undeveloped setting and would attract attention. Residence Option B is set away from Horseshoe Bend Road (approximately 100 feet) and the existing vegetation would continue to provide a partial screen from the road. Although Residence Option B is visible from the road, it would not dominate the view or detract from the current user experience, and constitutes a long-term minor direct adverse impact to aesthetic resources.

There are no inconsistencies with the Klickitat County Shoreline Management Program or WAC 173-26-241. Adherence to the Klickitat Shoreline Management Program policies and regulations related to aesthetics would be completed by obtaining a Conditional Use Permit from Klickitat County.

Indirect

No changes or other development outside the study area are anticipated to occur; therefore, no indirect effects are expected to occur from construction or operation of the Wahkiacus Hatchery.

Klickitat Hatchery Study Area

Construction

Construction-related activities, including heavy equipment operation, clearing and grading, material stockpiles, and worker presence would be visible from all four key viewpoints throughout construction. Construction activities would last approximately 12 months and take place almost year-round until completion.

Construction would involve the removal or demolition of some existing structures within the Klickitat Hatchery. The activities associated with the removal of these structures and construction of new structures would attract attention of those present at the Klickitat Hatchery. Given that Views 4, 6 and 7 currently contain built features, it is anticipated the new structures would not detract from the current user experience. The new structures proposed at the Klickitat Hatchery site would attract attention; however, they would not dominate the view. Therefore, the changes to Views 4, 6, and 7 would represent a long-term minor adverse direct impact to aesthetic resources.

Activities associated with the removal of the pollution abatement pond and water intake, partial removal of the in-river concrete, and construction of the new pollution abatement pond and water intake along the right bank (facing downstream) of the Klickitat River would be partially visible to river users as they travel downstream on the Klickitat River (View 5, Figure 3-7). The view of construction activities from the river is partially screened by vegetation and the lower topographic position of the river limits the visibility of site construction. Sensitive viewers (river users) would experience a negative effect locally from these construction activities; however, this effect would only occur for a brief period of time and constitutes a direct moderate impact to aesthetic resources.

Operational

Overall the operational changes associated with Views 4, 6 and 7 would be limited because existing hatchery facilities would be replaced with new hatchery facilities (Figure 3-7 and Figure 3-8). In some cases the new facilities would be larger; however, given that the site was previously developed, no impact to aesthetic resources is anticipated from operation on Views 4, 6, and 7.

The new pollution abatement pond and water intake would be reconstructed in the same location. These facilities would remain partially screened by vegetation. Other rebuilt or new facilities within the Klickitat Hatchery would not be visible from the river due to the lower topographic position of the river and vegetation screening. The modification of the in-river concrete weir would improve the view of the river by removing a portion of a manmade feature and returning the river to a more natural state. The pollution abatement pond and water intake would attract attention as river users pass through the Klickitat Hatchery; however, these features are currently present and the rebuilding of these features would not change the existing river experience. The pollution abatement pond and water intake would not dominate the view or detract from current user experience. Thus, the operation of the Klickitat Hatchery would have a long-term minor direct beneficial impact to aesthetic resources represented by View 5.

There are no inconsistencies with the Klickitat County Shoreline Management Program or WAC 173-26-241. Adherence to the Klickitat Shoreline Management Program policies and regulations related to aesthetics would be completed by obtaining a Conditional Use Permit from Klickitat County.

Indirect

No changes or other development outside the study area are anticipated to occur; therefore, no indirect effects are expected to occur from construction or operation of the Klickitat Hatchery.

McCreedy Creek Study Area

Construction

Construction-related activities, including heavy equipment operations, material stockpiles, and workers presence would be visible throughout construction. The McCreedy Creek site would require clearing and grading activities over approximately 1.4 acres. Construction activities would last approximately 2 months and take place in one consecutive period until completion. Construction activities would attract attention; however, sensitive viewers (tribal members who use the site for camping, fishing, and hunting) would discontinue use of the site during the development of the acclimation facility. Given that the sensitive viewers would not be present at the site, there would be no impact to aesthetic resources from construction.

Operational

Long-term operational uses of the McCreedy Creek site would fall into two categories: seasonal and permanent. Seasonal operations would occur from late March to early May each year and would involve the temporary placement of several structures. These structures would include aluminum raceways, mobile residence, generators, mobile acclimation units, and several in-water structures. In early May each year, those structures would be removed from the site. Permanent uses of the McCreedy Creek site relate to development of a new 12-foot-wide gravel road that would run along the perimeter of the raceways and other structures, an earthen pond, and a fence around the cleared area.

The seasonal use of the site for acclimation facilities would attract attention; however, as discussed above, tribal use of the site would not occur during acclimation season. Tribal use of the site would continue following the seasonal use period. Given that sensitive viewers would not be present at the site during acclimation activities and most structures are mobile and would be removed following seasonal use, there would be no impact to aesthetic resources from operation of the McCreedy Creek site.

Indirect

No changes or other development outside the study area are anticipated to occur; therefore, no indirect effects are expected to occur from construction or operation of the McCreedy Creek site.

Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Alternative 3 would not involve any construction, ground-disturbing activities, or alteration of the Wahkiacus site; therefore, sensitive viewers (motorists and trail users) would not experience a change in site aesthetics. The site would remain in its current state and views would be unaffected by Alternative 3.

Klickitat Hatchery Study Area

Under Alternative 3, the Klickitat Hatchery site would be redeveloped in the same way as it would under Alternative 2, with only a slight difference in the size of the adult holding pond and the pollution abatement pond and the addition of a rearing raceway.

Construction and operational aesthetic impacts associated with the site would be the same as described under Alternative 2.

McCreedy Creek Study Area

Under Alternative 3, the McCreedy Creek site would be used as an acclimation facility in the same way as it would under Alternative 2. Construction and operational aesthetic impacts associated with the site would be the same as described under the Alternative 2.

Mitigation Measures

1. To avoid, minimize, or mitigate potential aesthetic impacts, the areas of disturbance would be limited to only those necessary for construction.

2. Following construction, all disturbed areas would be seeded with native grasses, planted with understory vegetation and, where appropriate, planted with tall over story vegetation such as oak, Douglas fir, ponderosa pine, or red cedar.

3.11.2 Soundscape

3.11.2.1 Affected Environment

The effects of noise on people are relatively localized due to the nature of noise as an airborne vibration, and because of how noise attenuates (decreases) through shielding (such as being blocked by hills and valley walls) and through geometric spreading (the weakening of noise levels with distance). For the purposes of evaluating the potential for noise impacts associated with the project alternatives in this EIS, a distance of 0.25 mile (approximately 1,300 feet) from each facility site is used as the potential area of project impact.

Noise is generally defined as unwanted sound. Noise is measured in terms of sound pressure level, which is expressed in decibels (dB). Sound level meters used to measure environmental noise generally incorporate a filtering system that approximate the normal human perception of noise. Measurements made using this filtering system are termed "A-weighted decibels," abbreviated as dBA. Noise levels referred to in this EIS are based on hourly-equivalent sound pressure levels (L_{eq}), which is the amount of noise energy represented by varying noise levels if they were evened out over a one-hour period.

Noise levels decrease with distance from a noise source. Sound from a point source attenuates by about 7.5 dB as distance doubles (WSDOT 2010). Subjectively, a 10 dBA change in noise levels is perceived by most people to be approximately a twofold change in loudness (e.g., an increase from 50 dBA to 60 dBA causes the perceived loudness to double). Generally, 3 dBA is the minimum change in outdoor sound levels that can be perceived by a person with normal hearing. No noise measurements were taken at the three project sites; however, all three sites are characterized by low background ambient noise levels typical of rural areas. The general noise environment and existing noise sources and for each site are summarized below.

Wahkiacus Study Area

The Wahkiacus project site is located in an area of low residential development. The area has considerable relief and is mostly open scrub and sparse forest. The site is located in a steep valley near the Klickitat River and near Washington State Route (SR) 142, which carries approximately 600 to 700 vehicles per day (average daily traffic; Mayer 2010). The existing buildings and activities at the site are not a significant source of ambient noise.

The most substantial sources of existing noise are the river and SR 142. On the river banks, noise levels are loud enough that human conversations need to be conducted with louder voices than is normal. At the existing buildings on the site, the river is audible but does not impede communication. Swale Creek is a minor source of noise at certain times of year, but is an ephemeral stream, which means it is dry for part of the year.

Vehicles on SR 142 produce the peak-observed noise levels during vehicle passbys; however, overall traffic volumes are low, with less than 100 cars in any single hour.

There are no residential units currently at the Wahkiacus project site. The nearest off-site residences are located approximately 900 feet (approximately 0.17 mile) northeast of the site on the north side of the Klickitat River. The Klickitat Trail, a recreational land use, is located approximately 250 feet to the south of the Wahkiacus project site.

Klickitat Hatchery Study Area

The Klickitat Hatchery is located in an area of very low development. The site is in an area with considerable relief and is characterized mostly by evergreen forests. The hatchery access road terminates at the facility and carries hatchery access traffic only. The existing hatchery is not a significant source of ambient noise.

The most substantial source of existing noise at this location is the Klickitat River. On the river banks, noise levels are loud enough that human conversations need to be conducted with louder voices than is normal. The river is audible at the hatchery, but does not impede communication.

Overall, the Klickitat Hatchery facility is characterized by low ambient noise levels typical of rural areas. The Klickitat Hatchery facility currently includes three on-site residences, which would be considered noise-sensitive land uses. There are no known off-site residences within 0.25 mile of the Klickitat Hatchery facility.

McCreedy Creek Study Area

The McCreedy Creek site is currently an undeveloped site located within the Yakama Nation Reservation. The McCreedy Creek site is in an area with considerable relief and is characterized mostly by evergreen forests. There is no noteworthy development in this area that produces existing noise other than an occasional car on the two-lane gravel road near the site.

The dominant sources of existing noise are the Klickitat River, and vehicles on the gravel road while vehicles are passing by. Close to the river, noise levels are loud enough that human conversations need to be conducted with louder voices than is normal.

Vehicles on the gravel road produce the peak-observed noise levels during vehicle passbys; however, overall traffic volumes are very low due to the remote nature of the site. There are no existing noise-sensitive land uses within 0.25 mile of the McCreedy Creek site.

Overall, the McCreedy Creek site is characterized by low ambient noise levels typical of rural areas.

3.11.2.2 Environmental Consequences

The magnitudes of potential impacts were evaluated as minor, moderate, and major, based on the following definitions:

Minor: Impacts to the soundscape from human-caused noise would be measurable but temporary and local. Current human-caused noise levels would return in the long term. Natural sounds would predominate.

Moderate: Impacts to the soundscape from human-caused noise would temporarily predominate during daylight hours, but would not be overly disruptive to noise-sensitive user activities.

Major: Impacts to the soundscape from human-caused noise would predominate during daylight hours and would be overly disruptive to noise-sensitive user activities in the area for sustained periods of time.

Alternative 1 – No Action Alternative

Implementation of the No Action Alternative would result in no new noise-generating activities at the Wahkiacus, Klickitat, or McCreedy Creek sites. Noise would continue to be generated at the Klickitat Hatchery and at the Wahkiacus Field Station and through normal hatchery operations. The McCreedy Creek site would remain undeveloped. Normal ambient background noise would continue to originate from the Klickitat River and traffic on local roads, where applicable, and occasional vehicles accessing the project sites. The sites would remain in their current state and views at each site would be unaffected by Alternative 1. No direct or indirect effects to aesthetic resources would result from Alternative 1.

Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

<u>Construction</u>

Construction of the project can be expected to cause moderate short-term noise impacts in areas directly adjacent to construction activity. Construction equipment noise levels are usually measured at 50 feet from the source, and some typical levels are listed in Table 3-27.

Table 3-27: Typical Construction Equipment Noise (dBA)

Types of Activities	Types of Equipment	Range of Noise Levels at 50 Feet
Materials Handling	Concrete mixers	75-87
	Concrete pumps	81-83
	Cranes (movable)	76-87
	Cranes (derrick)	86-88
Stationary Equipment	Pumps	69-71
	Generators	71-82
	Compressors	74-87
Impact Equipment	Pneumatic wrenches	83-88
	Rock drills	81-98
Land Clearing	Bulldozer	77-96
	Dump truck	82-94
Grading	Scraper	80-93
	Bulldozer	77-96
Paving	Paver	86-88
	Dump truck	82-94

Source: U. S. Environmental Protection Agency, 1971b.

Effects from construction noise would be direct effects. No indirect construction noise effects are anticipated. Noise from construction activities is exempt from the WAC regulations, except for nighttime (10 p.m. to 7 a.m.) impacts to Environmental Designation for Noise Abatement Class A properties. No nighttime construction is anticipated at the Wahkiacus site.

The nearest residences are located approximately 900 feet (approximately 0.17 mile) from the site and may experience some temporary moderate impacts from construction noise.

Operational

New on-site residences would be constructed approximately 400 feet to the south of the nearest hatchery buildings under Residence Option A, or approximately 800 feet southeast of the nearest hatchery buildings under Residence Option B. The nearest off-site residences are located approximately 900 feet (approximately 0.17 mile) northeast of the site on the north side of the Klickitat River.

Operational noise sources at the Wahkiacus hatchery would include electric heat and water pumps, electric low water, temperature, and predator alarms (mounted on the hatchery building), and a diesel-driven emergency generator. Standard operation of the hatchery facility is not expected to generate noise that would differ substantially from that currently experienced at the nearby Klickitat Hatchery. Any effects from new or modified noise sources would be direct effects. No indirect effects are anticipated. The dominant ambient background noise sources at the site would continue to be from the river, and from SR 142.

Given the low overall noise levels observed at the Klickitat Hatchery, and the proposed Wahkiacus Hatchery's overall similarity to that facility, it is not anticipated that noise levels under Alternative 2 at the Wahkiacus site would cause noise impacts in exceedance of the WAC maximum environmental noise levels at on-site residences, or at the nearest off-site receptors. Operational noise impacts would therefore be characterized as minor at Wahkiacus hatchery facility.

Klickitat Hatchery Study Area

<u>Construction</u>

A variety of construction equipment would be used to develop the complex. On-site temporary staging areas would be created and used during the construction phase. Initial construction staging would be on the right bank of the river near Pond No. 25. Heavy equipment would be brought in on lowboys (trailers) using the eastside access road. Equipment would also be staged in previously disturbed areas on the right bank of the hatchery property near each project location away from public parking.

Construction equipment that would be used during construction would be similar to those used at the Wahkiacus study area under this alternative and are included in Table 3-27. Effects from construction noise would be direct effects. No indirect construction noise effects are anticipated.

Noise from construction activities is exempt from the WAC regulations, except for nighttime (10 p.m. to 7 a.m.) impacts to Environmental Designation for Noise Abatement Class A properties. No nighttime construction is anticipated at the Klickitat Hatchery site. On-site residences would experience the greatest degree of impact from construction noise; however, the on-site residences are not anticipated to be occupied during the construction period. Off-site residences approximately 0.25 mile from the site may experience some temporary minor impacts from construction noise.

<u>Operational</u>

Operational noise sources at the Klickitat Hatchery would include electric heat and water pumps, electric low water, temperature, and predator alarms (mounted on the hatchery building), and a diesel-driven emergency generator. Standard operation of the hatchery facility is not expected to generate noise that would differ substantially from the existing conditions. Any effects from new or modified noise sources would be direct effects. No indirect effects are anticipated. The dominant ambient background noise at the site would continue to be from the river.

Given the low overall noise levels at the existing facility, it is not anticipated that noise levels under Alternative 2 would cause noise impacts in exceedance of the WAC maximum environmental noise levels at on-site residences, or at the nearest off-site receptors (which are located more than 0.25 mile from the site). Operational noise impacts would therefore be characterized as minor at Klickitat Hatchery.

McCreedy Creek Study Area

Construction

A variety of construction equipment would be used to develop the site for acclimation activities, which would include construction of the culverts, construction of the seasonal streamside water intake, and delivery of the mobile acclimation raceways.

On-site temporary staging areas would be created and used during the construction phase. Construction equipment that would be used during construction would be similar to those used at the Wahkiacus study area under this alternative and are included in Table 3-27. Effects from construction noise would be direct effects. No indirect construction noise effects are anticipated.

There are no federal, state, tribal, or local (county) noise regulations that would apply at the McCreedy Creek site due to its location on tribal lands.

The on-site mobile residence is not anticipated to be occupied during the construction period. The nearest off-site residences are located more than 0.25 mile from the site and are not expected to experience temporary impacts from construction noise.

Operational

Operational noise sources at the McCreedy Creek site would include diesel and/or propane gas generators to supply necessary power to the facility 24 hours per day during the acclimation period (April - June), and electric low water, temperature, and predator alarms on the water intake. Any effects from new noise sources would be direct effects. No indirect effects are anticipated.

Proposed locations for the on-site mobile residence and the temporary generators have not been developed at this stage. Siting of these elements of the facility should be made to minimize disturbance to on-site staff from generator noise. However, there are no noise regulations that would be applicable at this site. Operational noise impacts at the mobile on-site residence are expected to be minor. No off-site noise impacts are expected.

Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Alternative 3 would not involve any construction, ground-disturbing activities, or alteration of the Wahkiacus site; therefore, no new or modified sources of noise would occur at the Wahkiacus site under this alternative. The site would remain in its current state and would be unaffected by Alternative 3.

Klickitat Hatchery Study Area

Under Alternative 3, the Klickitat Hatchery site would be redeveloped in the same way as it would under Alternative 2. Alternative 3 would result in temporary minor impacts from construction to the nearest off-site residences located approximately 0.25 mile from the hatchery. Operational noise impacts would be characterized as minor at the Klickitat Hatchery site.

McCreedy Creek Study Area

Under Alternative 3, the McCreedy site would be used as an acclimation facility in the same way as it would under Alternative 2. No off-site noise impacts are expected to occur from construction or operation of the McCreedy Creek site. Operational noise impacts at the mobile on-site residence are expected to be minor.

3.11.2.3 Mitigation Measures

No noise impacts are anticipated under Alternative 1. No noise impacts are anticipated as a result of long-term operation of hatchery and acclimation facilities under Alternatives 2 and 3. Therefore, no long-term mitigation is required.

Short-term construction noise would occur under Alternatives 2 and 3, but is exempt from the requirements of WAC 173-60 during daytime hours, and would not be applicable at any time at the McCreedy Creek site. No nighttime construction work is anticipated at the Klickitat or Wahkiacus sites; therefore, no mitigation is required.

3.12 Socioeconomics

3.12.1 Land Use and Transportation

3.12.1.1 Affected Environment

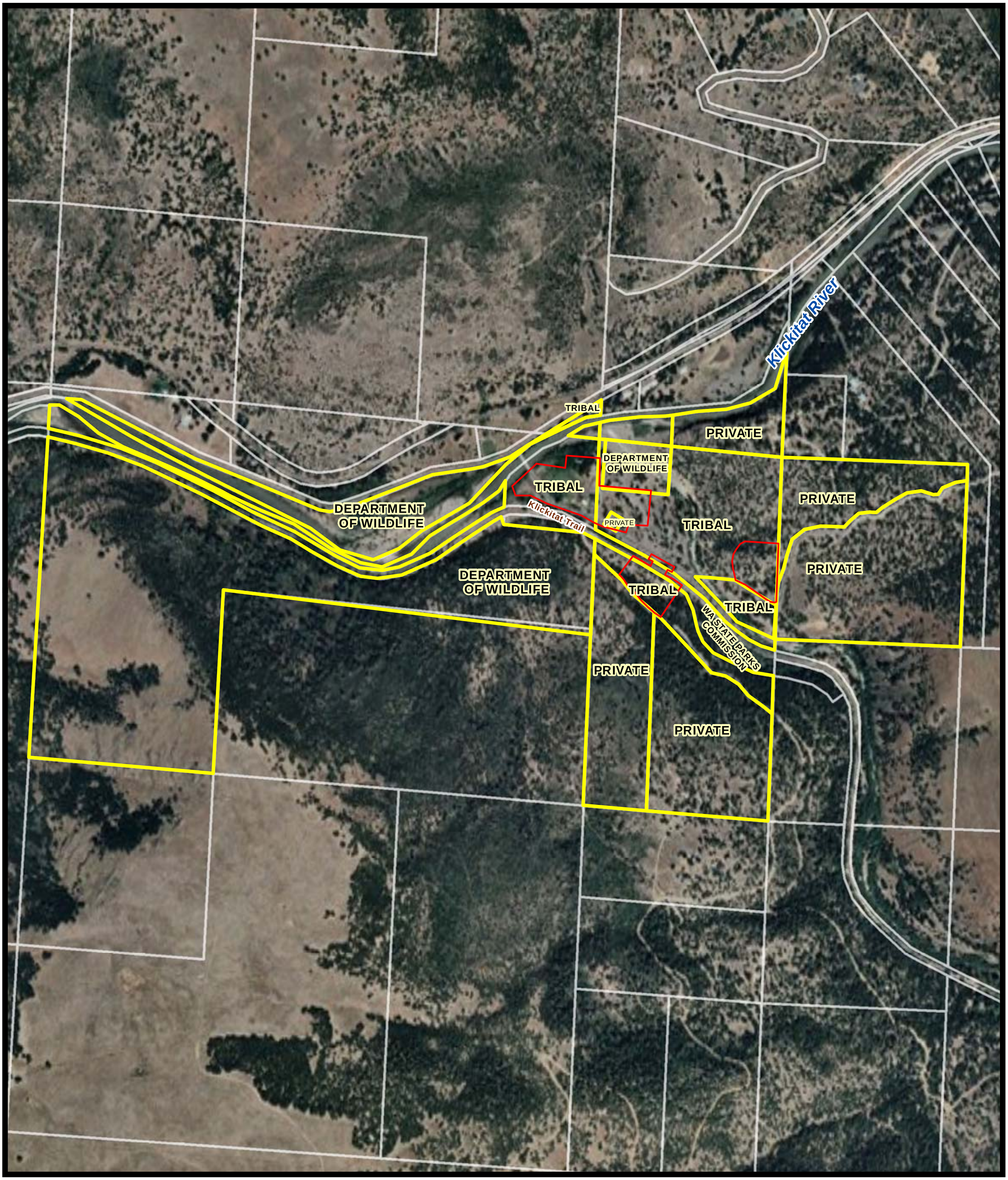
Wahkiacus Study Area

Land Use and Zoning

The land use study area is defined as the parcels directly affected by project actions and adjacent parcels. The study area at Wahkiacus includes the parcels that are currently operated by the Yakama Nation or WDFW; those parcels immediately adjacent to the north, east, and south; and those parcels located west of the project across the Klickitat River (Figure 3-9).

The majority of the land proposed for development at the Wahkiacus site is currently owned by the Yakama Nation. The WDFW owns two parcels at the confluence of Swale Creek and the Klickitat River and the two parcels proposed for residential development under Alternative 2 are privately owned. Existing structures at the site consist of mobile offices, a maintenance building, and a house that serves as office space for Yakama Nation staff.

The Wahkiacus study area is zoned as Open Space by Klickitat County. The purpose of this zone is to retain or conserve the open character of the land and safeguard the health, safety, and welfare of residents by limiting development in areas where police, fire, and safety protection is not possible without excessive cost to the community.



Klickitat Hatchery Complex Program

Land Use-Wahkiacus Site

Figure 3-9

May 2011

Legend

- County Parcel
- Disturbance Area
- Land Use Study Area

0 0.05 0.1 0.2 0.3 0.4 Miles

Single family dwellings and conservation uses, such as fish hatcheries, are permitted outright in this zone. The existing structures are considered a nonconforming use under the Open Space zoning (Sheridan 2011).

The section of the Klickitat River that runs through the Wahkiacus study area is designated as a Conservancy Environment under the Klickitat County Shoreline Master Plan. The purpose and intent of the conservancy environment is to protect, conserve, and manage existing natural resources and/or unique, valuable, aesthetic, historic, and cultural areas to achieve sustained resource utilization and provide recreational opportunities.

Transportation

The study area for assessing transportation impacts at Wahkiacus is defined as local access roads and connected major arterials. The study area includes roads used to access the site, including Horseshoe Bend Road, Schilling Road, Wahkiacus Park Road, and major highways, including Washington SR 142 and the Glenwood Highway (see Figure 3-10).

SR 142 is a 2-lane, undivided paved road that parallels the Klickitat River on the opposite bank from the Wahkiacus project site. Horseshoe Bend Road, a gravel county road, extends east-west through the southern portion of the project site and crosses the Klickitat River on a 2-lane paved bridge, coming to a T-intersection with SR 142. Schilling Road branches to the south off Horseshoe Bend Road. The project site is accessed via Horseshoe Bend Road and Wahkiacus Park Road.

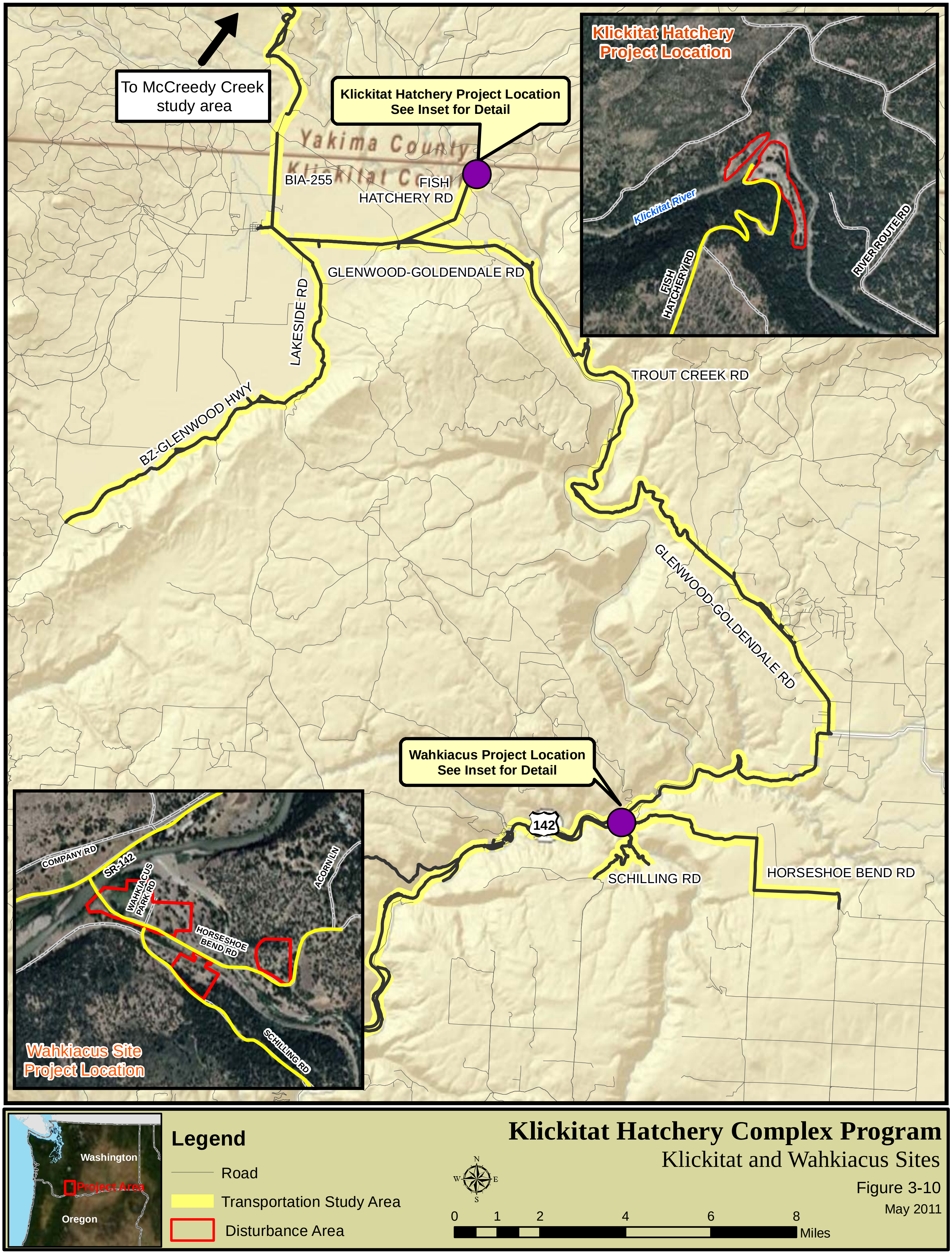
SR 142 provides access along the Klickitat River between the towns of Lyle and Goldendale. It is a WSDOT-designated rural collector road consisting of two 11-foot lanes with 1-foot paved shoulders on each side. SR 142 has a speed limit of 40 miles per hour (WSDOT 2009a). Average daily traffic volume on SR 142 near Wahkiacus was 560 vehicles in 2009 (WSDOT 2009b).

Klickitat Hatchery Study Area

Land Use and Zoning

The land use study area at the Klickitat Hatchery includes the hatchery property, which is on both sides of the Klickitat River, and all adjacent parcels to the east, west, and south of the hatchery property. The Klickitat Hatchery site covers approximately half of a 167-acre parcel that is owned by the State of Washington and co-managed by WDFW and the Yakama Nation.[8] Existing structures at the site include a main hatchery building, three residence buildings, a generator building, freezer building, energy building, and several storage sheds.

[8] The Klickitat Hatchery is within an area known as Tract D. Jurisdiction over Tract D is in dispute between Klickitat County and the Yakama Nation.



Legend

- Road
- Transportation Study Area
- Disturbance Area

Klickitat Hatchery Complex Program

Klickitat and Wahkiacus Sites

Figure 3-10

May 2011

The area surrounding the hatchery is rural in character with no residences or structures on adjacent parcels. The majority of the adjacent parcels are privately owned; however, the United States Forest Service owns a parcel directly south of the hatchery property. All adjacent parcels are used for timber production and have no existing improvements.

The entire project area is zoned as Forest Resource by Klickitat County. The purpose of this zone is to provide a stable commercial forest and wild land base and to encourage good multiple use forest management in its broadest definition. Any activities, uses, products, and value related to forests and wild lands are considered appropriate and compatible. The Klickitat Hatchery is considered a conforming use within the Forest Resource zone. The section of the Klickitat River that runs through the project area is designated as a Conservancy Environment under the Klickitat County Shoreline Master Plan. The purpose and intent of the conservancy environment is to protect, conserve, and manage existing natural resources and/or unique, valuable, aesthetic, historic, and cultural areas to achieve sustained resource utilization and provide recreational opportunities.

Transportation

The study area for assessing transportation impacts includes roads used to access the Klickitat Hatchery, such as Fish Hatchery Road, and major highways connecting the access roads, including SR 142 and the Glenwood Highway (see Figure 3-10).

Access to the Klickitat Hatchery is via Fish Hatchery Road, a private two-lane gravel/dirt-surfaced county road that branches northeast off Glenwood Highway 2.8 miles south of the hatchery facilities. Glenwood Highway is a paved county road that provides cross-county connection between Glenwood and SR 142 near Goldendale. Roads in the Klickitat Hatchery project area include the Glenwood Highway, which connects Lakeside Road outside of the City of Glenwood with SR 142; Fish Hatchery Road, which provides the only access to the Klickitat Hatchery site; and several private haul roads. A newly constructed one-lane bridge over the Klickitat River provides access to hatchery facilities on the left and right banks of the river. Average daily traffic volume on SR 142 after the junction with Glenwood Road was 800 in 2008 (WSDOT 2008a). The Glenwood Highway is a paved two-lane county-operated highway.

McCreedy Creek Study Area

Land Use and Zoning

The McCreedy Creek study area for determining land use impacts includes the proposed development site and the adjacent properties.

The McCreedy Creek project site is located at RM 70 of the Klickitat River. It is a 1.3-acre parcel within an 807,000-acre designated closed area of the Yakama Nation Reservation, available for the exclusive use of tribal citizens. Most of the forest in the closed area has been selectively harvested by the Yakama Nation and the tribe intends to continue to use the lands for timber production. The project site is a forested meadow with a gentle slope toward the Klickitat River. There is no development at the site or in the immediate vicinity. This area is used by tribal members primarily for camping, fishing, and hunting (Sharp 2009b). The Yakama Nation Reservation is not subject to local or state regulations such as zoning and shoreline codes. The closed area is regulated under tribal code.

The majority of the land located within the closed area (87.5 percent) is owned by the Yakama Nation, with nonnative American landowners holding titles to the remainder. The Yakama Nation plans to acquire these nonnative American lands as they become available. Timber harvest on nonnative American land within the closed area is controlled by the Yakama Nation, according to Resolution T-25-91, passed by the Yakama Nation Tribal Council in 1990 (Yakama Nation 2005b).

Transportation

The analysis of transportation impacts in the McCreedy Creek study area considers the access road to the McCreedy Creek site as the affected environment. The McCreedy Creek project site is accessible from Klickitat River Road (also known as BIA Road 255), a two-lane dirt road that parallels the Klickitat River through the closed area of the reservation. Because the Klickitat River Road provides access to the closed area, use is restricted to tribal members; therefore, the number of vehicles using the road in this area is very few. The Klickitat River Road is operated and maintained by the Bureau of Indian Affairs as part of the Indian Reservation Roads system.

3.12.1.2 Environmental Consequences

For land use and transportation, each level of impact was defined as follows:

> ***Minor:*** Impacts to land use would be limited to the project site. Any changes in land use would be consistent with local (city or county) plans and zoning. Traffic volumes would not noticeably increase. No impacts would be perceptible at the regional (Klickitat County, Yakima County, and Yakama Reservation) level, and local impacts would be limited.
>
> ***Moderate:*** Impacts to land use would occur at the site and at adjacent properties. Changes may be incompatible with adjacent land uses, but would be consistent with local plans and zoning. A short-term increase in traffic volumes would result in noticeable impacts in the vicinity of the project.
>
> ***Major:*** Impacts to land use would be readily apparent and would not be compatible with adjacent uses. Project elements are inconsistent with adopted plans and zoning. A long-term increase in traffic volumes would result in noticeable impacts in the region.

Alternative 1 – No Action Alternative

Current land use in the Wahkiacus site, Klickitat Hatchery site, and McCreedy Creek site would continue under the No Action Alternative. No modifications would be constructed and land ownership would remain unchanged. No change in use patterns or access for local transportation corridors is expected.

Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

Construction

Development of the Wahkiacus Hatchery and Acclimation Facility would change the existing land use by increasing the developed area at this site. Buildings would be sited on areas that are currently undeveloped. While construction of facilities to manage natural resources is an allowed use within Conservancy environments, development of the Wahkiacus Hatchery and Acclimation Facility would require a Conditional Use Permit and Floodplain Permit from the County. Construction of facilities below the OHW of the Klickitat River would be considered a Shoreline Alteration under the Klickitat County Shoreline Master Plan. Because the impact would be limited to the project site and the project would be consistent with county plans and zoning, this would be considered a minor direct impact to land use. Construction activities associated with Alternative 2 would not change zoning within the Wahkiacus study area.

Construction would cause a short-term (18 month) increase in traffic. Approximately six trucks per week would travel from the Portland metro area and approximately 30 construction worker vehicles per week would travel round-trip from local cities (Mayer 2010), resulting in a two percent increase in average daily traffic on SR 142 near the Wahkiacus site. This construction traffic would have a minor impact on transportation and traffic in the Wahkiacus study area because it would be of short duration and would involve relatively few truck trips. The increased traffic would be relatively unnoticeable by local residents and travelers on SR 142.

Weekly construction traffic on Horseshoe Bend Road would likely be noticeable to other travelers on that road because trucks would be slowing to turn into the construction site where there is currently minimal traffic. Construction workers would likely access the site in the morning and depart in the evening, limiting the presence on Horseshoe Bend Road to two short periods during the work days. At only 10 trips per week, large construction vehicles would be on the road very infrequently. Other travelers on the road would likely adjust to the presence of construction-related vehicles by timing trips accordingly or adjusting to short delays.

A section of Horseshoe Bend Road east of the bridge would be partially closed during construction of the new culvert under Horseshoe Bend Road. Flaggers would be placed on site, as necessary, to allow traffic to continue to move safely. Direct short-term adverse impacts to transportation from the culvert replacement would be considered minor due to the low volume of traffic currently using this section of Horseshoe Bend Road and would have no indirect impacts on regional traffic.

Operational

The proposed development at the Wahkiacus site under Alternative 2 is an allowed use under the Klickitat County Zoning Ordinance. Under Alternative 2, land use at the Wahkiacus site would be a mix of conservation and residential. Because both residential and conservation uses are approved in areas zoned as Open Space, the area would not need to be rezoned. Long-term operation of the project would result in minor beneficial direct impacts to land use at the Wahkiacus site because the site would no longer be considered a nonconforming use under the Open Space zoning.

Roads in the project area would remain unchanged and traffic would not noticeably increase as a result of the project. There would be no transportation impacts detectable at the regional (Klickitat County, Yakima County, and Yakama Reservation) level. Long-term operation of the project would result in minor localized traffic impacts due to increased traffic associated with the new residences and additional employees at the Wahkiacus Hatchery and Acclimation Facility. No impacts to regional transportation facilities in the Wahkiacus study area are anticipated.

Klickitat Hatchery Study Area

<u>Construction</u>

Construction activities associated with Alternative 2 would not change land use or zoning at the Klickitat Hatchery. Construction of facilities to manage natural resources is an allowed use within Conservancy Environments under Klickitat County Shoreline Master Plan. Construction activities below the ordinary high water mark of the Klickitat River would be considered a Shoreline Alteration under the Klickitat County Shoreline Master Plan and would require a Conditional Use Permit and Floodplain Permit from the County. A Yakama Nation Water Code Hydraulic Permit would also be required for activities below the ordinary high water mark. Considering the permit requirements, there would be minor short-term, site-specific direct impacts to land use as a result of construction of Alternative 2.

Construction would increase traffic by approximately seven trucks per week traveling from the Portland metro area and approximately 20 construction worker vehicles traveling round-trip from residences within 75 miles of the site per week (Mayer 2010), resulting in a one percent increase in average daily traffic in the project area compared to 2008 volumes. Indirect adverse impacts to transportation from construction would be minor, because the short-term increase in traffic would not be noticeable to other drivers in the project area.

<u>Operational</u>

Alternative 2 would not change land use at the Klickitat Hatchery site. The current Klickitat County zoning designation of Forest Resource allows fish hatcheries and related facilities as an activity related to forests and wild lands. No changes to land use or zoning are anticipated at the Klickitat Hatchery study area as a result of Alternative 2. Long-term operation of the project would result in no impacts to land use in the Klickitat Hatchery study area.

Roads in the project area would remain unchanged and traffic would not noticeably increase as a result of Alternative 2. There would be no transportation impacts perceptible at the regional (Klickitat County, Yakima County, and Yakama Reservation) level. Long-term operation of the project would result in no impacts to transportation facilities in the Klickitat Hatchery study area.

McCreedy Creek Study Area

Construction

Construction activities associated with Alternative 2 would not change land use or zoning at the McCreedy Creek study area, resulting in minor impacts to land use because site disturbance would be limited to the project site.

Construction would increase traffic by approximately 10 trucks traveling from the Portland metro area during one two-week period for materials delivery, and approximately 10 construction worker vehicles traveling round-trip from residences within 50 miles of the site per week for the two month construction period (Mayer 2010).

A section of Klickitat River Road would be partially closed during replacement of the existing culvert that carries McCreedy Creek under the road. Flaggers would be placed at the site, as necessary, to allow traffic to continue to flow safely. Direct short-term adverse impacts to transportation from the culvert replacement would be considered minor due to the low volume of traffic currently using this section of Klickitat River Road and would have no indirect impacts on regional traffic.

Operational

Following improvements at the McCreedy Creek site under Alternative 2, tribal use for camping, fishing, and hunting would continue outside of the seasonal use of the acclimation facilities. Seasonal operation of the project would result in minor direct impacts to land use, changing the site from an undeveloped restricted area used for recreation to a conservation use. No tribal permits would be needed for the seasonal use.

New access roads would be constructed at the site, but Klickitat River Road and all other roads in the project area would remain unchanged as a result of the project and traffic would not noticeably increase. Operation of the project is expected to indirectly result in long-term minor adverse impacts to transportation in the McCreedy Creek study area.

Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Current land uses in the Wahkiacus study area would not change under Alternative 3. No additional facilities would be constructed and land ownership would remain unchanged. No change in use patterns or access for local transportation corridors is expected.

Klickitat Hatchery Study Area

Land use and transportation impacts of Alternative 3 at the Klickitat Hatchery study area are similar to those discussed for Alternative 2. Short-term construction activities would not change land use or zoning and may result in minor indirect adverse impacts to transportation. Construction of the facility below the Klickitat River OHW would require a Conditional Use Permit and Floodplain Permit from Klickitat County. A Yakama Nation Water Code Hydraulic Permit would also be required for activities below the ordinary high water mark. Operation of the facility would not change land use or zoning and would have a long-term minor indirect adverse impact on transportation in the project area.

McCreedy Creek Study Area

Land use and transportation impacts of Alternative 3 at the McCreedy Creek study area are similar to those discussed for Alternative 2. Alternative 3 would not change land use or zoning at the McCreedy Creek study area, and would have a minor impact on transportation due to the low volume of traffic. The seasonal operational use of the site would result in minor direct impacts to land use from restricted tribal use and a long-term minor adverse indirect impact to transportation in the McCreedy Creek study area.

3.12.1.3 Mitigation Measures

Measures to avoid, minimize or offset potential impacts would be incorporated into the permitting process and could include the following:

- Clear vegetation along access roads to improve sight lines and allow safe passage of vehicles in opposite directions.
- Obtain county permits for Wahkiacus and, if needed, for Klickitat Hatchery; obtain tribal permits/approvals as necessary.

3.12.2 Social and Economic Environment

3.12.2.1 Affected Environment

Population and Employment

The general study area for social and economic resources, such as population, income, and employment characteristics, include Klickitat County, Yakima County, and the Yakama Reservation.

To characterize the affected social and economic environment, demographic information from Klickitat and Yakima counties, population centers within those counties, and the Yakama Reservation was reviewed. Table 3-28 includes recent population data for the study area. The 2010 Census indicates that the population of Klickitat County is 20,318 and the total population of Yakima County is 243,231 (U.S. Census Bureau 2011).

The Native American population in Klickitat and Yakima counties was estimated to be 11,454 in 2008, increasing from 11,363 in 2000. Enrolled members of the Yakama Nation tribal membership is estimated to be 8,870 (Table 3-28).

In the study area counties, economic activities and primary industries are diverse, including agriculture and food processing, forest products, transportation and warehousing, manufacturing, recreation and tourism, health care, and the service-sector industries (BEA 2010).

Table 3-28: Recent Population Data for the Study Area

County/City Tribal/ Reservation	2010 Population[1]	Est. 2008 Native American Population[2]	Est. 2008 Per Capita Income[3]	Est. 2008 Employ. (all Jobs)[3]	Est. 2008 Construction Employment[3]	Est. 2008 Population Below Poverty Level[4]
Washington State	6,724,540	119,995	43,732	3,962,668	268,371	11.3 percent
Klickitat County	20,318	735	32,550	10,319	749	16.8 percent
Yakima County	243,231	10,719	30,661	123,495	5,567	18.6 percent

[1] *U.S. Census Bureau, 2011*

[1] *Office of Financial Management, 2009*

[2] *BEA Local Area Region, 2010*

[3] *U.S. Census Bureau, 2010b*

The recreation industry, which includes sport salmon and steelhead fishing, is a growth industry in the project study area. Within the study area, most larger-scale employment and commercial activities are in Yakima County.

Economic activity on and near the Yakama Reservation includes several tribe-operated enterprises, including timber products, Columbia River fisheries, farming units, gaming facilities, tourist and recreation sites, and several other types of small commercial enterprises. The Yakama Nation also maintains and provides for its members significant health, education, and human services needs (Yakama Nation Economic Development 2006).

Subsistence Fisheries

Subsistence fishing by the Yakama Nation occurs year round and targets all stocks of salmon and steelhead. Ceremonial fishing generally targets spring Chinook salmon. Tribal harvest includes gill nets set in the Columbia River and dip net fishing in the Klickitat River. When fish runs are large, per *U.S. v. Oregon*, the parties negotiate for commercial fishing opportunities. Additional information on fish harvest may be found in Section 3.4.1.4.

Environmental Justice Considerations

Executive Order 12898 to the Council on Environmental Quality provides that federal agencies make environmental justice a part of their mission by conducting NEPA compliance that: 1) allows adequate scoping input by minority or low-income populations to identify a project’s potential effects on them; 2) ensures all potential impacts are appropriately identified by identifying whether impacts are disproportionally high and adverse with respect to low-income and minority populations; and 3) offers mitigation measures to reduce adverse impacts on minority or low-income communities. The only measurable minority population within the study area consists of Native Americans, with the majority being members of the Yakama Nation.

The Yakama Nation proposed that BPA adopt the project as part of the agency's effort to implement the NPCC's Columbia River Basin Fish and Wildlife Program and mitigate fish and wildlife affected by the basin's federal hydropower projects. Increasing the number of returning anadromous salmonids is important to the cultural and economic livelihood of the Yakama Nation.

3.12.2.2 Environmental Consequences

For impacts to social and economic factors each level of impact was defined as follows:

> ***Minor:*** Impacts to population, income, and employment would occur on a very small scale and would have no effect on local or regional demographics. Impacts to housing and utilities would be limited to the immediate project area. Additional demand on housing would be met with the proposed project and existing local housing inventory.
>
> ***Moderate:*** Impacts to population, income, and employment would occur at a regional level and affect local demographics. Impacts to housing would occur outside of the immediate project area. Additional demand on housing would be met with the proposed project and existing local housing inventory.
>
> ***Major:*** Impacts to population, income, and employment would occur in Klickitat and Yakima Counties and the Yakama Reservation, and affect local demographics such that local planning models predicting growth would need to be updated. Impacts to housing would be limited to the immediate project area. Additional demand on housing would not be met with the proposed project and existing local housing inventory.

For impacts to subsistence fisheries each level of impact was defined as follows:

> ***Minor:*** Increased competition for resources may occur but would not affect availability of resources for tribal members.
>
> ***Moderate:*** Increased competition for resources would occur and may affect availability of resources for tribal members.
>
> ***Major:*** Increased competition for resources would occur and would result in a decline in the availability of resources for tribal members.

Alternative 1 – No Action Alternative

Economic conditions in the region would not change from the existing conditions described above. No new construction would be undertaken and no additional jobs would be created. Employment associated with the Klickitat Hatchery would be consistent with current operational levels.

Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

Construction

Population and Employment

Construction would provide short-term employment opportunities for local and nonlocal labor, based on the location of the contractors and the need for skilled and general laborers. The construction work force would consist of approximately 30 full time workers employed for an estimated construction period of 18 months. The majority of workers are expected to commute from within 50 miles. Construction would result in a direct short-term beneficial impact on employment in the region of the Wahkiacus study area.

It is assumed that construction workers would travel from their homes within 50 miles of the site and any new housing needs would be met by temporary housing such as hotels. Additional demand on housing would be met by existing capacity in the project area, resulting in minor short-term direct impacts to housing.

Spending by construction workers in the study area would have a short-term beneficial impact on the local economy. Construction workers would patronize hotels and restaurants and may also purchase personal and small construction-related supplies from local commercial enterprises. The short-term duration of the impact would result in an overall minor beneficial impact on the local economy.

Subsistence Fisheries

Subsistence dip net fishing at the Wahkiacus site could be interrupted during the in-water work construction period. No traditional family fishing sites are known to exist within the project construction area but existing undocumented subsistence and ceremonial fishing could occur. Fisheries resources would still be available to tribal members, directly resulting in minor adverse impacts to subsistence fisheries during the short-term construction period.

Environmental Justice Considerations

The effects of construction for Alternative 2 on the natural and human environment would not disproportionately adversely affect low-income or minority populations in the vicinity of the Wahkiacus site. Construction activities would be limited to the site and immediate surroundings, which are removed from population centers and would not disturb local study area communities. Construction effects on water resources, fisheries, air quality, noise, aesthetics, land use, transportation, vegetation and wildlife, and other resources would be of short duration and minor intensity. Because effects, in general, would be site-specific or local and there are no communities within the immediate project vicinity, impacts would not be disproportionally borne by any low-income and minority populations.

The Yakama Nation has enacted a Tribal Employment Rights Ordinance requiring all employers subject to the Tribe's jurisdiction to give preference in employment, training, and subcontracting to Indians. Yakama Tribal Employment Rights Ordinance Contacts provide contact lists for Indian-owned construction and construction-relation companies, facilitating the employment of these companies for project work. Jobs created by construction of the project could benefit minority Native American individuals, but the effect would be short term and minor.

<u>Operational</u>

Population and Employment

Long-term changes to population, income, and employment characteristics are not expected from project construction of the Wahkiacus Hatchery and Acclimation Facility. Operation of the new hatchery facilities would result in the addition of up to five new full time hatchery workers, increasing the population of the project area by the number of resident hatchery workers hired to maintain the facility and their families (three to 12 individuals). Under Alternative 2, additional housing would be required to allow hatchery workers and their families to live on site. The additional demand would be met by the construction of up to three additional residences on a newly acquired 36-acre parcel. The additional residences would result in direct long-term minor impacts on housing.

The additional workers would likely be hired from somewhere within the study area, having a minor beneficial direct impact on the regional economy. Spending by the added workforce in the community would result in a minor indirect long-term beneficial impact to employment and the local tax base.

Subsistence Fisheries

The proposed changes to the fish production programs under Alternative 2 would support returning spring Chinook and summer steelhead to a level where the potential for predictable ceremonial and subsistence fisheries for the Yakama Nation would be possible and would continue to support coho and fall Chinook harvest. The availability of fisheries resources for tribal members would ultimately increase, indirectly resulting in long-term beneficial impacts to subsistence fisheries. Additional information on fish harvest may be found in Section 3.4.1.4.

Environmental Justice Considerations

Operation of hatchery and acclimation facilities at the Wahkiacus site would have no population level impacts on minority or low-income groups.

The availability of fisheries resources for tribal members would ultimately increase, resulting in minor impacts to subsistence fisheries, which would benefit minority and low-income families over the long term.

Klickitat Hatchery Study Area

<u>Construction</u>

Population and Employment

Construction impacts to population, income, and employment at the Klickitat Hatchery study area would be similar to those described for the Wahkiacus study area, with a similar number of construction workers temporarily employed for 12 months. The benefit to social and economic conditions in the study area would be short term and minor.

Construction impacts to housing in the Klickitat Hatchery study area would be similar to those described for the Wahkiacus study area, with construction workers travelling from local cities. Any additional demand on housing would be met by existing capacity in the project area, directly resulting in minor short-term impacts to housing.

Spending by construction workers in the study area would have a short-term beneficial impact on the local economy. Construction workers would patronize hotels and restaurants in the project area and may also purchase personal and small construction-related supplies from local commercial enterprises. The short-term duration of the impact would result in an overall minor beneficial impact on the local economy.

Subsistence Fisheries

Construction impacts at the Klickitat Hatchery study area would be similar to those described for the Wahkiacus study area. No traditional family fishing sites are known to exist within the project construction area; however, dip net fishing at the Klickitat Hatchery site could be interrupted during the in-water work construction period. Fisheries resources would still be available to tribal members outside the immediate construction area. The overall effect of construction at the Klickitat Hatchery on subsistence fishing would be direct, minor, and adverse, but of short duration.

Environmental Justice Considerations

The effects of construction for Alternative 2 on the natural and human environment would not disproportionately adversely affect low-income or minority populations in the vicinity of the Klickitat Hatchery site. Because effects, in general, would be site-specific or local and there are no communities within the immediate project vicinity, impacts would not be disproportionally borne by any low-income and minority populations.

In accordance with the Yakama Nation's Tribal Employment Rights Ordinance, jobs created by construction of the project could benefit minority Native American individuals, but the effect would be short term and minor.

<u>Operational</u>

Population and Employment

Long-term operation of the new and upgraded Klickitat Hatchery facilities would require the hiring of approximately two additional hatchery workers due to the increase in production at the facility. The additional workers would likely be hired from somewhere within the study area, having a minor beneficial direct impact on the regional economy. Spending by the added workforce in the community would result in a minor indirect long-term beneficial impact to employment and the local tax base.

No additional housing would be required for operation of the project because no new long-term employees would be required. The three current residences at the hatchery would be demolished and replaced with three 3-bedroom, 2-bathroom, 2,400-square-foot houses. This would improve housing conditions for site residents, resulting in a long-term benefit for a few individuals, but would not change housing conditions in the study area.

Subsistence Fisheries

The proposed changes to the fish production programs under Alternative 2 would support returning spring Chinook and summer steelhead to a level where the potential for a predictable ceremonial subsistence fishery for the Yakama Nation would be possible, and would continue to support coho and fall Chinook harvest. The availability of fisheries resources for tribal members would ultimately increase, indirectly resulting in long-term beneficial impacts to subsistence fisheries. Additional information on fish harvest may be found in Section 3.4.1.4.

Environmental Justice Considerations

Operation of hatchery and acclimation facilities at the Klickitat Hatchery site would have no population level impacts on minority or low-income groups. The availability of fisheries resources for tribal members would ultimately increase, resulting in minor impacts to subsistence fisheries, which would benefit minority and low-income families over the long term.

McCreedy Creek Study Area

<u>Construction</u>

Population and Employment

Construction would provide short-term employment opportunities for local and nonlocal labor, based on the location of the prime and sub-contractors and the need for skilled and general laborers. The number of local residents who may be employed during construction cannot be predicted at this time, but the construction work force would consist of approximately 10 full time workers employed for an estimated construction period of 2 months. Construction would result in a direct short-term beneficial impact on employment in the region of the project.

It is assumed that construction workers would travel from local cities within 50 miles of the site and any new housing needs would be met by temporary housing such as hotels. No impacts to housing are anticipated.

Spending by construction workers in the study area would have a short-term beneficial impact on the local economy. Construction workers would patronize hotels and restaurants in the project area and may also purchase personal and small construction-related supplies from local commercial enterprises. The short-term duration of the impact would result in an overall minor beneficial impact on the local economy.

Subsistence Fisheries

The McCreedy Creek site is currently used for recreational and subsistence fishing, and use by tribal members would restricted during construction at the McCreedy site. No short-term impacts to subsistence fisheries outside of the McCreedy Creek site are anticipated during construction.

Environmental Justice Considerations

Construction of the proposed facilities at McCreedy Creek would be limited in duration, areal extent, and intensity. Its location on the Yakama Nation Reservation would directly affect tribal lands and the tribal community; however, because the project would be developed at the direction of the Yakama Nation and benefit its members, no environmental justice issues would arise.

In accordance with the Yakama Nation's Tribal Employment Rights Ordinance, jobs created by construction of the project could benefit minority Native American individuals, but the effect would be short-term and minor.

<u>Operational</u>

Population and Employment

Operation of the seasonal acclimation site would employ one full time fish culturist during the acclimation season (late March through early May). The additional worker would likely be hired from within the study area, creating a minor, direct, beneficial impact to employment. No noticeable impact on the local or regional economy or tax base is anticipated.

The fish culturist would reside on-site in a self-contained mobile residence, meeting the additional housing requirement and resulting in no impacts to study area housing demand.

Subsistence Fisheries

The proposed facilities at the McCreedy Creek site would support returning summer steelhead populations for a predictable ceremonial subsistence fishery for the Yakama Nation. The availability of fisheries resources for tribal members would ultimately increase, indirectly resulting in long-term beneficial impacts to subsistence fisheries. Additional information on fish harvest may be found in Section 3.4.1.4.

Environmental Justice Considerations

Change of use of the McCreedy Creek site may affect tribal members and their cultural practices. The project would be developed at the direction of the Yakama Nation and benefit its members. There are no high and adverse environmental or cultural effects associated with the project. The benefit to the tribal members would outweigh adverse effects from the change in use. No environmental justice issues would arise.

Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Alternative 3 would have no effect on population, economic conditions, employment, subsistence fishing, or communities in the Wahkiacus study area.

Klickitat Hatchery Study Area

Socioeconomic impacts of Alternative 3 at the Klickitat Hatchery study area are similar to those discussed for Alternative 2. Effects of construction on employment, housing, subsistence fishing, and the general population, as well as minority and low-income populations would be the same. Long-term operation of the project would have the same effects on employment and the local economy. Approximately two additional hatchery workers would be needed due to the increase in production at the facility.

The existing residences would be demolished and replaced with the three 3-bedroom houses described under Alternative 2, having no impact on housing demand, and creating a direct beneficial impact to housing conditions. Due to hatchery capacity at the Klickitat Hatchery, additional fish may need to continue to be reared in out-of-basin hatcheries. While this would not achieve the separation goal of the master plan, fish production goals and hatchery/harvest approaches would be similar to Alternative 2. The availability of fisheries resources for tribal members would ultimately increase, indirectly resulting in long-term beneficial impacts to subsistence fisheries.

McCreedy Creek Study Area

The effects of Alternative 3 on socioeconomic conditions, subsistence fisheries, and environmental justice considerations at and around the McCreedy Creek study area would be the same as described for Alternative 2.

3.12.2.3 Mitigation Measures

Given the limited socioeconomic effects associated with the Klickitat Hatchery Project, no mitigation is proposed.

3.12.3 Recreation

3.12.3.1 Affected Environment

Wahkiacus Study Area

The Klickitat Trail is the primary recreation facility in the vicinity of the Wahkiacus project site. This rail-to-trail conversion parallels the Klickitat River and passes through the southern portion of the project site. The Klickitat Trail, owned by the State of Washington and managed by the Washington State Parks and Recreation Commission, is a discontinuous 31 miles and extends from Lyle at the mouth of the Klickitat River upstream to the community of Warwick. The trail parallels the river south of the Wahkiacus project site and then diverges eastward following Swale Creek.

The portion of the Klickitat Trail that runs through Swale Canyon is most frequently used by visitors between the months of March and May, and is typically closed during times of high fire danger. Due to its remote nature, the Swale Canyon portion of the trail is mainly used by mountain bikers, but is popular with cross-country skiers during the winter months (WSPRC 2010). The least frequently used portion of the trail is located directly south of Wahkiacus along the Klickitat River. Infrequent trail use in this segment is largely due to the 1997 bridge removal approximately 2.5 miles south of Wahkiacus that created a "dead end" (WSPRC 2010). No trail use data has been published; however, the Statewide Comprehensive Outdoor Recreation Plan projected use for hiking, biking, and horseback riding on the Klickitat Trail as a percent of the population (IAC 2003). According to the Statewide Comprehensive Outdoor Recreation Plan, participation from 1979 to 1999 increased dramatically, except for equestrian activities, which remained stable. It can be surmised from this data that the use of the Klickitat Trail could be expected to continue or increase as the population grows.

There is a campground one mile south of Wahkiacus on SR 142: the Mineral Springs (Ice House) Campsite offers approximately 15 tent sites and a toilet for overnight camping.

Other recreational uses of the area include fishing, photography, recreational boating, swimming in summer, and cross-country skiing in winter. The Klickitat River is used for both tribal and nontribal (sport) fishing in the vicinity of the Wahkiacus site. This stretch of the Klickitat River is also popular with both kayakers and rafters, and is typically considered a Class II stream in the vicinity of the Wahkiacus site, indicating a medium level of difficulty (depending on the water level) (Bennett 1998). Swale Creek would be considered a Class II stream in the vicinity of the Wahkiacus Site, however this portion of the creek is densely vegetation and the channel is not accessible by raft or kayak.

Klickitat Hatchery Study Area

Recreational boating and fishing are the only recreational opportunities at the Klickitat Hatchery site (Klickitat County 2010). Swimming along this stretch of the river is limited due to steep cliffs and limited access points. A public parking area is available to fishermen at the Klickitat Hatchery and pedestrian access is provided to both sides of the river by the newly constructed bridge. Washington State Sports Fishing Regulations prohibit fishing between boundary markers on the Klickitat River above and below the Klickitat Hatchery (WDFW 2010c). Both tribal and nontribal (sport) fishing is allowed above and below these boundaries. Tribal fishermen must follow Yakama Nation fishing regulations and nontribal fisherman must be in compliance with the WDFW fishing regulations (Sharp 2010a).

Because the area surrounding the hatchery is all privately owned, most hiking and camping takes place outside of the immediate vicinity of the site.

The Klickitat River is part of a popular 21 mile class III+ run between the southern boundary of the Yakama Nation Reservation and the Glenwood-Goldendale Road bridge for both rafts and kayakers. The weir at the hatchery creates a hazard that may require portaging during low flows to avoid damaging equipment. Kayakers often use the area near the hatchery as a take-out spot, accessing the take-out spot via Fish Hatchery Road (American Whitewater Association 2003). Commercial and private raft trip groups will often stop at the hatchery to have lunch before continuing on to Leidl Campground, which is situated near the Glenwood-Goldendale Road bridge (Wet Planet 2010). The number of private kayakers and rafters using this stretch of river is unknown. The season is typically limited to mid-April through May, due to low water levels. In a busy year, it is estimated that each of the 5 – 10 commercial rafting companies that run this stretch of the Klickitat will guide between 50 – 100 people during the limited season (Wet Planet 2010).

The closest available campsites to the Klickitat Hatchery are at Outlet Creek Campground, approximately 0.5 mile east of Fish Hatchery Road on Glenwood Highway. Outlet Creek Campground is adjacent to Mill Pond, a manmade reservoir that provides swimming, fishing, and recreational boating opportunities.

McCreedy Creek Study Area

The McCreedy Creek project site is located within the closed area of the Yakama Nation Reservation, where access is limited to tribal members. The site is occasionally used as a primitive campground by tribal members. Hunting and fishing for sustenance and ceremonial purposes is permitted within the closed area for enrolled members of the tribe. The Yakama Nation enforces several restrictions on hunting and fishing in the closed area, based on the Yakama Nation Wildlife Code (2005c).

3.12.3.2 Environmental Consequences

For recreation, each level of impact was defined as follows:

> ***Minor:*** Impact would be detectable and/or would only affect some recreational users. Changes in access would be slight but detectable; however, use would not be affected.
>
> ***Moderate:*** Impact would be readily apparent and would affect many recreational users. Users would be aware of the effects associated with proposed changes and access and user experience would noticeably change.
>
> ***Major:*** Impact would affect a majority of recreational users. Users would be highly aware of the effects associated with proposed changes. Changes in recreational user experience would noticeably change.

Alternative 1 – No Action Alternative

Wahkiacus Study Area

Current recreational opportunities within the Wahkiacus study area would continue under Alternative 1. Access to the Klickitat Trail, recreational boating, and local camp sites would not change.

Klickitat Hatchery Study Area

Current recreational opportunities within the Klickitat Hatchery study area would continue under Alternative 1. Recreational boating, hunting, bird watching, hiking, and camping available within the vicinity would remain unchanged.

McCreedy Creek Study Area

Current recreational opportunities within the McCreedy Creek study area would continue under Alternative 1. The site would continue to be available to tribal citizens for primitive camping and hunting for subsistence and ceremonial purposes.

Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

<u>Construction</u>

Recreation near the Wahkiacus site could be temporarily interrupted during construction of the new hatchery facilities proposed as part of Alternative 2. In-water construction of the intake facility and fish ladder would temporarily require recreational boaters to portage around the construction area and fishing would be temporarily restricted in the immediate vicinity. Additionally, if Residence Option A is chosen, construction of the access road crossing of the Klickitat Trail could impede access and use of the trail during construction. The presence of construction vehicles and equipment could disturb trail users and potentially close portions of the trail. Construction of Residence Option B would have no effect on the Klickitat Trail. Short-term direct impacts from construction are expected to have a moderate adverse effect on recreation at the Wahkiacus site due to the noticeable effects to access and use of recreational facilities in the project area.

<u>Operational</u>

Operation of additional hatchery facilities, including in-water structures, at the Wahkiacus site proposed as part of Alternative 2 could have minor impacts on access to recreation at the site, but would not impact the use and overall character of recreation in the area. The current proposal would not result in low flows during the peak recreational boating season (mid-April through May). The Klickitat Trail would continue to be open to the public for hikers, bikers, and cross-country skiers. The access road to Residence Option A would cross the Klickitat Trail posing a potential risk to trail users; however, traffic on the access road is likely to be no more than 10 vehicles per day. Trail users would be able to see some of the facilities from the trail (see Section 3.11.1.2 for additional information), but the additional structures would only affect a very small section of the trail. The additional structures would not change the overall character of the trail, as other segments of the trail south of Wahkiacus parallel developed areas. See Section 3.11 for a further discussion of project aesthetics.

New fishing regulations would be implemented by the WDFW and the Yakama Nation after the new facility is constructed to set boundaries above and below the new facilities and restrict fishing activities immediately adjacent to the new facilities. Above and below these new boundaries, tribal fishermen would be allowed to harvest fish in compliance with the Yakama Nation fishing regulations; nontribal fishermen would be allowed to harvest fish in compliance with WDFW fishing regulations (Sharp 2010a).

Considering impacts to Klickitat Trail use and fishing, operation of the project would directly result in minor adverse effects to recreation in the Wahkiacus study area.

Klickitat Hatchery Study Area

Construction

Recreational boating near the Klickitat Hatchery site would not be affected by construction activities because the established in-water work window corresponds to the low flow period when the river is not useable to boaters. Therefore, there would be no effect on recreation at the Klickitat Hatchery site because users would not be present.

Construction of Alternative 2 would not impact the Outlet Creek Campground or other recreation opportunities in the project vicinity.

Operational

Partial removal of the abandoned adult capture in-river concrete weir would have a minor improvement on passage in the study area for nonmotorized boats during periods of low flow. Construction of the fish ladder, river water intake, and juvenile exits would not have any long-term effects on recreational boating in the study area. Access to the commonly used take-out spot would not change under Alternative 2. Long-term impacts from operation of the project would directly result in minor beneficial effects to non-motorized boat recreation near the Klickitat Hatchery site.

Operation of Alternative 2 would not impact the Outlet Creek Campground, fishing or other recreation opportunities in the project vicinity.

McCreedy Creek Study Area

Construction

Construction of the temporary acclimation facilities at McCreedy Creek would have a short-term moderate adverse impact on recreational use of the site. Tribal use of the area for camping, fishing, and hunting would be discontinued during construction of the facility, but the number of recreational users displaced would be very limited. Due to the undeveloped forested nature of the area, primitive camping, hunting, and fishing opportunities are readily available to tribal members throughout the closed area. The McCreedy Creek site is remote and not widely used, so the number of displaced recreational users would be minimal.

Operational

The seasonal use of the temporary acclimation facilities at McCreedy Creek would have a minor adverse impact on recreational use of the site. Tribal use of the area for camping, fishing, and hunting would be discontinued during the acclimation period, but the number of recreational users displaced would be very limited and they would likely make use of nearby areas. The long-term adverse effect would be local and of minor intensity.

Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

Current recreational opportunities within the Wahkiacus study area would continue under Alternative 3. Access to the Klickitat Trail, recreational boating, and local camp sites would not change.

Klickitat Hatchery Study Area

Impacts to recreation in the Klickitat Hatchery study area would be similar to those described for Alternative 2. Construction of in-water facilities would have a short-term minor adverse impact of nonmotorized boaters, but the number of boaters affected would be very small due to seasonal low flows. Partial removal of the concrete weir would have a minor long-term beneficial impact on recreational boaters by improving passage during conditions of low flow.

McCreedy Creek Study Area

Impacts to recreation in the McCreedy Creek study area would be the same as described under Alternative 2. The site would not be available to tribal citizens for camping, hunting, and fishing for subsistence and ceremonial purposes during the acclimation period, resulting in a periodic, minor, adverse, local impact.

3.12.3.3 Mitigation Measures

- Flaggers would be used at the intersection of the Klickitat Trail and the access road on days when construction would occur. Safety signage also would be posted at the intersection of the Klickitat Trail and Schilling Road to caution users of construction.
- Warnings would be posted on the riverbank upstream of the work areas cautioning boaters of construction. Outreach to boaters would occur before construction begins.
- If Residential Option A were constructed, impacts from the trail crossing could be offset with placement of an information kiosk at the Klickitat Trail providing information to users about the trail. Accommodations also may be made to provide additional parking for trail users. These measures are subject to additional discussions between BPA, Yakama Nation, and Washington State Parks and Recreation.

3.13 Public Health and Safety

3.13.1 Affected Environment

3.13.1.1 Wahkiacus Study Area

A combination of tribal, state, and county agencies provide public health and safety resources for the Klickitat River basin area. Most of these resources can be accessed through the Klickitat County Sheriff's office or the Yakama Nation Tribal Police Department, depending on the location. The Klickitat County Sheriff's office and the Yakama Nation Tribal Police Department serve as a communication link between other public and emergency service providers in Klickitat and Yakima Counties. Local law enforcement departments coordinate emergency 911 calls and dispatch for fire districts, police, and emergency medical services for Klickitat and Yakima Counties, and the Yakama Nation Reservation.

Fire protection at the Wahkiacus site is served by the Klickitat County Fire Protection District No. 12, which is a volunteer fire department staffed by 15 volunteer firefighters, and located in Klickitat, Washington.

Health and medical services are available at several locations in the vicinity of the project site, including Klickitat Valley Hospital in Goldendale, Washington, Skyline Hospital in White Salmon, Washington, Yakima Valley Memorial Hospital in Yakima, Washington, and Providence Toppenish Hospital in Toppenish, Washington. Additional medical services are also available in nearby cities across the Columbia River at Mid-Columbia Medical Center in The Dalles, Oregon, and at Providence Hood River Hospital in Hood River, Oregon. Each of these facilities provides emergency services. The nearest emergency room location to the Wahkiacus site is the Klickitat Valley Hospital, approximately 19 miles from the site.

Existing health and safety concerns at the Wahkiacus site are related to the close proximity to the Klickitat River. Steep banks in the vicinity of the river could be a cause of injury and a fall in these areas could result in possible loss of life risks.

3.13.1.2 Klickitat Hatchery Study Area

Emergency response to the Klickitat Hatchery site is provided by the same organizations described above. One exception is that fire protection in the vicinity of the Klickitat Hatchery site is provided by the Klickitat County Fire Protection District No. 8 area, which is a volunteer fire department staffed by 13 volunteer firefighters in Glenwood, Washington. Emergency response is also provided by the Yakama Nation Forestry Department and WDNR (Sharp 2010c). Fire protection for forest and range lands within the county are provided by WDNR.

Health and medical services are available at several locations in the vicinity of the project area, as described above for the Wahkiacus site. The nearest emergency room location to the Klickitat Hatchery site is the Klickitat Valley Hospital, approximately 35 miles from the site.

Existing health and safety concerns at the Klickitat Hatchery site are related to the close proximity to the Klickitat River, and to on-site storage of hazardous materials such as propane, gasoline, and diesel. Steep banks in the vicinity of the river could be a cause of injury and a fall in these areas could result in possible loss of life risks.

Public recreation use of, and access to, the Klickitat Hatchery is limited as the facility is located at the end of an access road that does not provide access to areas other than the hatchery itself. The hatchery is located on a promontory that occupies the right bank of the Klickitat River where the river turns through a greater than 90^{o} bend, further restricting access to the site. There are no public hiking trails that provide access to the site either along the river banks, or from the road to the south.

The Klickitat River is used for both tribal and nontribal (sport) fishing in the vicinity of the Klickitat Hatchery, however WDFW regulations identify boundaries above and below the hatchery that are closed to both tribal and nontribal fishing.

3.13.1.3 McCreedy Creek Study Area

Emergency response to the McCreedy Creek site is provided by the same organizations as are described above for the Klickitat Hatchery site.

Health and medical services are available at several locations in the vicinity of the project area, as described above for the Wahkiacus site. The nearest emergency room location to McCreedy Creek site is the Providence Toppenish Hospital, approximately 58 miles from the site.

The area is not open to nontribal fishermen. Tribal fishing is permitted in compliance with the Yakama Nation fishing regulations (Sharp 2010a). Public access to the McCreedy Creek sites is restricted due to this site's location in a closed area of the Yakama Nation Reservation and the site is only open to members of the Yakama Nation with special permission status.

Existing health and safety concerns at the McCreedy Creek site are related to the close proximity to the Klickitat River. Steep banks in the vicinity of the river could be a cause of injury and a fall in these areas could result in possible loss of life risks.

3.13.2 Environmental Consequences

For purposes of this EIS, the intensity of impacts to public health and safety are categorized as follows:

> ***Minor:*** Impacts to public health and safety would be measurable but short term. All impacts would be injury-related occurring during construction activities.
>
> ***Moderate:*** Impacts to public health and safety would be measurable. Most impacts would be injury-related occurring during construction activities; however, some injuries or public safety issues would occur in the long term. All impacts would occur on-site.

> ***Major:*** Impacts to public health and safety would be measurable. Some impacts would be injury-related occurring during construction activities; however, injuries or public safety issues would occur in the long term and throughout the local area.

3.13.2.1 Alternative 1 – No Action Alternative

Implementing Alternative 1 would not cause additional health or safety risks to the public or hatchery workers. Under this alternative, no new safety or security measures would be warranted. Klickitat County and tribal emergency services could be expected to be needed at the same level as is currently experienced.

3.13.2.2 Alternative 2 – Full Master Plan Buildout

Wahkiacus Study Area

Construction

All construction activities entail some degree of safety risk. For construction workers, it is expected the safety risks would be the same as similar construction activities for other projects. The potential for these hazards to result in injuries to workers would be minimized through the selection of construction workers, application of BMPs, and adherence to state and federal safety standards.

As a public health measure, the selected contractor would be expected to provide a portable restroom throughout the duration of construction. Portable restrooms would be removed between work periods, if more than one work season is required.

The selected contractor would be informed that no construction debris would be allowed to enter the river. Construction materials that could become lodged downstream of the site could become a life-threatening hazard to boaters. Potential emergencies during construction could include construction accidents, drownings, or fires. Notification of the need for emergency services at the site would occur through initial contact with local law enforcement via a 911 call.

Public access to construction areas would be restricted to minimize risk to public health and safety.

Construction impacts to public health and safety would be measurable; however they would be considered minor and short-term. All impacts would likely be directly related to injury occurring during construction activities.

Operational

For operational hatchery workers, it is expected the safety risks would be the same as similar hatchery facilities. Hatchery and acclimation facilities under this alternative would be constructed to meet current code requirements. In terms of health and safety hazards that hatchery workers would be exposed to, hatchery work has many of the same hazards as other types of resource farming, but it also poses additional hazards associated with water impoundments and nighttime work. For example, fish holding tanks pose potential drowning, electrocution, and slip (mud and slime) hazards. Nighttime work raises issues such as fatigue and human error, lighting and visual acuity, and awareness of coworker presence. Other possible hazards include punctures or cuts from fish teeth or spines, exposure to low temperatures, and infection of cuts or abrasions. In addition, hatchery facility workers may be exposed to mechanical hazards, bacterial and parasitic infections, and poor ergonomic practices. These risk factors can result in fatal or nonfatal injuries and occupational diseases (Meyers 2008).

The Wahkiacus facilities would be designed to comply with applicable Washington Department of Labor and Industry health and safety requirements, as well as Klickitat County building regulations, where applicable. A security fence would be installed around the perimeter of the hatchery and acclimation facilities and an informational kiosk would be located adjacent to the public parking area.

Up to 1,800 gallons of diesel fuel for emergency generator use would be stored at the Wahkiacus site in appropriate diesel tanks. Hazardous materials handling and storage regulations would be followed.

New fishing regulations would be implemented by the WDFW and the Yakama Nation after the new facility is constructed to restrict fishing activities immediately adjacent to the new facilities. Because the area immediately adjacent to the hatchery and acclimation facilities would be closed to fishing, public health and safety impacts to fishermen are not anticipated.

Operation of the proposed facilities at Wahkiacus is expected to result in long-term minor to moderate direct impacts to public and employee health and safety.

Klickitat Hatchery Study Area

Construction

Health and safety risks during construction to hatchery workers at the Klickitat Hatchery site are expected to be similar to those described above for the Wahkiacus site.

Alternative 2 includes some in-water construction work at this site to remove a portion of an abandoned adult capture in-river concrete weir. As discussed in Section 3.14.15.3, in-water construction would occur during low flows when boaters are not present. As a result recreational boaters are not expected to experience any public health or safety impacts during construction. Because the area immediately adjacent to the hatchery is closed to fishing, impacts to public health and safety to fishermen during construction are not anticipated.

Construction impacts to public health and safety would be measurable; however they would be considered minor and short-term. All impacts would likely be directly related to injury occurring during construction activities.

Operational

Given there are no public recreation activities occurring on the Klickitat Hatchery site, no operational impacts to public health and safety are anticipated.

Because the area immediately adjacent to the hatchery is closed to fishing, impacts to public health and safety impacts to fishermen during either operation are not anticipated.

Operational impacts to recreational boating are not expected to occur. Public health and safety of boaters is likely to be improved as a result of the project as the proposed action includes the partial removal of a concrete weir that currently spans the river at the bend of the Klickitat River adjacent to the hatchery. The partial removal of the weir would constitute a direct beneficial impact to recreational boating safety.

The Klickitat Hatchery design would comply with applicable Washington Department of Labor and Industry health and safety requirements, as well as Klickitat County building regulations, where applicable.

Redevelopment and operation of the hatchery facility is expected to result in minor to moderate impacts to public and employee health and safety.

McCreedy Creek Study Area

Construction

Construction activities at the McCreedy Creek site would include clearing and grubbing of the site to prepare it for the temporary structures associated with the proposed acclimation facility. Construction would also occur at the downstream culvert during its conversion to a bridge, and the construction of the new water intake structure. Health and safety risks during construction at the culvert are expected to be similar to those described above for the Klickitat Hatchery site.

Construction impacts to public health and safety would be measurable; however they would be considered minor and short-term. All impacts would likely be directly related to injury occurring during construction activities.

Operational

Operational health and safety risks would be similar to, but less than, those anticipated at the Klickitat and Wahkiacus sites under this alternative because the types of operation and the limited seasonal nature of activities are less than would occur at the other facilities.

Small propane and/or diesel tanks would be stored on-site to run small on-site generators during the acclimation period. The risk to fisheries workers from these items would be low because hazardous materials handling and storage regulations would be followed.

Once the McCreedy Creek Acclimation Facility is constructed, access to the site would be restricted and would not be available for use; therefore, there are no public health or safety risks associated with the operation of the facility to nonfisheries workers.

Operation of an acclimation facility at the McCreedy Creek site is expected to result in direct minor impacts to public and employee health and safety.

3.13.2.3 Alternative 3 – Klickitat Hatchery Buildout

Wahkiacus Study Area

No new or modified public health and safety risks would occur at the Wahkiacus site under this alternative. Public health and safety risks would be the same as those described under Alternative 1.

Klickitat Hatchery Study Area

Under Alternative 3, the Klickitat Hatchery site would be redeveloped in the same way as it would under Alternative 2. Public health and safety risks associated with the site would be the same as described under Alternative 2.

McCreedy Creek Study Area

Under Alternative 3, the McCreedy site would be used as an acclimation facility in the same way as it would under Alternative 2. Public health and safety risks associated with the site would be the same as described under Alternative 2.

3.13.3 Mitigation Measures

The following mitigation measures have been incorporated into project planning to avoid, minimize, or offset potential adverse effects of the project on public health and safety:

- At active work sites (including excavation, spoil disposal, and construction), all unauthorized personnel would be excluded from entry.
- Portable restrooms would be provided and debris collection undertaken during construction.
- Signs would be posted on the Klickitat Trail near the Wahkiacus site throughout construction to warn users of vehicle crossings where the trail and access road intersect. Flaggers would be used at the intersection of the Klickitat Trail and the access road on days when construction would occur.
- Signs would be posted upstream of the project area on the Klickitat River at each site informing boaters of construction. An outreach plan would be developed to inform this user group of construction activities.

3.14 Cumulative Impact Analysis

This section describes the potential cumulative impacts of the Proposed Action and its alternatives. The Proposed Action, in combination with past, present, and reasonably foreseeable actions identified below, could potentially result in cumulative impacts to the natural, physical, and socioeconomic resources described in Section 3.1 through 3.13 of this EIS. The following sections describe the cumulative impact analysis methodology used, actions considered, and the cumulative impact analysis for each affected resource.

3.14.1 Cumulative Impacts Analysis Methodology

The Council on Environmental Quality regulations to implement the NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). As stated in the Council on Environmental Quality handbook, "Considering Cumulative Effects" (CEQ 1997), cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being affected and should focus on effects that are truly meaningful. Cumulative impacts are considered for all alternatives, including Alternative 1—the No Action Alternative.

The analysis of cumulative impacts was accomplished using four steps:

Step 1 — Identify Resources Affected

> In this step, each resource affected by any of the alternatives is identified. These are the same resources as described in the affected resources section in Chapter 3.

Step 2 — Establish Boundaries

> In order to identify the past, present, and reasonably foreseeable actions to consider in the cumulative impact analysis, affected resource-specific spatial and temporal boundaries must be identified. The spatial boundary is the area where past, present, and reasonably future actions have, are, or could take place and result in cumulative impacts to the affected resource when combined with the impacts of the alternatives being considered. As stated above, this boundary is defined by the affected resource and may be a different size than the proposed project area. The temporal boundary describes how far into the past and forward into the future actions should be considered in the impact analysis. Appropriate spatial and temporal boundaries may vary for each resource.

Step 3 — Identify Cumulative Action Scenario

> In this step, the past, present, and reasonably foreseeable future actions to be included in the impact analysis for each specific affected resource are identified.

These actions fall within the spatial and temporal boundaries established in Step 2.

Step 4 — Cumulative Impact Analysis

This final step involves the analysis of the impacts of the actions identified in Step 3 in addition to the impacts of the proposed action and its alternatives. This will result in the total cumulative impact for each resource.

3.14.2 Past, Present, and Reasonably Foreseeable Future Actions

The determination of what past, present, and reasonably foreseeable future actions to consider in the impact analysis is based on the resources being affected by the proposed action or its alternatives. In this cumulative impacts analysis, the only types of past actions considered are those that continue to have present effects on the affected resources. The impacts of these past actions are largely captured in the discussion of the affected environment chapter for each resource. Present actions are those that are currently occurring and also result in impacts to the same resources that the alternatives impact. These include:

- *U.S. v Oregon* harvest goals.
- Grazing and timber harvest in the Klickitat River Subbasin.
- Positive impact of improvements to passage at Lyle and Castile falls.
- Other YKFP habitat improvements.

The determination of what future actions should be considered requires a level of certainty that they will occur. This level of certainty is typically met by the completion of permit application, the subject of approved proposals or planning documents, or other similar evidence. Determining how far into the future to consider actions is based on the impact of the alternatives being considered. Once the impacts of the alternatives are no longer experienced by the affected resource, then future actions beyond that need not be considered.

Given the remote nature of the project sites and the area of influence of the proposed action on affected resources, the reasonably foreseeable future actions considered in this cumulative impacts analysis are limited to the continuation of present day activities (i.e., rural land development, agriculture and timber harvest, recreational use of the Klickitat River, and fish harvest) and a few known planned projects, which are:

- Replacement of Horseshoe Bend Bridge (Wahkiacus site).
- Salmon Recovery Funding Board projects.
- Klickitat Subbasin Plan actions.
- Washington State Salmon Recovery Planning Process.

3.14.3 Cumulative Impacts Analysis

The following sections provide the analysis of any cumulative impacts when potential impacts from the proposed action are combined with past, present, and reasonably foreseeable actions. Potential cumulative impacts are described for each resource in the order that the affected resources are presented in Sections 3.1 through 3.13 of this EIS.

The analyses of cumulative impacts are for Alternatives 2 and 3. It can be assumed that anticipated future activities associated with Alternative 1 would be consistent with existing land use plans and policies and meet the legal obligations related to environmental protection. Alternative 1 would have no cumulative effects on air resources, geology and soils, water quality and quantity, fisheries, vegetation, wildlife, threatened and endangered species, wetlands, floodplains, cultural resources, aesthetics, socioeconomics, or public health and safety.

3.14.4 Air Resources

3.14.4.1 Air Quality

Historic land development activities in the region have created sources of air pollutant emissions that continue today (e.g., railroad lines, industrial areas, Columbia River ship traffic and ports, land clearance for agricultural purposes, etc.). As present actions, these sources of emissions affect background levels; however, existing air pollutant concentrations at the project sites are relatively low. Construction and long-term use and activities associated with the reasonably foreseeable future actions are similar to past present actions and are not expected to change ambient air quality in the region or at any of the project sites. Emissions from construction and operations of Alternative 2 or 3 would cause a very slight increase in background levels, although this increase would not be detectable at distances beyond approximately one mile from facilities. The cumulative effect of the project and all other past, present, and reasonably foreseeable future actions on air quality would not be markedly different from the direct and indirect project impacts of the project itself (Alternative 2 or 3), described in Section 3.1.1.2.

3.14.4.2 Climate Change

GHG concentrations in the atmosphere and corresponding climate change occurring over the past 50 years have been primarily caused by anthropogenic contributions. GHG emissions have largely originated from the burning of fossil fuels and the clearing of forests around the world from many and varied sources during this time, as well as for a significant period before that (Karl et al. 2009). Therefore, unlike the cumulative impacts analyses for other resources discussed in this section, the global nature of GHG makes cataloguing past, present, and reasonably foreseeable future actions for this resource impossible.

Nonetheless, in a general sense, any action where fossil fuels have been or are being burned contributes to GHG concentrations. Examples of such actions include home heating, automobile and other vehicle use, electricity generation, processing and manufacturing of goods, and wood-burning activities, among others. In addition, actions that result in the disturbance of soil or loss of vegetation can also increase concentrations. Vegetation can affect concentrations in two ways. First, if vegetation is removed prior to maturation, the carbon storing potential is lost and CO_2 can no longer be sequestered in that vegetation. Second, if that vegetation is burned, it will release all of the carbon it has sequestered back into the atmosphere as CO_2. These actions have occurred in the past and are likely still occurring, and will continue to occur in the future at some unknown level.

In analyzing the cumulative impact of Alternatives 2 and 3, global, national, and regional GHG emissions were considered. In 2006, the United States Energy Information Administration (EIA) estimated global GHG emissions at 29,017,000,000 metric tons of CO_2 equivalent (EIA 2009a). In 2008, total U.S. GHG emissions were estimated at 6,956,800,000 metric tons of CO_2 equivalent. Overall, total U.S. emissions have risen by approximately 14 percent from 1990 to 2008. In 2007, the four states within BPA's service territory emitted an estimated 180,060,000 metric tons of CO_2 (see Table 3-29).

Table 3-29: Estimated Annual CO_2 Emissions for Each State in BPA's Service Territory

State	CO_2 Emissions (metric tons)
Idaho	16,280,000
Montana	37,700,000
Oregon	43,520,000
Washington	82,560,000
Total	180,060,000

Source: EPA 2007

As a result of increased GHG concentrations, the earth's temperature has increased by about 1.5°F over the last century (Karl et al. 2009). Models predict that the warming of the planet will continue and could be as much as 11.5°F warmer by 2100 with the current level of emissions. The effect of increased temperatures include sea level rise due to shrinking glaciers, changes in biodiversity as species try to move into more optimal temperature ranges, early initiation of phonological events, lengthening of growing seasons, and thawing of permafrost (Karl et al. 2009).

In the Northwest region of the United States, statistical data indicates that the annual average temperature has risen about 1.5°F over the past century, with some areas experiencing increases up to 4°F. Many experts believe this temperature rise is a major contributing factor to the 25 percent reduction in average snowpack in the Northwest over the past 40 to 70 years. A continued decline in snowpack in the mountains will decrease the amount of water available during the warm season. A 25- to 30-day shift in the timing of runoff has been observed in some places, and the trend is expected to continue as the region's average temperature is projected to rise another 3 to 10°F in the 21st century (Karl et al. 2009).

In terms of cumulative impacts to the atmospheric levels of GHG, any addition, when considered globally, could contribute to long-term significant effects to climate change. However, the concentrations estimated for Alternatives 2 and 3, when compared to the regional, national, and global rates, are negligible and comparatively insignificant. National and international efforts to reduce GHG emissions such as the carbon sequestration markets and the Kyoto Protocol may help reduce the rate of emission.

3.14.5 Geology and Soils

Effects of both Alternatives 2 and 3 on soils and geology would be localized and only affect the resources present on the sites where new facilities are proposed. Similarly, effects of other actions in the region that involve ground disturbance would only affect the soils and geologic resources bound by the limits of the disturbance. The proposed action would not contribute to a loss of resources that have special qualities or characteristics that could have a compounding effect on those resources as a whole. Therefore, Alternatives 2 and 3 would not contribute to cumulative effects on soils and geology.

3.14.6 Water Quality and Quantity

The cumulative effects analysis for water resources considers all actions in the Klickitat River Subbasin that have past, present, or reasonably foreseeable future impacts on water quality and quantity in the subbasin. The Klickitat River Subbasin has been affected by timber harvest, agriculture, some residential and commercial development, habitat restoration projects, salmon recovery projects, and watershed management activities. Timber harvest, agriculture, and development contribute to water quality impairment in the basin.

Future demand for water is influenced by expected changes in population, industrial and commercial uses, and variations in existing water uses. At present, residential and nonresidential water use accounts for eight percent of the total amount of water used in the Klickitat River Subbasin and irrigation consumes the remaining 92 percent of the water used (Watershed Professionals Network and Aspect Consulting 2005). This ratio of water use is expected to continue into the future as population growth in Klickitat County is relatively slow and agricultural use dominates the local economy.

Water diverted under Alternative 2 for the proposed hatchery and acclimation facilities at Wahkiacus would have no cumulative effect on overall Klickitat River hydrology as the volume withdrawn would be returned to the river within 100 feet of the intake; however, water withdrawal from Swale Creek for the facility would contribute to a cumulative negative effect on water volume in its lower reach. This impact on water volume in Swale Creek would be short-term and temporary, only occurring during periods when instream flow is sufficient to support hatchery withdrawals while maintaining instream flows to support beneficial uses for fish, including salmonids. There are no known foreseeable actions to address over appropriations of water on Swale Creek. At the Klickitat Hatchery, Alternatives 2 and 3 would not contribute to a cumulative impact on river hydrology because proposed intake volumes would be the same as present volumes, with total volume returned to the river via the fish ladder.

Based on the good overall water quality of the Klickitat River and minimal foreseeable development, the legally allowable effluent from the proposed facilities under Alternative

2 and 3 would not result in adverse cumulative effects on water quality of the Klickitat River Subbasin.

3.14.7 Fisheries

Aquatic habitat in the region has been substantially affected by agriculture and rural development. Effects to fisheries resources due to such developments are anticipated to persist at current levels. Actions that contribute to adverse effects include ongoing irrigation diversions, fish harvest , agricultural development along riparian corridors, and rural and road development. Adverse effects of development, agriculture, water diversion, timber harvest, and fish harvest would continue resulting in negative impacts to the aquatic habitat in the reasonably foreseeable future.

Ongoing actions that contribute to beneficial effects on fisheries resources include those actions aimed at protecting, enhancing or restoring aquatic and riparian habitat in the Klickitat River. The Yakama Nation's YKFP is a comprehensive fish habitat rehabilitation program for the mainstem Klickitat River and several tributaries. Ongoing and proposed future projects include increasing streamflows, improving fish passage, screening diversions, reducing sediment loads, and restoring stream channel and riparian habitats. These programs, in combination with numerous state, federal, and local plans (described below) are anticipated to result in a beneficial effect on aquatic resources in the Klickitat River Subbasin.

Salmon Recovery Funding Board Projects

Projects funded by the Washington State Salmon Recovery Funding Board are aimed at protecting intact functioning salmonid habitats through acquisition or restoration of impaired salmon habitats. Several ongoing salmon/habitat recovery projects are proposed in the Klickitat Subbasin in Klickitat County, including riparian habitat restoration; these projects would benefit fish species and their habitats.

Klickitat Subbasin Plan

A goal of the Klickitat Subbasin Plan is to identify management actions that promote compliance with the ESA and Clean Water Act (CWA) through maintenance, restoration, and enhancement of fish habitat and populations. The plan also intends to establish tribal and recreational harvest practices that protect the biological integrity and genetic diversity of the subbasin (Yakama Nation et al. 2004).

Washington State Salmon Recovery Planning Process

The goal of the State Salmon Recovery Planning process is to "restore salmon, steelhead, and trout populations to healthy harvestable levels and improve those habitats on which the fish rely" (Joint Natural Resources Cabinet 2002). Actions associated with the Klickitat River Anadromous Fisheries Master Plan and the Klickitat Lead Entity Region Salmon Recovery Strategy all contribute to the planning processes and would contribute to beneficial effects on fisheries resources.

Washington State Wildlife Area Plan – Klickitat Wildlife Area

Management goals for the Klickitat Wildlife Area are to preserve and enhance habitat and species diversity for both fish and wildlife resources, maintain healthy populations of game and nongame species, protect and restore native plant communities, and provide diverse opportunities for the public to encounter, utilize, and appreciate wildlife and wild areas. The plan sets management priorities for WDFW within the Klickitat Wildlife Area, including riparian vegetation protection, road removal (control of sediment inputs to the Klickitat River), weed control, fire management, and other habitat management actions to enhance and protect aquatic and terrestrial wildlife. Continuance of this plan would result in beneficial effects to fisheries resources.

Implementation of the Klickitat Basin (Water Resources Inventory Area 30) Watershed Management Plan

The Watershed Management Plan was developed and approved in accordance with Chapter 90.82 Revised Code of Washington. The plan considers available water resources and the attendant supply systems relative to current demand as well as future demand for domestic, commercial, institutional, and agricultural (irrigation and stockwater) uses. The Plan addresses the need to maintain adequate water in streams and rivers for fish, including species that are listed under the federal ESA and other aquatic species. Recovery and Multispecies Strategies implemented under the Watershed Management Plan are anticipated to have beneficial impacts to fisheries resources in the region.

Middle Columbia River Steelhead Recovery Plan

This plan addresses steelhead status and recovery in terms of the “four Hs” that affect the species’ survival: habitat, the hydropower system, hatcheries, and harvest. For hatchery effects, the plan relies on Hatchery and Genetic Management Plans and Artificial Production for Pacific Salmon (Appendix C of Supplemental Comprehensive Analysis, NMFS 2008 FCRPS Biological Opinion). For fishery management planning, it refers to the *U.S. v. Oregon* process for mainstem fisheries, and Fisheries Management Evaluation Plans for tributaries. The major factors currently limiting the viability of Middle Columbia River steelhead populations are degraded tributary habitats, impaired fish passage in the mainstem Columbia River and tributaries, hatchery-related effects, and predation/competition/disease. The recovery plan proposes actions to reduce or mitigate the limiting factors and threats to steelhead survival throughout the life cycle.

Yakima Klickitat Fisheries Project

The Yakama Nation, as the Lead Agency, in coordination with the co-manager, Washington Department of Fish and Wildlife, is testing the principles of supplementation as a means to rebuild fish populations through the use of locally-adapted broodstock in an artificial production program (the Klickitat Hatchery Complex Program is part of the Yakima Klickitat Fisheries Project). The goal is to increase the numbers of naturally spawning fish, while maintaining the long-term genetic fitness of the fish population being supplemented. Under Alternative 1, ongoing hatchery programs at the Klickitat Hatchery would continue to result in minor to moderate adverse cumulative effects to some fisheries resources, particularly listed juvenile salmonids.

Monitoring and Evaluation Actions–Component of Yakima Klickitat Fisheries Project

Under the YKFP, smolt trapping may be used to characterize migration of hatchery summer steelhead juveniles. In addition, migrating juvenile hatchery coho would be collected in existing smolt monitoring traps to determine if they are preying on ESA-listed steelhead or bull trout. Some nontarget fish species may be captured and handled at the trapping facilities. These evaluations have the potential to harass, kill, or injure handled fish. For example, smolt monitoring with screw traps in the Klickitat River have resulted in some fish losses over time. According to the Yakama Nation (2008d), incidental take of steelhead juveniles resulting from rotary screw trap operations averaged 3.7 percent of the total number of juveniles handled between 2003 and 2006.

Fish Trapping and Handling Facilities

At Lyle Falls and Castile Falls, all adult collection facilities have been designed to meet NMFS standards; therefore, injury or mortality to nontarget species during fish handling and sorting procedures are likely minimal. Adverse effects due to operation of these facilities, however, likely occur, and contribute to the cumulative effects to fisheries resources in the subbasin.

Harvest Regulations

Annual harvest regulations for tribal and nontribal fisheries are established through fishery comanager’s processes. Court decisions, such as *U.S. v. Oregon*, influence these regulations. Under Alternative 1, cumulative effects to fish resources due to commercial and tribal harvest will likely contribute to ongoing moderate adverse effects to fish resources in the Klickitat River Subbasin.

Alternatives 2 and 3 are compatible with and additive to other aquatic habitat and fish management programs (such as HSRG recommendations for the Klickitat Hatchery Complex Program) in the region.

Implementation of Alternative 2 would reduce hatchery-associated effects of competition, predation, and genetic introgression; these changes, in combination with other habitat protection and improvement actions, should result in a positive cumulative effect on the fish populations in the Klickitat River Subbasin. Habitat protection and enhancement projects associated with the various local, state, and federal plans presented above, combined with in-water actions associated with this alternative would increase temporary construction effects (increases in sediment and turbidity; temporary fish passage delays) associated with in-stream work. However, the resulting effects associated with habitat protection and enhancement projects are ultimately beneficial.

Implementation of Alternative 3 is compatible with and additive to other aquatic habitat and fish management programs in the region; however, this alternative does not fully benefit the fish populations of the subbasin through reduction of competition and predation effects. While the cumulative effect of Alternative 3 is still a positive one, it does not achieve as great a benefit as Alternative 2. As with Alternative 2, habitat improvements and effects associated with Alternative 3, in combination with other actions in the watershed, would result in a net positive benefit.

3.14.8 Vegetation

Considered with past, present, and reasonably foreseeable future actions that have resulted in the loss of native vegetation in the region, Alternatives 2 and 3 would contribute incrementally to cumulative impacts to vegetation as a result of permanent vegetation loss at newly developed sites. The cumulative impact would be greater with Alternative 2 because of the additional development footprint associated with the facilities at Wahkiacus.

3.14.9 Wildlife

Permanent loss of wildlife habitat associated with site development under Alternatives 2 and 3 would contribute incrementally to a cumulative loss of habitat from past, present, and reasonably foreseeable future actions. The cumulative impact would be greater with Alternative 2 because of the additional development footprint associated with the facilities at Wahkiacus.

3.14.10 Threatened and Endangered Species

The cumulative effects discussed in Section 3.14.7 apply to the Columbia River bull trout and MCR steelhead populations. Due to previous actions affecting fish habitat (including critical habitat of the MCR steelhead), water quality, and harvest, these populations are imperiled. The Proposed Action, in combination with future potential actions, is not anticipated to exacerbate the decline of the MCR steelhead population even though a minor loss in critical habitat would occur. Considered with past, present, and reasonably foreseeable future actions, the project would result in a beneficial impact to threatened and endangered fish species in the study area and watershed by promoting population recovery and improving fish habitat.

Considered with past, present, and reasonably foreseeable future actions that have resulted in the loss of available habitat to support threatened and endangered terrestrial species in the study area, the Proposed Action would contribute incrementally to cumulative impacts with permanent loss of habitat for threatened and endangered terrestrial species at the project sites. The cumulative impact would be greater with Alternative 2 because of the additional development footprint associated with the facilities at Wahkiacus.

3.14.11 Wetlands

Past development in the Klickitat River Subbasin has resulted in wetland losses; however, recent and continuing efforts by local, state, and federal regulatory agencies are designed to preserve and protect wetlands and ensure no net loss of total wetland acres within a watershed. The Proposed Action would result in a permanent loss of wetlands at the Wahkiacus (Alternative 2) and Klickitat Hatchery sites (Alternatives 2 and 3). This could contribute incrementally to wetland losses in the subbasin; however, mitigation measures would be implemented to offset the wetland impacts of either alternative. Wetland mitigation projects can be an improvement over existing conditions by providing enhancement, restoration, and creation of wetlands at a protected site. This mitigation has the potential cumulative effect of restoring and enhancing the value and function of wetlands in areas that are protected from future development.

3.14.12 Floodplains

Past and present actions in the floodplain have contributed to changes in floodplain function and damage to property. Federal, state, and local regulations, plans, and policies limit development in floodplains to avoid changes to river and stream hydrology and protect public health and welfare. The proposed Wahkiacus facilities (Alternative 2) would negligibly contribute to continued development within the 100-year floodplain in this region. The maintenance building would be within the floodway fringe, but at a rarely inundated elevation, therefore with negligible effects on floodway capacity. This contrasts with other potential developments within the 100-year floodplain of the Klickitat River that would reduce the capacity of the floodplain to pass high flows.

It is anticipated the existing Horseshoe Bend Bridge will be removed and a replacement constructed immediately downstream of its current location, although the project is not currently funded. The replacement bridge will incorporate a longer span to accommodate flood flows within the natural channel and restored overbank conveyance. The result will be a reduced backwater effect upstream of the crossing. The Yakama Nation anticipates the existing left bank bridge abutment would remain to accommodate the hatchery water intake.

With reduced backwater effect as a result of Horseshoe Bend Bridge replacement, the overall cumulative effect on floodplains in the Wahkiacus area would be beneficial. The magnitude of the benefit will be determined in hydraulic studies conducted in support of bridge design.

Alternative 3 would have no contribution to cumulative effect on floodplains.

3.14.13 Cultural Resources

Construction of the Klickitat Hatchery Complex Program facilities under Alternative 2 or 3 would contribute to a continuum of development and policies that affect historic cultural values and resources (e.g., housing and infrastructure development, regional fish management policies, and ocean and river harvest of salmon). The Klickitat Hatchery Complex Program, in conjunction with other fishery management efforts, would help increase populations of salmon and steelhead populations, culturally important resources. Cultural resource investigations conducted as part of this project contribute cumulatively to the body of knowledge of history and uses of the area. Disturbance or loss of cultural resources at the Wahkiacus site under Alternative 2, combined with other reasonably foreseeable actions that could adversely affect cultural resources through ground disturbance would have an adverse cumulative effect on these resources.

3.14.14 Aesthetics

3.14.14.1 Visual

Historic development activities within the vicinity of the project have created the visual features that are present today. The reconstruction of the Horseshoe Bend Road bridge would not have a cumulative effect on visual resources because it will replace an existing built feature. There are no reasonably foreseeable actions that, when combined with the proposed action under Alternative 2 or 3, would contribute to a cumulative adverse effect on visual resources in the study area.

3.14.14.2 Soundscape

Historic land development activities in the vicinity of the project sites have created sources of noise that continue today (e.g., roads and isolated residential developments), and affect general background levels. Background noise levels in the rural areas of the proposed development sites are typically low. One of the most significant source of noise at each site is the Klickitat River. The other typical source of noise at these sites is highway traffic, although average daily traffic volumes are low to very low, depending on the site. There are no reasonable foreseeable future actions that would affect general background noise levels at any of the three project sites.

Construction noise associated with Alternatives 2 and 3 would have a short duration and is not expected to occur at the same time as any other construction project in the area that could have a compounding effect on noise. Neither Alternative 2 nor 3 would contribute to a cumulative noise impact.

3.14.15 Socioeconomics

3.14.15.1 Land Use and Transportation

Land Use

Continued rural development in the Klickitat River Subbasin would continue to reduce the amount of open space and undeveloped areas. County and tribal authorities protect natural areas by limiting the areas of development with zoning ordinances and other plans and policies. There are no reasonably foreseeable actions that, when combined with the proposed action, would contribute to a cumulative adverse effect on land use in the study area. The change in land use at Wahkiacus (Alternative 2) would contribute slightly to the ongoing conversion of natural areas to developed use in the subbasin, but would not create a cumulative effect that would be considered different from background levels. The development at the McCreedy Creek site (Alternatives 2 and 3) would not contribute to a cumulative effect on land use because there are no existing or reasonably foreseeable future developments in that area that did or would affect land use. With no other action to add land use impacts, there would be no cumulative effect.

Transportation

Klickitat County plans to replace the bridge at Horseshoe Bend Road at some point in the future, but a schedule has not been developed. The new bridge could be designed to accommodate two-way traffic, which would be an increase in capacity over existing conditions. The increased capacity of the bridge would improve access between SR 142 and Horseshoe Bend Road, which could result in an increase in traffic on the bridge; however, the overall increase would not be significant because there are no new attractions or developments to draw traffic. Construction of the Horseshoe Bend Road bridge and the Wahkiacus Hatchery and Acclimation Facility (Alternative 2) could have a temporary cumulative adverse effect on traffic if they were to occur at the same time. Long-term operations of both facilities would not have a cumulative effect on traffic in the area. Construction and operation at the Klickitat Hatchery proposed under Alternatives 2 and 3 would not contribute to a cumulative transportation impact.

3.14.15.2 Socioeconomics

Operation of Alternative 2 or 3 would result in a long-term increase in available fishery resources, beneficially impacting commercial, recreational, and subsistence fishing in the vicinity. The beneficial impacts would improve socioeconomic conditions in the region by supplementing personal incomes, which increases spending and has secondary impacts in the communities where spending occurs. When the socioeconomic effects of Alternatives 2 and 3 are added to those of several fish protection and mitigation actions under the Columbia River Basin Fish and Wildlife Program, they would cumulatively benefit the communities in the region. The benefit would be greater with Alternative 2 because it provides greater improvement for the fisheries resource and creates additional jobs with the development of the Wahkiacus Hatchery and Acclimation Facility.

3.14.15.3 Recreation

Recreational activities in the Klickitat River Subbasin have grown in recent years and are expected to continue to grow with the population. There are no planned improvements to existing recreational facilities or planned developments of new recreation facilities in areas that would draw more users to the project area for Alternatives 2 or 3. The Horseshoe Bend Bridge replacement could improve access to the Klickitat Trail and attract more trail users; if Residence Option A were built, Alternative 2 may improve amenities for recreation users at the Wahkiacus site by providing an information kiosk and additional parking. With these two actions, Alternative 2 could have a minor cumulative effect on recreation by increasing demand for recreation use along the Klickitat Trail.

There are no reasonably foreseeable future actions that would affect Klickitat Trail and thereby contribute to a cumulative effect on trail users. Washington State Parks and the U.S. Forest Service are in the process of developing a Classification and Management Plan for the Klickitat Trail. The Classification and Management Plan will address overall visitor experiences, natural and cultural resources, use of the park’s buildings, recreation fields and trails, and other topics of interest to the community and park visitors.

Preliminary recommendations define a long-term boundary, which includes working with land owners to advance management goals, developing new trail heads, and establishing land use classifications. All recommendations are subject to review and would only be pursued if property owners are willing to participate (Washington State Parks 2008).

Alternative 3 would not contribute to a cumulative effect on recreation because there are no additional actions that would compound the effects of Alternative 3.

3.14.16 Public Health and Safety

Public use of the Klickitat River and surrounding areas has increased as recreation activities such as hiking, biking, kayaking, and camping have become more popular. These activities also bring people closer to water-dependent industries and facilities, which increases the public health risks. Public interaction with fish production facilities is usually restricted by fences, but can be difficult to control, particularly with recreation users on the water. The addition of facilities in the Wahkiacus area under Alternative 2 would increase the presence of water-dependent industries, increasing the public health risk. Replacement of the Horseshoe Bend Bridge could improve access to the Klickitat Trail and increase the number of visitors, which would further increase the risk to public health and safety. This would have a minor cumulative impact on public health.

Alternative 3 would have no cumulative effect on public health and safety because there are no other reasonably foreseeable future actions that would compound the effects of the associated improvements.

3.15 Unavoidable Adverse Effects

The No Action Alternative, Alternative 1, would not affect the existing conditions as described in the Affected Environment section of Chapter 3. Thus, no unavoidable adverse effects on the environment would occur under Alternative 1.

Alternative 2 would require the conversion of currently undisturbed to somewhat disturbed lands at the Wahkiacus and McCreedy Creek sites. Changes to these sites include grading and vegetation removal, which result in habitat loss and force wildlife to forage, nest, and breed elsewhere. This type of ground disturbance would also adversely affect known cultural materials present below-surface at Wahkiacus. As a result of the development, more frequent and intense use of the sites by humans would occur, which also affects wildlife behavior and deters use of the sites. Diversion and use of surface waters at these sites would affect in-stream hydrology, creating a bypass reach where flows would be reduced. The effect may be minor on the Klickitat River and McCreedy Creek where flows are able to support the divergence; however, on Swale Creek, the loss of flow in the lower reach of the creek could further impair water quality. This effect would be minimized by only operating the Swale Creek intake during periods when instream flow is sufficient to support hatchery withdrawals while maintaining instream flows to support beneficial uses for fish, including salmonids. Placement of new facilities within the floodplains of the Klickitat River and Swale Creek could also reduce floodplain function to some minor, localized degree. These unavoidable adverse effects on soils and geology, vegetation, and wildlife could be mitigated, but would not be unavoidable. Improvements at the Klickitat Hatchery would occur within an already disturbed area and would not cause an unavoidable adverse effect on environmental resources; however these modifications and demolition of existing residence structures would adversely affect the integrity of these historic structures. These unavoidable adverse effects on historic structures could be mitigated but would not be unavoidable.

Alternative 3 would have fewer unavoidable adverse impacts than Alternative 2 because there would be no new development at the Wahkiacus site. Unavoidable adverse effects at the McCreedy Creek site would be the same as for Alternative 2.

3.16 Relationship of Short-term Uses and Long-term Productivity

Alternative 1 would not change the aquatic environment or alter any terrestrial sites. Alternatives 2 and 3 are expected to greatly enhance productivity of the aquatic environment through salmon and steelhead population increases, from which other aquatic and terrestrial species, including humans, may derive benefits. The lands developed for hatchery and acclimation facilities, employee housing, and ancillary facilities would be permanently taken out of vegetative productivity and reduce available habitat for terrestrial species. Construction activities would temporarily affect more land than would be permanently developed (structures, roadway, parking), but long-term productivity of these temporarily affected areas would not likely be adversely affected because of the measures that would be taken to restore disturbed, undeveloped areas to pre-existing conditions (e.g., through replanting, weed control, standard construction BMPs, etc.). The stream reaches between the intakes and outlets at Wahkiacus (Alternative 2) and McCreedy Creek (Alternatives 2 and 3) would have slightly lower total flow. This would not affect productivity at McCreedy Creek (Alternatives 2 and 3) or in the Klickitat River at Wahkiacus (Alternative 2). Swale Creek productivity, however, could be compromised by flow reduction in its lower reach under Alternative 2 if flows were diverted during atypical low flow periods. Impacts to Swale Creek flows would be minimized by only operating the Swale Creek intake during periods when instream flow is sufficient to support hatchery withdrawals while maintaining instream flows to support beneficial uses for fish, including salmonids.

3.17 Irreversible and Irretrievable Commitment of Resources

Alternative 1 involves no development or consumption of materials other than the operational resources associated with existing facilities. Resources that would be irreversibly and irretrievably committed as a result of implementing Alternative 2 or 3 of the Klickitat Hatchery Complex Program are the building materials, fuel, equipment, and operational supplies used to construct and operate the program. Building materials include rock, metals, wood, glass, and plastic. These would be obtained from off-site sources and suppliers and installed at the project sites. Petroleum products and other chemicals would be used and/or consumed at all sites. Neither alternative would require use of scarce resources or deplete available supplies such that the resources would be unavailable for other users and other needs.

Chapter 4: Consultation Review, and Permitting Requirements

Numerous federal, state, and local environmental laws and administrative requirements must be satisfied prior to initiation of the proposed project. Compliance with these regulatory requirements is examined in this chapter. The intent of each law, regulation, ordinance, or guideline is described, followed by an assessment of the proposed project's compliance/consistency.

4.1 National Environmental Policy Act

The National Environmental Policy Act of 1969 as amended (42 USC 4321 et seq.) requires federal agencies to assess and disclose the effects of proposed actions on the environment. This EIS has been compiled to meet NEPA requirements, enabling BPA, the Yakama Nation, and the other agencies involved to consider and disclose the potential environmental consequences of and mitigation for the proposed action. BPA and the Yakama Nation conducted formal scoping meetings and informal outreach efforts with interested and potentially affected parties. The identified key issues were used to guide the environmental analysis. Copies of the draft EIS will be sent to the relevant agencies, organizations, and interested parties for review and comment. After a formal public comment period on the draft EIS, a final EIS will be prepared to include responses to comments, corrections or clarifications to the analysis and, if necessary, additional analyses. The final EIS will be used by federal decision-makers to determine if they wish to proceed with the Klickitat Hatchery Complex Program.

4.2 Fish, Wildlife, and Habitat

4.2.1 Federal Endangered Species Act

The Endangered Species Act of 1973 and its amendments (ESA, 16 USC 1531 et seq.) require federal agencies ensure their actions do not jeopardize endangered or threatened species or their critical habitats. Sources of information for the potential occurrence of sensitive species and their habitats in the project area include NMFS, USFWS, and the Washington Natural Heritage Database. Each was consulted during formulation of this draft EIS for lists of threatened, endangered, sensitive, or candidate species and presence of habitat. Potentially affected species and their habitat are discussed and analyzed in Section 3.7. Based on this information, BPA is preparing a Biological Assessment for consultation in accordance with ESA Section 7. The Yakama Nation has also submitted Hatchery and Genetic Management Plans to NMFS to address the fish production aspects of the project. The final EIS will summarize the outcome of these consultation efforts with agencies and no decision on the Proposed Action will be reached by BPA until this consultation is complete.

4.2.2 Fish and Wildlife Conservation

The Fish and Wildlife Coordination Act of 1934 (16 USC 661 et seq.) requires federal agencies to consult with the USFWS and state fish and wildlife agencies when "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted…..or otherwise controlled or modified" by permit or license. Provisions of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (6 USC 839 et seq.) are intended to protect, mitigate, and enhance fish and wildlife of the Columbia River and its tributaries. Other federal acts and laws, such as the Fish and Wildlife Conservation Act of 1980 (16 USC 2901 et seq.), encourage federal agencies to conserve and promote conservation of game and nongame species and their habitats.

Alternatives 2 and 3 would divert waters of the Klickitat River, and Swale and McCreedy creeks, to rear and acclimate spring and fall Chinook, steelhead, and coho. This use would not consume the water, but would use it briefly and then discharge it back into the river. This use would enhance restoration of spring and fall Chinook, summer steelhead, and coho, increasing their abundance, productivity, distribution, and diversity. Sections 3.4 through 3.7 of this EIS describe the potential effects to fish and wildlife resources. USFWS and WDFW will be sent a copy of this Draft EIS and their comments will be included in the Final EIS.

4.2.3 Magnuson-Stevens Fishery Conservation and Management Act of 1976

The NMFS is responsible for ensuring compliance with the Magnuson-Stevens Fishery Conservation and Management of 1976. Public Law 104-297, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act to establish new requirements for evaluating and consulting on adverse effects to Essential Fish Habitat.

The facilities associated with the Klickitat Hatchery Complex Program are located within Essential Fish Habitat for Pacific salmonids (coho and Chinook salmon). This EIS addresses Essential Fish Habitat in Section 3.4. Compliance with this law is consolidated with ESA Section 7 consultation. The Biological Assessment will contain any conservation measures intended to appropriately avoid and minimize impacts to essential fish habitat of federally-managed fish species.

4.2.4 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 USC sections 703-712, July 3, 1918, as amended) implements various treaties and conventions between the United States and other countries, including Canada, Japan, Mexico, and the former Soviet Union, for the protection of migratory birds. Under the act, taking, killing, or possessing migratory birds or their eggs or nests is unlawful. Most species of birds are classified as migratory under this act, except for upland birds such as pheasant, chukar, and gray partridge. None of the proposed project facilities would be constructed on or near known waterfowl or shorebird concentration areas, migratory routes, or any other area acquired as a reservation for migratory birds.

4.2.5 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 USC 668-668d, June 8, 1940, as amended) prohibits the taking of, possession of, and commerce in bald and golden eagles, with limited exceptions. Information from Section 3.7 reveals there are no documented nest sites within line of site or within a mile of the project area. The type of disturbance that would occur in the project area would not interfere with or prevent bald or golden eagles from completing any portion of their life cycle. Because this Act covers only intentional acts, or acts in "wanton disregard" of the safety of golden or bald eagles, this project is not viewed as subject to its compliance.

4.3 Heritage Conservation and Cultural Resources Protection

The National Historic Preservation Act of 1966 as amended (16 USC 470) requires federal agencies with land management or permitting authority to take into account the potential effects of their undertakings on properties that are listed or eligible for listing on the National Register of Historic Places. Consultation must occur with the State Historic Preservation Office and relevant Tribal Historic Preservation Officer regarding the inventory and evaluation of properties potentially eligible for National Register nomination and to determine whether the project undertaking would adversely affect them. Yakama Nation archaeologists and cultural specialists conducted cultural resource surveys at each proposed project site where ground disturbance may occur (Section 3.10). They presented the survey findings to the Washington State Historic Preservation Office and Yakama Tribes' Tribal Historic Preservation Officer. Consultation among BPA, the Yakama Nation, and the historic preservation officers is ongoing to document the finding of effect and resolve adverse effects through mitigation requirements.

Facilities proposed on federal or tribal land will follow the requirements of the Archaeological Resource Protection Act (16 USC 470 et seq.). Archaeological Resource Protection Act requirements must be followed should archaeological resources be removed from the McCreedy Creek site. The Archaeological and Historic Preservation Act (16 USC 469 et seq.) directs federal agencies to notify the Secretary of the Interior if they find that a federal action might cause the destruction of significant scientific, prehistoric or archaeological data. Section 3.10 discusses the likelihood of encountering cultural materials at the proposed construction sites.

Executive Order 13175, Consultation and Coordination with Indian Tribes, states that the U.S. government will continue to work with Indian tribes on a government-to-government basis to address issues concerning tribal self-government, trust resources, and Indian tribal treaty and other rights. The Klickitat Hatchery Complex Program would contribute to the spirit of intergovernmental cooperation, and upon implementation, has the potential to enhance the culturally significant tribal ceremonial and subsistence fishery for Chinook, coho, and steelhead salmon in the Klickitat River.

4.4 Floodplain/Wetlands Assessment

Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands, require the protection of floodplains and wetlands. Department of Energy regulations, Compliance with Floodplain/Wetlands Environmental Review Requirements (10 CFR 1022.12), also require a floodplain/wetland impact assessment. If either would be affected or altered by project facilities, the effects must be disclosed. Sections 3.9 and 3.8 of this EIS describe the effects of the proposed project on wetlands and FEMA-mapped floodplains.

4.5 Farmlands

Section 154 (a, b) of the Farmland Protection Policy Act requires BPA to identify and quantify adverse impacts of the proposed action on farmlands. The location and aerial extent of Prime and other important farmlands as designated by the Natural Resource Conservation Service were obtained from Natural Resource Conservation Service soil surveys for Klickitat and Yakama Counties. Klickitat, Wahkiacus, and McCreedy Creek sites do not have any Prime, Unique, or other designated farmlands in the potential footprint of the project (NRCS 2011).

4.6 Other Consultation and Compliance Requirements

4.6.1 State Environmental Policy Act

The State of Washington Environmental Policy Act (SEPA), Washington State's most fundamental environmental law, was enacted in 1971 as chapter 43.21C Revised Code of Washington. Much like the federal National Environmental Policy Act, SEPA is designed to provide decision makers and the public with impartial information about a project and analyze alternatives to the proposal, including ways to avoid or minimize adverse impacts or to enhance environmental quality. The purpose of SEPA is to encourage harmony between the citizenry and the environment, to promote efforts that will prevent or eliminate damage to the environment, to stimulate human health and welfare, and to enrich understanding of the ecological systems and natural resources that are important to Washington State. Information provided during the SEPA review process helps decision makers understand how a proposal will affect the environment and identify measures to reduce likely effects, or deny a proposal when adverse effects are identified. This EIS may be adopted by WDFW as the lead state agency to fulfill the SEPA requirement.

4.6.2 State, Area-wide, and Local Plans and Approval

Various federal, state, tribal, and local permits and approvals would be required to implement the Klickitat Hatchery Complex Program. State and federal permits may apply to construction and operations at these sites. Facilities on the Yakama Reservation (the proposed McCreedy Acclimation Facility) would require tribal governmental approval. Modifications to the Klickitat Hatchery site may require federal, state, tribal, and Klickitat County approvals prior to construction (Table 4-1).

The hatchery and acclimation ponds are water-dependent uses, so water rights and in-water work permits are required. Elements would be incorporated into project design to ensure consistency with the appropriate authorizations once they are known.

In-stream construction (below the ordinary high water mark) requires a Hydraulic Project Approval from Washington State or the Yakama Nation, depending on the work location, which would specify when in-water work can occur and what measures would be needed to protect channels, riparian zones, and water quality. Construction activities above the ordinary high water mark of the Klickitat River would be considered a Shoreline Alteration under the Klickitat County Shoreline Master Plan and would require a Conditional Use Permit and Floodplain Permit from the County. Klickitat County and the Yakama Nation may also require an approval to allow construction within a designated floodplain to ensure that appropriate design measures are included. A Critical Areas Permit would be required from the County for any activities that may impact a wetland, stream, or associated buffers. On state-owned aquatic lands, Washington Department of Natural Resources (WDNR) would need to review and approval authority for any new structures.

Table 4-1: Permits and Other Approvals Expected to be Required for the Klickitat Hatchery Complex Program Facilities

Permit or Approval	Permitting Agency/Authority	Permit Time Line
Water Rights and Wells (Groundwater and Surface Water)	Yakama Nation and WDOE	1 year
NPDES for Hatchery Discharge	EPA	6 months – 1 year
Corps Clean Water Act Sections 404/10	Corps	6 months – 1 year
ESA and Intake Screening	NOAA Fisheries and USFWS	6 months
Water Quality Certification(Section 401)	Yakama Nation and WDOE	90 days
NPDES Stormwater General Permit for Construction	EPA and WDOE	45 days
Hydraulic Project Approval	Yakama Nation and WDFW	6 months – 1 year
Floodplain Permit	Yakama Nation and Klickitat County	120 days
Use of State-owned Aquatic Lands	WDNR	90 days
Shoreline Substantial Development Permit	Yakama Nation and Klickitat County	120 days
Critical Areas Permit	Klickitat County	120 days
Shoreline Conditional Use Permit	Klickitat County	6 months – 1 year
Land Use/Building Permits	Yakama Nation and Klickitat County	120 days

4.6.3 Clean Water Act

Uncontrolled water pollution led to enactment of the Federal Water Pollution Control Act Amendments of 1972. As amended in 1977, this law became commonly known as the Clean Water Act. It is the principal federal law governing water pollution control and establishes the basic structure for regulating discharges of pollutants into the waters of the U.S. It gave the U.S. Environmental Protection Agency (EPA) the authority to implement pollution control programs such as setting wastewater standards for industry. The Clean Water Act also contains requirements to set water quality standards for all contaminants in surface waters and makes it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit is obtained under its provisions. The Corps was given the authority to regulate and issue permits for the discharge of dredged or fill material into waters of the U.S. Some provisions of the Clean Water Act have been delegated by the EPA to the states, including the issuance of wastewater discharge permits and stormwater permits for construction.

Section 401

Section 401 of the Clean Water Act includes the State Water Quality Certification program requiring that the state certify compliance of federal permits and licenses with state water quality requirements. Application would need to be made to WDOE when final facility design is complete and prior to construction.

Section 402

This section authorizes stormwater discharges associated with construction activities greater than one acre. An NPDES permit authorizes construction projects, provided notice is given to the authorizing agency and appropriate erosion control plans and measures are implemented. The action agency is responsible for preparing and implementing a Stormwater Pollution Prevention Plan that would be overseen by WDOE. Application would need to be made to WDOE when final facility design is complete and prior to construction. Pertinent information will include construction schedules and quantities and quality of potential discharge.

Section 404

Authorization from the Corps is required under this section when there is a discharge of dredged or fill material into waters of the U.S., including wetlands. When design is finalized, a permit application would need to be submitted to the Corps at which time they will determine if this project would be evaluated under the Nationwide Permit process or if an Individual Permit would be required.

4.6.4 Noise Control Act

The Noise Control Act of 1972 (42 U.S.C. 490 et seq.) promotes an environment free from noise that jeopardizes human health and welfare. Federal and state regulations establish guidelines that implement the intent of the act. No local noise standards exist for areas that would be affected by the proposed action. No noise in excess of state, federal, and tribal standards is expected from this project (Section 3.11.2). Temporary construction noise during daylight hours is exempt from state and federal standards.

4.6.5 Clean Air Act

Emissions produced by construction and operation of the proposed project facilities must meet standards of the Clean Air Act and the amendments of 1970 (42 USC 741 et seq.). In Washington, the authority for ensuring compliance with this act is delegated to

WDOE. The proposed action would not violate current clean air standards, as described in Section 3.1.

4.6.6 Resource Conservation and Recovery Act, Toxic Substances Control Act and Federal Insecticide, Fungicide, and Rodenticide Act

The federal Resource Conservation and Recovery Act (42 USC 692 et seq.) regulates the disposal of hazardous wastes. The Toxic Substances Control Act (15 USC 2601) gives authority to the EPA to regulate substances that present unreasonable risks to public health and the environment. The federal Insecticide, Fungicide, and Rodenticide Act (7 USC 136 et seq.) authorizes the EPA to prescribe conditions for use of pesticides. Construction, operation, and maintenance of the proposed facilities would meet the guidelines for use, handling, storage, and disposal of such hazardous substances (Section 3.13). Necessary permits would be obtained if regulated pesticide products are used.

4.6.7 Executive Order on Environmental Justice

Executive Order 12898 directs federal agencies to consider the effects of their programs, policies and activities on minority and low-income populations. Federal agencies are required to assess environmental justice concerns in the NEPA analysis. The potential for the Klickitat Hatchery Complex Program to affect low-income communities and minority populations is summarized in Section 3.12.2.

4.6.8 Consistency and Coordination with Regional Aquatic Resource Planning

4.6.8.1 NMFS Recovery Plan

NMFS has formulated a working draft of a recovery plan to satisfy the requirements of the Endangered Species Act to support recovery of the Distinct Population Segment (DPS) of steelhead found in the Klickitat Subbasin (NMFS 2007). The purpose of the plan is to "restore the Klickitat steelhead population and its habitat to a level that supports DPS recovery and allows the population to become a viable component of its ecosystem." Biological recovery goals are designed to "ensure long-term persistence of viable populations of naturally produced steelhead distributed across their native range."

The proposed project is consistent with the goals of the NMFS Recovery Plan. One of the project's major goals is to enhance and restore summer steelhead to their historical range within the Klickitat Subbasin. Hatchery steelhead will not be released above Castile Falls for 9 years so that it may be determined if wild fish can recolonize this habitat on their own. If wild steelhead do not recolonize stream habitat above Castile Falls, a hatchery program that uses both anadromous and resident rainbow trout (and associated crosses) as broodstock will be implemented. To accomplish this, a new juvenile acclimation facility may be constructed at McCreedy Creek for hatchery juvenile steelhead released upstream of Castile Falls. Integrated hatchery programs for steelhead are designed to meet specified proportion of natural influence and proportion of hatchery-origin fish in the natural spawning escapement (pHOS) objectives to ensure the natural environment drives the adaptation of the integrated population. HSRG guidelines for the composition of hatchery- and natural-origin steelhead spawners used as broodstock and spawning in the wild will be followed. Hatchery releases above Castile Falls will be terminated once steelhead population goals are achieved in this portion of the subbasin.

4.6.8.2 Klickitat River Subbasin Plan

The Klickitat Subbasin Plan was prepared for the Northwest Power and Conservation Council (NPCC) in 2004. The subbasin planning process exists within the context of the Fish and Wildlife Program (NPCC 2000), which envisioned the plans would provide locally-developed fish and wildlife restoration and protection priorities. The Klickitat Subbasin Plan had as a major goal the identification of management actions that would promote compliance with the federal Endangered Species Act and the federal Clean Water Act. The plan's vision statement is as follows:

> *We envision healthy self-sustaining populations of indigenous fish and wildlife that support harvest and other purposes. Decisions and recommendations will be made in a community based, open and cooperative process that respects different points of view, and will adhere to all rights and statutory responsibilities. These efforts will contribute to a robust and sustainable economy.* (Yakama Nation et al. 2004)

The subbasin goals identified by the plan are:

- *Protect or enhance the structural attributes, ecological function, and resiliency of habitats needed to support healthy populations of fish and wildlife.*

- *To restore and maintain sustainable, naturally producing populations of spring Chinook, steelhead that support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the subbasin.* (Yakama Nation et al. 2004)

The proposed project is aimed at accomplishing both subbasin goals, but is particularly concerned with the second goal.

4.6.8.3 Klickitat Lead Entity Regional Salmon Recovery Strategy

The Klickitat Lead Entity Region Salmon Recover Strategy (Klickitat Lead Entity 2008) includes a set of goals and implementation priorities for salmonid restoration and habitat improvement in the Klickitat River Subbasin. Specific improvement projects would be funded by the Salmon Recovery Funding Board. The Lead Entity will measure success by the number of manmade limiting factors that are mitigated and by the return of healthy native salmonids to harvestable and sustainable levels. The strategy report identifies limited high quality perennial pools and cover habitat in the lower 3.1 miles of Swale Creek as limiting factors for steelhead and juvenile spring Chinook. One of the recommended actions is the placement of LWD in Swale Creek. This action is included in the development plan for the Wahkiacus Hatchery and Acclimation Facility under

Alternative 2. Therefore, implementation of Alternative 2 would be consistent with a component of the Klickitat Lead Entity Region Salmon Recover Strategy.

4.6.8.4 Washington State Watershed Planning Process

The watershed planning process for the State of Washington began with passage of Engrossed Substitute House Bill 2514 in 1998 (Ch. 90.82 RCW). The planning process is aimed at finding local solutions to watershed issues. The primary goal of the program is to successfully manage water to ensure the supply is sufficient for all users, including people, farms, and salmon. In-stream flow issues are the focus of the program. The state is currently entering into a programmatic EIS for the Columbia River Basin Water Drainage Program. Watershed planning in the Klickitat area is in a Phase 4 implementation stage. The Klickitat Hatchery Complex Program is located in a managed watershed under this program and its use of water is considered in the watershed planning process.

4.6.8.5 Washington State Salmon Recovery Planning Process

In 2000, the State of Washington instituted the salmon recovery planning process under the concept that "extinction is not an option." The goal of the process is to "[r]estore salmon, steelhead, and trout populations to healthy harvestable levels and improve those habitats on which the fish rely" (Joint Natural Resources Cabinet 2002). Recovery plans must include objective, measurable criteria for recovery, site-specific management, and time and cost estimates aimed at recovery of salmonid populations. The plans integrate local habitat efforts with actions involving hatcheries and harvest. The Klickitat Hatchery Complex Program is consistent with elements of the state's Klickitat Salmon Recovery Plan .

The lead entity for the salmon recovery area encompassing the Klickitat River is Klickitat County. The Yakama Nation is represented on both the Citizen's Advisory Committee and the Technical Advisory Committee along with a variety of local, state, and federal agencies and organizations. The Klickitat Lead Entity Region Salmon Recovery Strategy document is available online at http://www.rco.wa.gov/documents/srfb/Lead_Entities/Klickitat/Strategy.pdf.

The vision statement of the Klickitat Salmon Recovery Plan is as follows:

> *Within ten years, restore salmon, steelhead, and trout populations to healthy, self-sustaining, and harvestable levels and improve habitat on which they rely, with strong community support and participation in the Klickitat Lead Entity geographic area.*

Their mission is to: "support salmon recovery by identifying credible and fundable habitat protection and enhancement projects and support related programs and activities that produce sustainable and measurable benefits for fish and fish habitat" (Klickitat County 2007).

4.6.9 Executive Order on Federal Leadership in Environmental, Energy, and Economic Performance

Executive Order 13514 states that federal agencies should identify and analyze impacts from energy usage and alternative energy sources in all Environmental Impact Statements and Environmental Assessments for proposals for new or expanded Federal facilities under the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq). BPA may fund the construction, operation, and maintenance of portions of the facilities proposed under the Klickitat Hatchery Complex Program. The final designs have not yet been completed for these facilities; however, BPA has made the following general assessment of energy usage and the potential for using alternative energy sources.

Ground and surface water pumps would require the majority of the energy usage for this project. Energy requirements have been minimized in the conceptual design of the project through the use of gravity flow water supplies where possible. Where pumps would be needed, the primary power source would be nearby power lines, with generators to be used for emergency backup. Energy sources other than electrical power are not likely to be feasible due to the size of the requirement and the constant demand cycle. The use of propane rather than diesel fuel for the generators is being considered, as propane would emit fewer greenhouse gases that would contribute to climate change. Energy efficiency would also be considered in the sizing of the pumps and pipelines. BPA would also encourage the Yakama Nation to use and promote energy-efficient design and operations in the new hatchery buildings, utilize incentives for energy conservation from local Public Utility Districts wherever feasible, and, where practical, to supply their power needs from existing renewable sources or install on-site renewable power generation, such as solar panels.

The Yakama Nation will own and operate the facilities, so the tribe would ultimately make final decisions for the facility designs and operations. However, BPA will use contractual mechanisms through the funding agreement to encourage design and operation practices in the manner described in Executive Order 13514.

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Chapter 6: Acronyms, Abbreviations, and Glossary

6.1 Acronyms and Abbreviations

BMP	best management practices
BPA	Bonneville Power Administration
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CO_2	carbon dioxide
Corps	U.S. Army Corps of Engineers
dB	decibels
dBA	A-weighted decibels
DPS	distinct population segment
EDNA	environmental designation for noise abatement
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FCRPS	Federal Columbia River Power System
FEMA	Federal Emergency Management Agency
GHG	greenhouse gases
GIS	geographic information system
gpm	gallons per minute
HSRG	Hatchery Scientific Review Group
ICTRT	Interior Columbia Technical Review Team
kW	kilowatt
dB	decibels
Leq	hourly-equivalent sound pressure levels
LWD	large woody debris
$\mu g/m^3$	micrograms per cubic meter
mg/L	milligrams per liter
mm	millimeter
N	nitrogen
N_20	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act

NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPCC	Northwest Power and Conservation Councils
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetland Inventory
ozone	O_3
P	phosphorus
PM	particulate matter
$PM_{2.5}$	particulate matter with an aerodynamic diameter of ≤2.5 micrometers
PM_{10}	particulate matter with an aerodynamic diameter of ≤10 micrometers
RCW	Revised Code of Washington
RM	river mile
RM&E	Research, Monitoring, and Evaluation
ROD	Record of Decision
SAAQS	State Ambient Air Quality Standards
SEPA	State of Washington Environmental Policy Act
SR	State Route
T&E	Threatened and Endangered
USC	United States Code
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WCTED	Washington Department of Community, Trade, and Economic Development
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOE	Washington Department of Ecology
WRIA	Water Resources Inventory Area
YKFP	Yakima/Klickitat Fisheries Project
§	Section

6.2 Glossary

Term	Definition
acclimation facility	A facility that allows artificially-produced fish that are raised elsewhere to be acclimated to a waterbody prior to release with the intention that, as adults, those fish will return to the waters in which they were released.
adipose-clipped	Connective tissue is clipped from hatchery smolt so they can be identified in a selective fishery.
ammocoetes	A protracted larval stage of lampreys.
broodstock	Mature adult fish collected from a river system and used for the creation of juveniles in artificial production programs. Eggs and milt (sperm) are harvested from broodstock to create fertilized eggs that are incubated in the hatchery environment.
cofferdam	A watertight enclosure from which water is pumped to expose the bottom of a body of water and permit construction.
Denil fish ladders	Ramps with baffles that create the effects of a set of rapids; used to provide upstream fish passage in areas where natural passage is blocked.
escapement	The portion of an anadromous fish population that escapes capture and reaches their spawning grounds.
eyed eggs	Approximately 30 days after fertilization the eggs develop eyes and are at a stage known as eyed eggs.
floodplain	Channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.
floodway	FEMA defines the floodway as the portion of the floodplain that is effective in carrying flow, within which this carrying capacity must be preserved and where the flood hazard is generally highest.
floodway fringe	FEMA defines the floodway fringe as the portion of the floodplain outside the regulatory floodway but still inundated by the designated one percent annual chance flood.
freshet	Flood caused by spring thaw.
harvestable fish	Hatchery fish that are marked in some way (adipose-clipped or other) to distinguish them from wild stocks. These marked fish are then allowed to be harvested by recreational fishers.
jack	A male of any salmon species that returns to the river of origin before it completes the typical life cycle of an adult. Though sexually mature, they are typically a lot smaller than those adults that go to the ocean for several years.
natural-origin fish	Fish that are not produced in artificial production facilities, but from parents that spawned in the wild.
raceway	An artificially-created pool used to hold and rear fish in artificial production facilities.
redds	The spawning ground or nest of various fish.
residualism	The tendency for fish to not migrate on time or at all.
salmonids	Any of a family of elongate bony fishes (as a salmon or trout) that have the last three vertebrae upturned.
scatter-plant	The process of out-planting hatchery juveniles into various locations throughout a waterbody with the intention that, as adults, fish will return to out-planted areas for spawning.
segregated harvest program	A program where fish are propagated as genetically separate or segregated populations relative to naturally spawning populations.
smolt	A young salmon about 2 years old that is at the stage of development when it is ready to migrate to the sea.
substrate	The base on which an organism lives.

Term	Definition
upriver brights	The run of fall Chinook salmon that retain their bright sides and firm flesh as they swim through the lower Columbia River; runs are typically upstream of the Dalles and Bonneville dams. Upriver brights are favored by commercial and sport fishers for their large size and firm flesh.
volitionally released	To be released (as in from hatcheries) without restriction or obstacles.
weir	A fence, pickets, or other enclosure installed in a waterway to prevent upstream migration and to allow for fish collection.

Chapter 7: List of Preparers

7.1 Preparers

Name	EIS Section	Experience and Education
Auten, Marc HDR Engineering	Soils and Geology	9 years' experience in Natural Resource Evaluations B.S., Environmental Science
Brown, Molly HDR Engineering	QA/QC	15 years' experience managing, writing and reviewing NEPA documents B.S., Environmental Studies
Buffington, Lori HDR Engineering	Technical Editor	Over 20 years of experience in technical editing and document design; responsible for editorial review of EIS', Biological Assessments, and other large-scale studies.
Cleveland, Leandra HDR Engineering	Deputy Project Manager, Vegetation, Wetlands, Wildlife, and Threatened and Endangered Species (terrestrial species)	12 years' experience writing NEPA documents and evaluating biological resources. B.S., Environmental Science
Holloway, Becky HDR Engineering	Fisheries and Threatened and Endangered Species (aquatic species)	14 years evaluating habitat suitability for federally listed threatened and endangered species, including impact assessment with emphasis on projects involving in-stream work. B.S., Marine Biology M.S., Biology, genetics emphasis
Hutchinson, Matt HDR Engineering	Water Quality and Quantity and Floodplains	5 years evaluating stream habitat B.S., Wildlife Biology
Michak, Patty MarineView Fisheries Consulting	Fisheries	28 years as a fisheries biologist; 12 years' experience preparing and reviewing NEPA documents. B.S., Fisheries Science
Milliken, Craig HDR Engineering	Air Quality, Soundscape and Public Health and Safety	14 years' experience in air quality analysis; 10 years in noise analysis. B.A., Geography Master of Environmental Sciences
Ostrem, Meagan HDR Engineering	Visual Resources and EIS Writer	7 years' experience writing NEPA documents B.S., Environmental Science and Environmental Policy
Snead, Carol HDR Engineering	Project Manager	22 years' experience managing and writing NEPA documents. B.S., Geology M.S., Geological Sciences
Twitchell, Sara HDR Engineering	Socioeconomics, Transportation, Land Use and Recreation	5 years' experience writing NEPA documents and evaluating potential impacts to the built environment. B.S., Ecology and Evolutionary Biology M.S., Environmental Science (in progress)

7.2 Reviewers

Name/Organization	Title
Clark, Rocco Yakama Agency, Bureau of Indian Affairs	Natural Resource Specialist, Environmental Coordinator
Conley, Will Yakama Nation	Hydrologist/Watershed Restoration Specialist
Dondy-Kaplan, Hannah BPA	Contract Environmental Protection Specialist
Easterbrooks, John WDFW	Regional Fish Program Manager/YKFP Policy Group WDFW Lead Representative
Frederiksen, Chris Yakama Nation	Research Scientist/Natural and Artificial Production Planner
Pierce, Kathy BPA	NEPA Compliance Office
Rau, Jason Yakama Nation	Klickitat Hatchery Complex Manager
Sharp, Bill Yakama Nation	Research Scientist/Project Lead
Todd Haight, Mary BPA	Project Manager
Turner, Richard NMFS	Fishery Biologist
Weintraub, Nancy BPA	Senior Environmental Protection Specialist
Zendt, Joe Yakama Nation	Research Scientist/Lead RM&E Biologist

Chapter 8: List of Agencies, Organizations, and Persons to Whom Copies of EIS Were Sent

BPA, as the lead agency, must circulate the EIS to interested and affected agencies, organizations and individuals. The list of agencies, organizations, and persons to whom this EIS was sent is contained in this chapter.

Federal Agencies

Environmental Protection Agency

US Department of Agriculture - Forest Service

US Department of Commerce – National Oceanic and Atmospheric Administration Fisheries Service

US Department of Defense – Army Corps of Engineers

US Department of the Interior - Fish and Wildlife Service; Bureau of Indian Affairs; Bureau of Land Management; National Park Service

Tribes or Tribal Groups

Confederated Tribes and Bands of the Yakama Nation

Washington State Agencies

Department of Archaeology & Historic Preservation
Department of Ecology SEPA unit
Department of Ecology
Department of Natural Resources
Department of Fish and Wildlife
Department of Transportation
Washington Parks and Recreation

Public Officials

Office of Governor Gregoire
Washington State Representatives
Washington State Senators

Local Governments

Yakima County Commissioners
Klickitat County Commissioners
Klickitat County
Yakima County

Libraries

Goldendale Community Library
White Salmon Valley Community Library

Interest Groups
American Rivers
Columbia River Intertribal Fish Commission
Klickitat Trail Conservancy
White Salmon Steelheaders Association
Wild Fish Conservancy

Individuals
Landowners within one-half mile of project sites and other interested parties

Chapter 9: Index

Appendix A
Adaptive Management Strategies

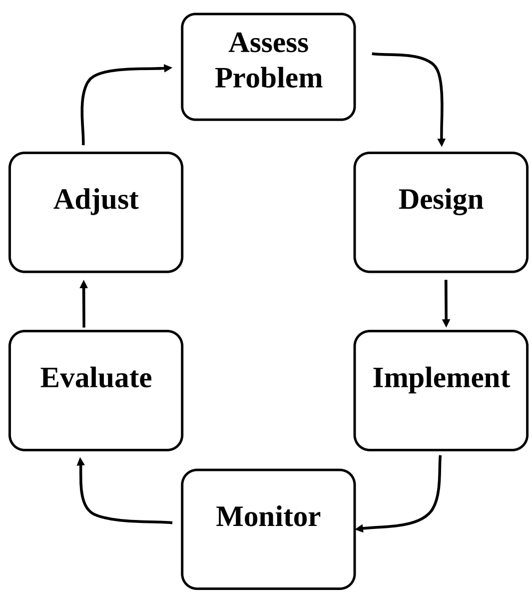
Appendix A — Adaptive Management Strategies

Overview

Successful management of natural systems is a challenging and complicated undertaking. Adaptive management—learning by doing—is based on the assumptions that current resources and scientific knowledge are limited and that a certain level of uncertainty exists. Nevertheless, an adaptive management approach attempts to apply available resources and knowledge and adjust management strategies as new information is revealed. Holling first described the principle of adaptive management as requiring management decisions and policies to be viewed as hypotheses subject to change—as sources of continuous, experimental learning (1978). Adaptive management, as recently defined by the Department of Interior's 2007 Technical Guide, "is a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood" (Williams et al. 2007).

The adaptive management process has six steps. These include: assessing the problem, designing management actions, implementing those actions, monitoring the effects of the actions, evaluating the monitoring data, and adjusting future actions based on that data (see figure 1 below).

Figure 1 The adaptive management cycle as described in the Department of the Interiors 2007 Technical Guide (Williams et al. 2007).



This process works well when integrated with the process required by the National Environmental Policy Act (NEPA). As with adaptive management, NEPA's primary goal is informed decision-making by understanding the impacts of a proposed federal action. The NEPA process can result in the development of an adaptive management framework: defining thresholds, outlining actions, and describing how those actions would be monitored and data assessed. In addition, the potential impacts of subsequent actions would be assessed, thereby allowing for the implementation of those actions described in the adaptive management component of the NEPA document (i.e., this appendix). This approach allows resource managers more flexibility and a better chance of achieving the plan' stated desired condition and can reduce or limit future environmental review requirements.

The Department of the Interior recently outlined the adaptive management approach in a technical guide developed to provide guidance to all DOI bureaus and agencies (Williams et al. 2007). Many other agencies have adopted this approach in terms of understanding and implementing adaptive management strategies. Furthermore, the Council on Environmental Quality's guidance requires "a monitoring and enforcement program to be adopted . . . where applicable, for any mitigation" required in a National Environmental Policy Act planning process (40 CFR 1505.2). These documents suggest that adaptive management may be usefulness in certain situations.

The following paragraphs lay out the framework for certain actions where the principles of adaptive management will be applied for this project. Two adaptive management strategies are described for two different management issues. In the future, other strategies may be developed using an adaptive management approach; however, they will likely still need a certain level of environmental review and compliance.

Proposed Strategies

The primary strategies considered in this EIS relate to the re-colonization of the upper Klickitat River by steelhead, and to native summer steelhead conservation. Strategies are also proposed for spring Chinook and coho, and for hatchery returns affecting harvest.

Re-colonization of the Upper Klickitat River by Summer Steelhead

The basic management hypothesis for upper river re-colonization of steelhead is that with the passage blockage removed at Castile Falls, summer steelhead will naturally re-colonize upstream waters. Monitoring would be conducted to evaluate natural re-colonization rates and the need for a conservation hatchery program. A nine-year period from the completion of the Castile Falls passage improvements in 2005 will provide up to three steelhead life cycles in which to assess the re-colonization rate. If it is determined that summer steelhead are not adequately re-colonizing areas above Castile Falls (i.e., approaching the 150 adult utilization rate as determined by Ecosystem Diagnosis and Treatment modeling habitat availability analysis), then an integrated hatchery program would be initiated that focused on conservation objectives for the upper river

Only natural-origin adults would be collected and used as broodstock for the upper river conservation program, preferably from the Castile Falls trap. If adults are not available at

Castile Falls, they would be collected at the Lyle Falls trap. The number collected would vary but not exceed 25% of total returns. The initial phase of this action would help determine if the upper Klickitat fish are expressing a resident life history capable of producing anadromous offspring. The size and duration of the program would be based on the results of the initial phase. If fish are artificially produced, they would be hatched and reared at the Klickitat hatchery and acclimated at the McCreedy Creek acclimation facility or other suitable acclimation site. Initially, the conservation program would have a goal of releasing 70,000 summer steelhead.

Monitoring would continue to determine the success of the conservation hatchery program. If fish are still not re-colonizing at adequate levels additional strategies will be developed.

Lower River Summer Steelhead Integrated (Conservation) Program

Ongoing monitoring and evaluation studies are attempting to determine the degree of introgression and offspring production of hatchery fish with native summer steelhead in the lower basin. Studies to date show that direct stream releases of Skamania-origin hatchery fish have resulted in a rate of introgression of approximately 4%. The Yakama Nation will continue to monitor this rate and production of offspring by hatchery fish under the segregated program proposed under Alternatives 2 and 3. If this monitoring shows increasing introgression, the Yakama Nation may convert the segregated program to an integrated program using natural-origin adults returning to the Klickitat River for broodstock. The program smolt release goal would be 130,000 smolts, the same as for the proposed segregated program, reared and volitionally released from the Klickitat Hatchery. This strategy should reduce the impacts to the native summer steelhead population in the lower river.

Spring Chinook Natural-Origin Broodstock Collection

For spring Chinook, one of the criteria to meet hatchery reform objectives is to limit the percentage of natural-origin adults taken for broodstock to 25 percent of the adult return. However, the proportion of the natural-origin run taken for broodstock may exceed 25 percent during early phases of the reformed program development. This may occur under circumstances where the natural-origin run size is less than 400 returning adults. The program will need to collect about 125 natural-origin adults annually in the initial years of the broodstock transition period, which equates to approximately 200,000 juveniles, or 25 percent of the total program. By doing this, the program will produce an adequate number of adult returns needed for the continued transition of the remainder of the program. In addition, first generation adult returns from the natural-origin crosses will be needed for the upper basin re-colonization by using adults outplants on the spawning grounds. Once the program has fully transitioned to the new hatchery stock and adult outplants in the upper basin are no longer necessary, the percentage of natural-origin adults taken for broodstock will be limited to 25 percent of the natural-origin run.

Meeting Coho Harvest Goal

The Yakama Nation is proposing to reduce the coho smolt releases from 3.7 million to one million under Alternatives 2 and 3. They believe that changing the program to local broodstock and acclimating coho in the Klickitat River Subbasin can maintain the combined (ocean, mainstem, and tributary) harvest goal of 14,000 fish with much lower releases. However, if the changes result in reduced adult returns and decreased harvest, they propose to supplement the Klickitat River Subbasin releases with direct releases of Washougal stock smolts from the Washougal Hatchery in the lower Klickitat River. The harvest would be monitored and up to 2.5 million of the Washougal smolts would be released to meet the harvest goal. The actual number of additional smolts to be released would be determined by the performance of the new program and the differential between the observed harvest and actual harvest objectives.

Hatchery Return Rates

One of the issues that hatchery managers face when trying to provide harvest opportunities is the rate at which salmonids return to the hatchery as adults. If they move too quickly upstream, then many harvest opportunities are lost. In order to avoid this hatchery managers will monitor fish passing through the downstream Lyle Fall facility and determine how long it takes the fish to move up to the hatchery location. One way managers mitigate for the fish moving up to the hatchery too quickly is to collect broodstock from across the entire run timing to ensure available fish for harvest from July through November. If the impact to the fishery is detrimental, an alternative is to return some fish back to the mouth of the river to allow additional harvest; however this strategy is generally not supported by the Hatchery Science Review Group, and fish often spend very little time in the fishery area during their second passage. If this becomes a problem for the Klickitat fishery program, the fish managers would confer with all parties and propose a solution.

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Appendix B
Potential Climate Change Adaption Strategies

Appendix B — Climate Change Adaptation

Overview

As described in Chapter 2, changes in the project may become necessary to address potential effects from regional climate change in the coming years. Global changes in climate, specifically temperature, have occurred naturally throughout history; however, there has been a significant increase over the last 100 years (Brekke et al. 2009), and "human-induced emissions of heat-trapping gases" have been identified as the primary contributors to this increase (Karl et al. 2009). Water resources and ecosystems have been identified as specific sectors that are and will be affected by changes in climate. In the Pacific Northwest, these sectors include salmon habitat. Specific issues that could affect salmon stem from changes in summertime stream temperature, seasonal low flows, and flooding frequency and magnitude (Mantua et al. 2009).

The University of Washington (UW) Climate Impacts Group has developed two regional climate change models based on two greenhouse gas emission scenarios (A1B and B1), as recommended by the Intergovernmental Panel on Climate Change. The B1 scenario depicts a lower emissions scenario than the A1B scenario, based partly on the projected development of cleaner and more efficient technologies with B1. However, both models predict significant state-wide increases in August water temperatures beginning in about 10 years and continuing into the future (Mantua et al. 2009; see Figure 1).

Water temperature is a critical component of salmon habitat (Mantua et al. 2009; see Affected Environment). When temperatures rise too high, aspects of the salmonid life cycle such as migration, spawning, and population distributions can be affected. High temperatures can also result in an increased risk of disease and even death. The maximum upper temperature within which fish can survive varies among salmonid species. Based on the best available evidence, these water temperature limitations are 75.2˚F (24˚C) for steelhead trout, 74.1˚F (23.4˚C) for coho salmon, and 75.2˚ F (24˚C) for Chinook salmon (Eaton and Scheller 1996). However, even water temperatures as low as 59˚F (15˚C) can subject salmon to increased predation and an inability to compete with warm-water species. Table 1 describes EPA recommended temperature thresholds during different life history phases for Pacific salmonid species. Based on this data, the temperature increases predicted by the climate change models described above would likely result in more frequent and persistent thermal migration barriers and thermally stressed waters for salmon. Summer water temperatures are also predicted to start earlier and last longer (Mantua et al. 2009). These higher temperatures would likely have the most severe impacts on summertime fish migrations.

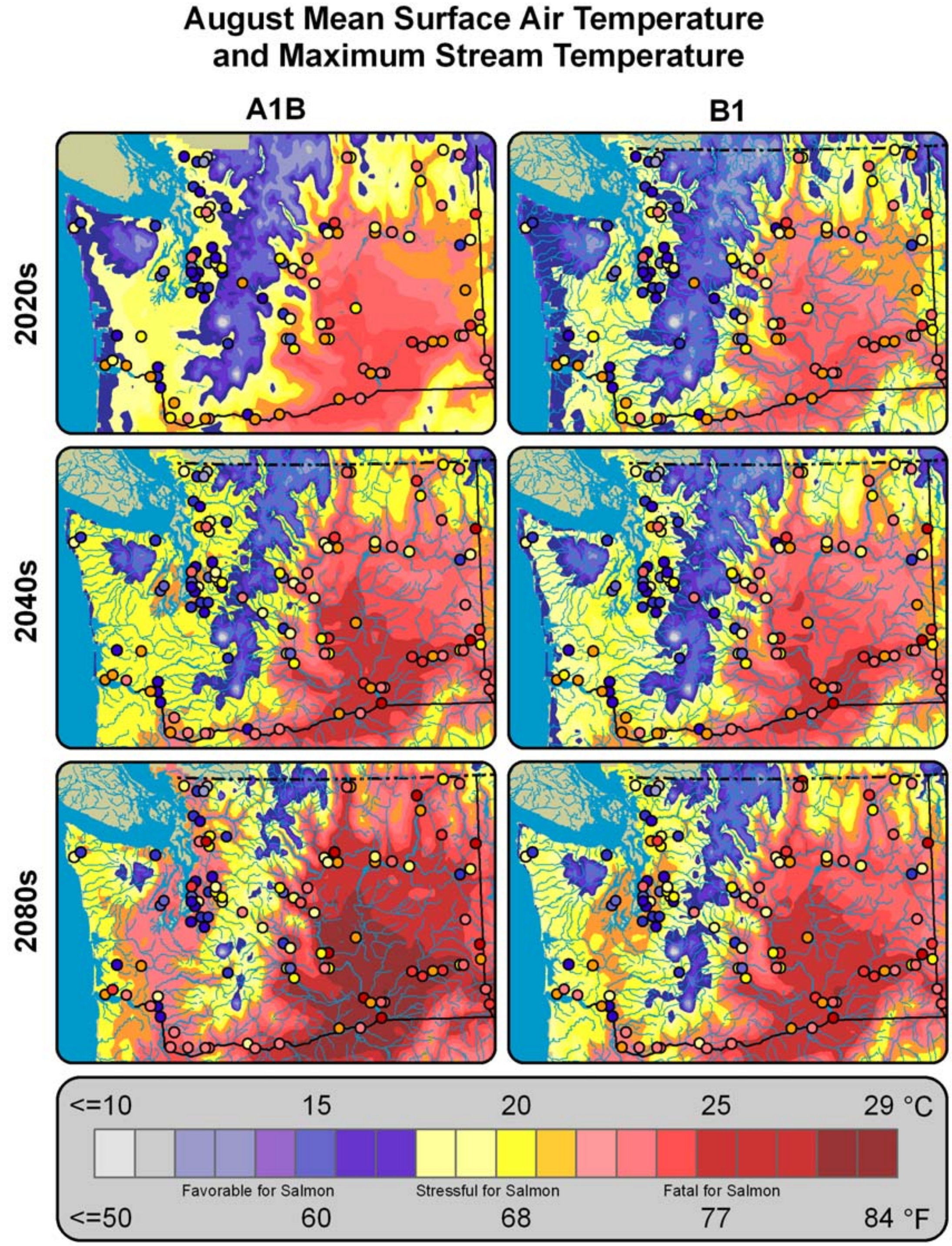

Figure 1. Future climate scenarios for several decades including the 2020s, 2040s, and 2080s are provided based on both climate scenarios (A1B and B1). Circles represent water temperatures (Figure from Mantua et al. 2009, pg 228).

Table 1: Recommended Temperature Thresholds for Pacific Salmon by Life History Phase

Salmonid Life History Phase Terminology	EPA-Based Recommended Temperature Thresholds to Protect Salmon and Trout[1]
Adult migration	<68°F (<20°C) for salmon and trout migration
Incubation	<55°F (<13°C) for salmon and trout spawning, egg incubation, and fry emergence
Juvenile rearing (early year)	<61°F (<16°C) for salmon "core" juvenile rearing
Smoltification	<59°F (<15°C) for salmon smoltification <57°F (<14°C) for steelhead smoltification
Juvenile rearing (late year)	<64°F (<18°C) for juvenile salmon and steelhead migration

[1]The EPA identified temperature unit is: Seven day average of the daily maximum water temperature.

Source: EPA 2003.

Climate change is also predicted to affect seasonal stream flows and flooding frequency and magnitude through changes to the watershed. Although the majority of the Klickitat subbasin is currently supplied by both snowmelt and rain (a transient–runoff dominant watershed), upstream the river is still fed largely by snowmelt from Mount Adams (an upstream snowmelt dominant watershed). Model predictions suggest that the watersheds feeding the Klickitat system will become largely transient–runoff (transition) dominant and rain dominant in the future (see Figure 2, below).

There are several repercussions to this change in watersheds. Flooding, both frequency and magnitude, is predicted to increase in December and January in transient–runoff watersheds. In transient–runoff dominant and rain dominant watersheds, the size of summer low flows is predicted to decrease, while their duration is expected to increase (Mantua et al. 2009). These watershed changes could result in changes to groundwater recharge rates and in the availability of water from local springs, further exacerbating water temperature issues. Changes in stream flows could also result in increased erosion rates, which could lead to increased sedimentation and further temperature changes.

In order to better put this in context, the UW Climate Center developed a graphic illustrating the potential climate related impacts on freshwater habitat for both steelhead and salmon. This illustration is recreated in figure 3. All of these potential changes could affect hatchery infrastructure, operations, and production as changes in water temperature and hydrology change from current conditions.

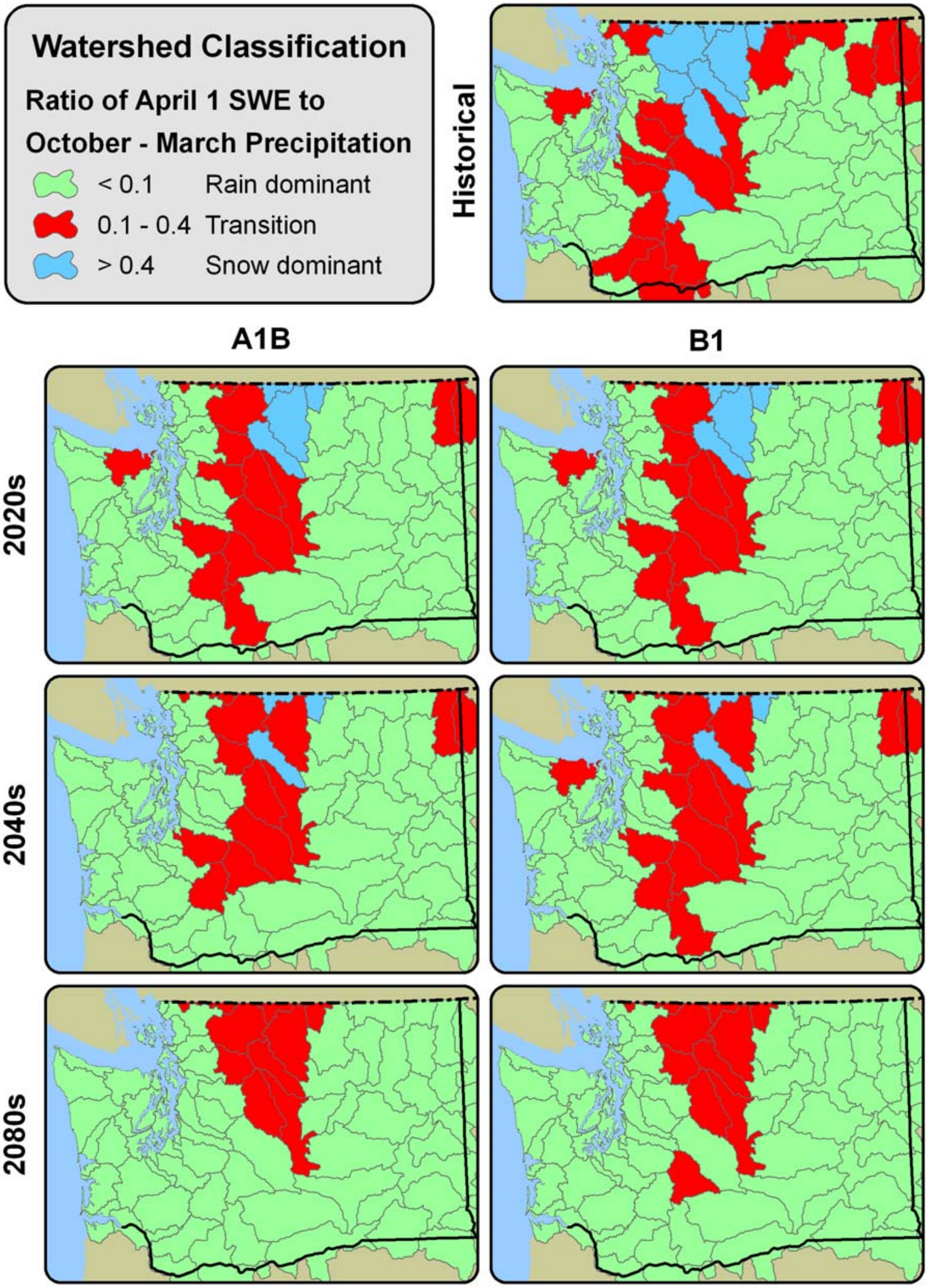

Figure 2. Watershed classification maps for simulated runoff in the historic period (1970-99), 2020s, 2040s, and 2080s. Simulations both climate scenarios (A1B and B1; Figure from Mantua et al. 2009, pg 234).

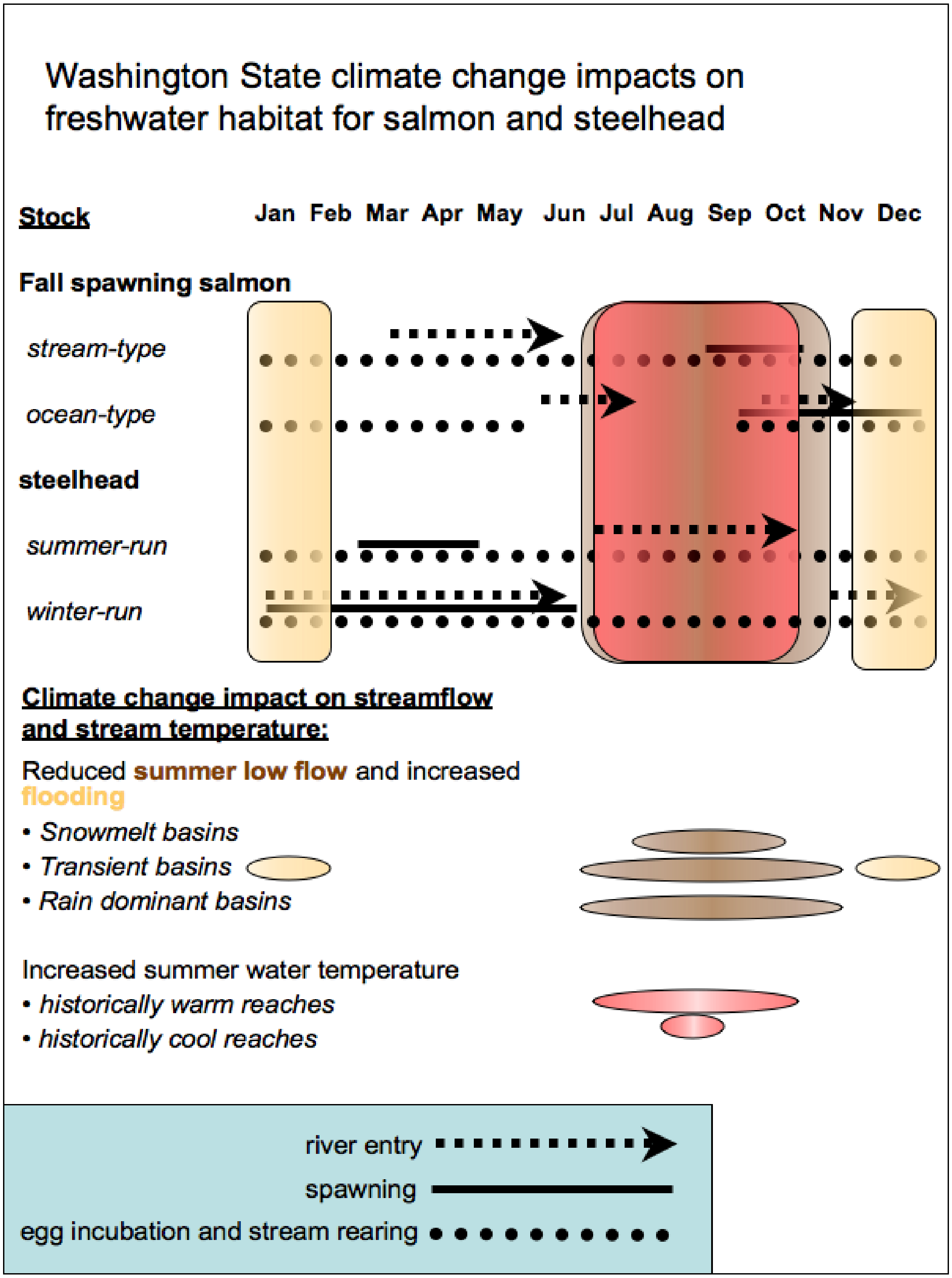

Figure 3. Potential climate change impacts of increased flooding, summer temperatures, and reduced summer low flow in freshwater habitat for salmon and steelhead. Example life history stages are shown for adult river entry (broken arrows), spawning (solid lines), and egg incubation and rearing periods (dotted lines) for generalized stocks. Tan shading highlights periods of increased flooding, brown shading indicates periods with reduced summer/fall low flows, and red shading indicates periods with increased thermal stress (Mantua et al. 2009, pg. 239).

Potential Future Responses

In considering future changes to salmonid habitat as a result of climate change, this EIS recognizes that the hatchery would have little impact on naturally-spawning salmonids in terms of habitat availability, other than those described in the environmental consequences chapter. In addition, the thermal exceedance that migrating fish may experience downstream of the facilities as a result of climate change are outside of the hatchery operation's control. However, there are some actions that may be necessary in the future to ensure that hatchery operations are maintainable given changing environmental conditions. As described in Chapter 2, these actions would likely require additional environmental review and permitting, but are described here to illustrate changes that may be necessary in the future.

Infrastructure changes

Water Intake—Water intake structures and pumps may need to be modified (e.g., extended deeper, relocated, etc.) as seasonal changes in stream flows and lower flows are experienced, especially in summer months.

Water Intake—Water intakes may need to be modified (e.g., installation of filters, settling pools, etc.) as sedimentation increases to reduce turbidity levels in hatchery water.

Adult ladders—Adult fish ladder entrances may need to be modified (e.g., extensions added, flows changed, etc.) to address changes in seasonal flows.

Flood protection—Additional measures may be required to reduce the risk of flood damage to hatchery building and local residences.

Spring Intake—Intake and pumps may need to be modified to ensure necessary water supply over time.

Water Discharge—Water discharges may need to be carefully monitored and manipulated to ensure the proper temperature is maintained for hatchery water discharges as stream temperatures increase over time.

Operation and Production changes

Acclimation Areas—Areas for acclimating fish may need to be re-evaluated to ensure appropriate water temperatures.

Acclimation Timing—Timing for fish acclimation and releases may need to shift as a result of changes in stream flow and temperature.

Hatchery Water Use—Depending on the air temperature and water temperatures, changes in the mixing ratios for water used in the hatchery and raceways may need to be modified.

Fish Production—Stocks being reared may need to change to those that are less affected by summer water temperatures.

Monitoring

Future monitoring of climate change will rest primarily with experts in the Region. Hatchery staff will be able to review monitoring data as it becomes available and use it to assist them in making changes to infrastructure, operations, and production. Using the updated monitoring data will allow staff to compare predictions to actual changes in the local environment and allow them to better meet changing conditions through time.

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Appendix C
State-listed Rare Plant Species in Klickitat County

Appendix C — State-listed Rare Plant Species in Klickitat County

Common Name	Scientific Name	Federal Status	State Status	Typical Habitat
Tall agoseris	*Agoseris elata*	—	Sensitive	Meadows, open woods, and exposed rocky ridge tops.
Grand redstem	*Ammannia robusta*	—	Threatened	Along the Columbia River in riparian mudflat wetlands.
Chaffweed	*Anagallis minima*	—	Threatened	Freshwater riparian areas, floodplains, around vernal pools.
Wormskiold's northern wormwood	*Artemisia borealis var wormskioldii*	Candidate	Endangered	Arid, generally supporting shrub-steppe vegetation.
Palouse milk vetch	*Astragalus arrectus*	—	Threatened	Found on grassy hillsides, sagebrush flats, river bluffs, and open ponderosa pine/Douglas fir forests in grassy or shrub-dominated openings.
Pauper milk vetch	*Astragalus misellus var pauper*	—	Sensitive	Open ridge tops and upper slopes, and rarely middle and lower slopes.
Ames' milk-vetch	*Astragalus pulsiferae var.suksdorfii*	Species of Concern	Endangered	Flat or very gentle terrain in coarse textured substrates.
Bolandra	*Bolandra oregana*	—	Sensitive	Along the Columbia River drainage near streams and moist, rocky places in deep shade.
Long-bearded sego lily	*Calochortus longebarbatus var. longebarbatus*	Species of Concern	Sensitive	Clay loams in vernally moist sites in meadows, forest meadow edges, and within semi-open areas within coniferous woods dominated by grasses and forbs.
Few-flowered collinsia	*Collinsia sparsiflora var. bruceae*	—	Sensitive	Thin soils over basalt on a variety of slopes, from almost flat to rather steep, generally south-facing.
Beaked cryptantha	*Cryptantha rostellata*	—	Threatened	Found in some of the driest microsites within the Columbia Basin.
Snake River cryptantha	*Cryptantha spiculifera*	—	Sensitive	Dry, open, flat or sloping areas in stable or stony soils.
Douglas' draba	*Cusickiella douglasii*	—	Threatened	Grows in a wide variety of habitats.
Clustered lady's-slipper	*Cypripedium fasciculatum*	Species of Concern	Sensitive	Mid- to late seral Douglas fir or ponderosa pine overstories with a closed herbaceous layer and variable shrub layer; mid elevations.
Fringed waterplantain	*Damasonium californicum*	—	Threatened	Damp ground, in vernal pools, on margins of intermittent streams, in sloughs, and on mud flats in marshy places.
Piper's daisy	*Erigeron piperianus*	—	Sensitive	Dry, open places, often with sagebrush.

Common Name	Scientific Name	Federal Status	State Status	Typical Habitat
Oregon coyote-thistle	*Eryngium petiolatum*	—	Threatened	Wet prairies and low ground.
Common blue-cup	*Githopsis specularioides*	—	Sensitive	Open places at lower elevations such as thin soils over bedrock outcrops, talus slopes, and gravelly prairies.
Diffuse stickseed	*Hackelia diffusa var. diffusa*	—	Threatened	Shaded areas, cliffs, talus, wooded flats, and slopes.
Gooseberry-leaved alumroot	*Heuchera grossulariifolia var. tenuifolia*	—	Sensitive	Basalt cliffs and steep slopes where moist.
Nuttall's quillwort	*Isoetes nuttallii*	—	Sensitive	Terrestrial in wet ground or seepages and in mud near vernal pools.
Dwarf rush	*Juncus hemiendytus var. hemiendytus*	—	Threatened	Mud flats, the edge of vernal pools, and moist to wet meadows.
Kellogg's rush	*Juncus kelloggii*	—	Endangered	Sandy to clayey damp soils in a variety of habitats such as vernal pools, seepage areas, and low spots in fields and meadows.
Inch-high rush	*Juncus uncialis*	—	Sensitive	Swales, moist places, and vernal pools; mid elevations.
Smooth goldfields	*Lasthenia glaberrima*	—	Endangered	Wet streambanks and in vernal pools.
Baker's linanthus	*Leptosiphon bolanderi*	—	Sensitive	Dry rocky places, often on open slopes, growing in fine textured mineral soils.
Twayblade	*Liparis loeselii*	—	Endangered	Springs, in bogs, and wet sunny places within Douglas fir-dominated forests.
Awned halfchaff sedge	*Lipocarpha aristulata*	—	Threatened	Wet soil.
Smooth desert-parsley	*Lomatium laevigatum*	—	Threatened	Crevices of the basaltic cliffs of the Columbia River and on adjacent rocky slopes of the sagebrush steppe.
Suksdorf's desert-parsley	*Lomatium suksdorfii*	Species of Concern	Sensitive	Open, moist, or rather dry places, from the valleys and foothills to moderate or high elevations in the mountains.
White meconella	*Meconella oregano*	Species of Concern	Threatened	Open grassland, sometimes within a mosaic of forest/grassland on gradual to almost 100% slopes.
Cusick monkeyflower	*Mimulus cusickii*	—	Threatened	Streambanks and other moist places.
Pulsifer's monkey-flower	*Mimulus pulsiferae*	—	Sensitive	Seasonally moist, open areas, often in exposed mineral soil, from the valleys and foothills to mid-elevations in the mountain.

Common Name	Scientific Name	Federal Status	State Status	Typical Habitat
Suksdorf's monkey-flower	*Mimulus suksdorfii*	—	Sensitive	Open, moist, or rather dry places from the valleys and foothills to moderate or occasionally rather high elevations in the mountains.
Branching montia	*Montia diffusa*	—	Sensitive	Moist forests in the lowland and lower mountain zones.
Mousetail	*Myosurus clavicaulis*	—	Sensitive	Hard, bare, desiccated clay, in sparsely vegetated areas of shallow vernal pools.
Marigold navarretia	*Navarretia tagetina*	—	Threatened	Open, stony, or rocky places where there is standing water or saturated soil in early spring.
Coyote tobacco	*Nicotiana attenuate*	—	Sensitive	Dry, sandy bottom lands, dry rocky washes, and in other dry open places.
Tufted evening-primrose	*Oenothera caespitosa ssp. marginata*	—	Threatened	Road cuts, dry hills, arid and rocky slopes in open and wooded areas, and in desert regions.
Adder's-tongue	*Ophioglossum pusillum*	—	Threatened	Terrestrial in pastures, old fields, roadside ditches, and floodplain woods in seasonally wet, rather acid soil.
Rosy owl-clover	*Orthocarpus bracteosus*	—	Endangered	Moist meadow conditions in the transition zone between wetland and upland.
Western yellow oxalis	*Oxalis suksdorfii*	—	Threatened	Meadows and moist woods and sometimes on dry open slopes.
Barrett's beardtongue	*Penstemon barrettiae*	Threatened	Species of Concern	Crevices along basalt cliff faces, on ledges of rock outcrops, on open talus and occasionally along well-drained roadsides.
Hot-rock penstemon	*Penstemon deustus var. variabilis*	—	Threatened	Dry foothills and lowlands.
Fuzzytongue penstemon	*Penstemon eriantherus var. whitedii*	—	Sensitive	Slopes of small canyons, and in dry and rocky habitats in the foothills of the Cascade Range and in the Columbia Basin; mid elevations.
Wheeler's bluegrass	*Poa nervosa*	—	Sensitive	Rock outcrops, cliff crevices, and occasionally in talus near the base of cliffs or outcrops.
Polygonum parryi	*Parry's knotweed*	—	Threatened	Vernally moist areas in otherwise dry habitats.
Obscure buttercup	*Ranunculus triternatus*	Species of Concern	Endangered	Meadow-steppe habitat.
Persistent sepal yellowcress	*Rorippa columbiae*	Species of Concern	Endangered	Near all types of bodies of water.
Lowland toothcup	*Rotala ramosior*	—	Threatened	Damp areas in fine sand and silt.

Common Name	Scientific Name	Federal Status	State Status	Typical Habitat
Soft-leaved willow	*Salix sessilifolia*	—	Sensitive	Riparian forest, in dredge spoils, and on a silty bank at the upper edge of an intertidal zone.
Scribner-grass	*Scribneria bolanderi*	—	Sensitive	Dry, sandy to rocky soil, sometimes along roadsides.
Oregon white-top aster	*Sericocarpus oregonensis ssp. oregonensis*	—	Threatened	Open woodlands and dry, open, often rocky coniferous forest.
Pale blue-eyed grass	*Sisyrinchium sarmentosum*	Species of Concern	Threatened	Meadows and small openings at mid elevations.
Western ladies-tresses	*Spiranthes porrifolia*	—	Sensitive	Wet meadows, along streams, in bogs, and on seepage slopes.
Flat-leaved bladderwort	*Utricularia intermedia*	—	Sensitive	Shallow ponds, slow-moving streams, and wet sedge or rush meadows.
Siskiyou false-hellebore	*Veratrum insolitum*	—	Threatened	Openings in thickets and mixed-evergreen forest on red clay.
California compassplant	*Wyethia angustifolia*	—	Sensitive	Open, grassy slopes; moist, open hillsides.

Source: WDNR 2010.

Appendix D
WDFW Priority Species that Could Occur in Klickitat County

Appendix D — WDFW Priority Species that Could Occur in Klickitat County

Common Name[1]	*Scientific Name*	Federal Status	State Status	Habitat Association
Amphibians				
Larch Mountain Salamander	*Plethodon larselli*	SOC	S	Steep talus slopes in forested areas, though they have also been found on steep slopes in old-growth forests, under woody debris on the forest floor or in piles of detritus beneath snags.[2]
Northern Leopard Frog	*Rana pipiens*	SOC	E	Inhabits marshes, wet meadows, riparian areas, and moist, and open woods.[2]
Oregon Spotted Frog	*Rana pretiosa*	C	E	Marshes and marshy edges of ponds, streams, and lakes.[2]
Western Toad	*Anaxyrus boreas*	SOC	C	Species is found in a wide variety of habitats ranging from desert springs to mountain wetlands; and it ranges into various upland habitats around ponds, lakes, reservoirs, and slow-moving rivers and streams.[3]
Reptiles				
Pacific Pond Turtle	*Clemmys marmorata*	—	E	Marshes, ponds, sloughs, and small lakes.[2]
California Mountain Kingsnake	*Lampropeltis zonata*	—	C	Occurs along the Columbia River Gorge.[2]
Sharptail Snake	*Contia tenuis*	SOC	C	Moist situations in pastures, meadows, oak woodlands, broken chaparral, and the edges of coniferous or hardwood forests; also shrubby rabbitbrush-sagebrush.[3]
Striped Whipsnake	*Masticophis taeniatus*	—	C	Inhabit relatively undisturbed native grasslands, sagebrush flats, and dry, rocky canyons.[2]
Sagebrush Lizard	*Sceloporus graciosus*	SOC	C	Sagebrush and other types of shrublands, also pinyon-juniper woodland and open pine and Douglas-fir forests.[3]
Birds				
Western grebe	*Aechmophorus occidentalis*	—	C	Marshes, lakes, and bays; in migration and winter also sheltered seacoasts, less frequently along rivers.[3]
Eastern WA breeding concentrations of: Grebes, Cormorants		—	—	Marshes, lakes, and bays.[4]
Eastern WA breeding: Terns		—	—	Marshes, lakes, and bays.[4]

Common Name[1]	*Scientific Name*	Federal Status	State Status	Habitat Association
Black-crowned Night-heron	*Nycticorax nycticorax*	—	—	Marshes, swamps, wooded streams, mangroves, shores of lakes, ponds, lagoons; salt water, brackish, and freshwater situations.[3]
Great Blue Heron	*Ardea herodias*	—	—	Fresh and saltwater wetlands, including seashores, rivers, swamps, marshes, and ditches.[4]
Cavity-nesting ducks: Wood Duck, Barrow's Goldeneye, Common Goldeneye, Bufflehead , and Hooded Merganser		—	—	Nest primarily in late successional forests and riparian areas adjacent to low gradient rivers, sloughs, lakes, and beaver ponds.[4]
Harlequin Duck	*Histrionicus histrionicus*	—	—	Fast-flowing water with loafing sites nearby. Streams usually have substrate that ranges from cobble to boulder, with adjacent vegetated banks.[4]
Bald Eagle	*Haliaeetus leucocephalus*	SOC	S	Breeding territories include upland woodlands and lowland riparian stands with a mature conifer or hardwood component; roosting trees vary.[4]
Ferruginous Hawk	*Buteo regalis*	SOC	T	Obligate grassland or desert-shrub nesters. [4]
Golden Eagle	*Aquila chrysaetos*	—	C	Open, arid plateaus deeply cut by streams and canyons, western shrub steppe and grassland communities and transition zones between shrub, grassland, and forested habitat.[4]
Northern Goshawk	*Accipiter gentilis*	SOC	C	Generally prefer mature or old forest habitat with a high density of large trees.[4]
Peregrine Falcon	*Falco peregrinus*	SOC	S	Nest on cliffs, off-shore islands and ledges on vegetated slopes; winter and fall, forage in areas with large shorebird or waterfowl concentrations.[4]
Prairie Falcon	*Falco mexicanus*	—	—	Inhabit arid environments and nest on cliffs usually associated with native steppe and shrub-steppe habitat.[4]
Chukar	*Alectoris chukar*	—	—	Nonnative species; mesic (moist) and semi-arid portions of shrub-steppe habitat characterized by steep, rocky, dry slopes.[4]
Mountain Quail	*Oreortyx pictus*	—	—	Mixed evergreen-deciduous forests, regenerating clearcuts, forest and meadow edges, chaparral slopes, shrub-steppe, and mixed forest/shrub areas.[4]

Common Name[1]	*Scientific Name*	Federal Status	State Status	Habitat Association
Ring-necked Pheasant	*Phasianus colchicus*	—	—	Nonnative species; permanent retention-type cover to sustain populations and use a variety of agricultural cover types.[4]
Sage Grouse	*Centrocercus urophasianus*	C	T	Sagebrush.[4]
Sooty Grouse	*Dendragapus fuliginosus*	C	T	Open foothills closely associated with streams, springs, and meadows; primarily in mountainous areas wherever open coniferous forests are present.[4]
Wild Turkey	*Meleagris gallopavo*	—	—	Nonnative species; habitat generalists, adapting to a variety of conditions across their range.[4]
Sandhill Crane	*Grus canadensis*	—	E	Large and small tracts of open habitat where visibility is good from all vantage points. Wet meadows, marshes, shallow ponds, hayfields, and grainfields are all favored for nesting, feeding, and roosting.[4]
Eastern WA breeding occurrences of: Phalaropes, Stilts and Avocets		—	—	Open water, marshes, and coastal areas.[4]
Yellow-billed Cuckoo	*Coccyzus americanus*	C	C	Open woodland (especially where undergrowth is thick), parks, deciduous riparian woodland.[3]
Burrowing Owl	*Athene cunicularia*	SOC	C	Open, dry areas in well-drained grasslands, shrub-steppe, prairies and deserts.[4]
Flammulated Owl	*Otus flammeolus*	—	C	Mid-elevation coniferous forests containing mature to old, open canopy yellow pine, ponderosa pine, Jeffrey pine, Douglas fir, and grand fir.[4]
Spotted Owl	*Strix occidentalis*	T	E	Older forested habitats.[5]
Vaux's Swift	*Chaetura vauxi*	—	C	Strongly associated with old-growth forests.[4]
Black-backed Woodpecker	*Picoides arcticus*	—	C	Standing dead lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosa*), western larch (*Larix occidentalis*) and mixed coniferous forests.[4]
Lewis' Woodpecker	*Melanerpes lewis*	—	C	Forested habitat with an open canopy and a shrubby understory, with snags available for nest sites and hawking perches.[4]
Pileated Woodpecker	*Dryocopus pileatus*	—	C	Inhabit mature and old-growth forests, and second-growth forests with large snags and fallen trees.[4]

Common Name[1]	*Scientific Name*	Federal Status	State Status	Habitat Association
White-headed Woodpecker	*Picoides albolarvatus*	—	C	Open-canopied, mature and old-growth ponderosa pine forests.[4]
Loggerhead Shrike	*Lanius ludovicianus*	SOC	C	Open habitat during both breeding and nonbreeding seasons. Grasslands or pastures with short or patchy grasses are usually used for foraging. Scattered trees, shrubs, or hedgerows are most often used for nesting and perching.[4]
Sage Sparrow	*Amphispiza belli*	—	C	Sagebrush-steppe plant communities.[4]
Sage Thrasher	*Oreoscoptes montanus*	—	C	Sagebrush; considered obligates of sagebrush communities.[4]
Mammals				
Preble's Shrew	*Sorex preblei*	SOC	C	Arid and semiarid shrub-grass associations; openings in montane coniferous forests dominated by sagebrush.[3]
Roosting Concentrations of: Big-brown Bat, Myotis bats, Pallid Bat		—	—	Ponderosa pine forest and woodlands, mixed conifer forests, shrub steppe, lowland conifer-hardwood forests, and riparian wetlands. Pallid bats prefer roosting in substrates in or around grasslands and dry shrub or forested habitat near water.[6]
Townsend's Big-eared Bat	*Corynorhinus townsendii*	SOC	C	Ponderosa pine forest and woodlands, mixed conifer forests, shrub steppe, lowland conifer-hardwood forests, and riparian wetlands. Roost in old buildings, caves, barns, and mines.[7]
Black-tailed Jackrabbit	*Lepus californicus*	—	C	Inhabits open plains, fields and deserts; open country with scattered thickets or patches of shrubs.[3]
White-tailed Jackrabbit	*Lepus townsendii*	—	C	Open grasslands and sagebrush plains.[3]
Western Gray Squirrel	*Sciurus griseus*	C	T	Areas where oak woodlands and pine forests converge, particularly near riparian areas. (Linders and Stinson 2007).
Townsend's Ground Squirrel	*Spermophilus townsendii*	SOC	C	Open sagebrush and grass but also includes large patches of sagebrush at the lower edges of forest, as well as pastures and abandoned fields.[3]
Fisher	*Martes pennanti*			Forests with a high percentage of canopy closure, abundant large woody debris, large snags and cavity trees, and understory vegetation near swamps or riparian habitats.[8]
Marten	*Martes americana*	—	—	Dense deciduous, mixed, or (especially) coniferous upland and lowland forest.[3]

Common Name[1]	*Scientific Name*	Federal Status	State Status	Habitat Association
Wolverine	Gulo gulo	SOC	C	Alpine and arctic tundra, boreal and mountain forests (primarily coniferous).[3]
Columbian Black-tailed Deer	*Odocoileus hemionus columbianus*	—	—	Coniferous forests, desert shrub, chaparral, grasslands with shrubs.[3]
Elk	*Cervus elaphus*	—	—	Uses open areas such as alpine pastures, marshy meadows, river flats, and aspen parkland, as well as coniferous forests, brushy clear cuts or forest edges, and semi-desert areas. [3]
Rocky Mountain Mule Deer	*Odocoileus hemionus hemionus*	—	—	Coniferous forests, desert shrub, chaparral, grasslands with shrubs.[3]

Legend:

C=Candidate

E=Endangered

S=Sensitive

SOC=Species of Concern

T=Threatened

Sources:

[1] *WDFW 2008*

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