# Lyle Falls Fish Passage Project

## Draft Environmental Impact Statement

DOE/EIS-0397

March 2008

**Lyle Falls Fish Passage Project**
**Draft Environmental Impact Statement (DOE/EIS-0397)**

**Responsible Agencies:** U.S. Department of Energy, Bonneville Power Administration (BPA); Confederated Tribes and Bands of the Yakama Nation (Yakama Nation); Washington Department of Fish and Wildlife (WDFW); U.S. Department of Agriculture, Forest Service (USFS),

**Title of Proposed Project:** Lyle Falls Fish Passage Project

**State Involved:** Washington (WA)

**Abstract:** BPA proposes to fund modification of the existing Lyle Falls Fishway on the lower Klickitat River in Klickitat County, WA. The proposed project would help BPA meet its off-site mitigation responsibilities for anadromous fish affected by the development of the Federal Columbia River Power System and increase overall fish production in the Columbia Basin. The fishway is owned by WDFW and operated by the Yakama Nation. Lyle Falls prevents some upstream migrating fish from reaching the upper watershed, especially when flows are low, and the existing fishway is inefficient. BPA must decide whether to fund the project; WDFW must decide whether to approve the proposed modifications and issue a Hydraulic Project Approval; and the US Forest Service must decide whether the project is consistent with the National Wild and Scenic Rivers Act.

The underlying need for the project is to improve fish passage to habitat in the upper part of the watershed. The Draft EIS evaluates the potential environmental impacts of two alternatives: No Action alternative and the Proposed Action. These alternatives are described in detail in Chapter 2 of the Draft EIS. In selecting between the alternatives, BPA will consider the following purposes: provide properly functioning year-round adult fish passage; provide facilities to collect biological information to monitor success of fishery management actions; and enhance opportunities for adult salmonids to access and use habitat in the upper Klickitat River.

The proposed project could impact geology and soils, water resources, fisheries, vegetation and wildlife, threatened and endangered species, wetlands and floodplains, cultural resources, air quality, noise, human health, public safety, aesthetics, land use, transportation, recreation, and socioeconomics. Chapter 3 of the EIS describes the Affected Environment and potential impacts in detail.

**Public comments are being accepted through May 12, 2008.**

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For additional copies of this document, please call 1-800-622-4520and ask for this document by name. The Draft EIS is also on the Internet at: http://www.efw.bpa.gov/environmental_services/Document_Library/Lyle Falls/. You may also request copies by writing to:

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# Chapter 1 Purpose of and Need for Action

This chapter summarizes the purpose of and need for action, why the Proposed Action is being considered, and the issues that the public recommended should be included in the analysis of the action. Decisions to be made by key regulatory agencies, including the U.S. Forest Service and Washington Department of Fish and Wildlife, and Bonneville Power Administration are summarized. We also disclose several issues identified by the public that were determined not relevant to this analysis.

## 1.1 Background

The Confederated Tribes and Bands of the Yakama Nation (YN) have requested funding from the Bonneville Power Administration (BPA) to modify the existing Lyle Falls fishway, which is located at Lyle Falls (Lyle Falls), on the lower Klickitat River in Klickitat County, Washington. Lyle Falls, a series of natural cascading waterfalls that have deeply incised the bedrock channel, is located 2.2 miles upstream from the mouth of the Klickitat River, which flows into the Columbia River at Lyle, Washington. The falls historically prevented some upstream migrating fish from reaching most of the Klickitat River watershed, particularly in late summer and early fall when river flows are low. The Lyle Falls fishway is owned by the Washington Department of Fish and Wildlife, but through an August 15, 2006 agreement, operational responsibility was transferred to the YN.

The Washington Department of Fisheries (WDF) constructed the fishway between 1952 and 1955 to provide a fish bypass around the falls and enable upstream passage for all adult anadromous fish under a wide range of flow conditions. However, over the intervening years fishery managers noted that the fishway did not function effectively and, in some cases, was found to impede passage of fish into the upper river. Erosion below the ladder entrance and bedload accumulation at the upstream ladder exit partially obstructs the ability of fish to use the structure. Fish that enter and climb the existing ladder then exit into the swift moving current of the Klickitat River, which causes fallback over Lyle Falls. The existing attraction flow system was installed on the fishway in 1960 in an attempt to effectively attract more fish to the fishway entrance and encourage their safe passage around the falls. Instead of performing as designed, air accumulated in the system, interrupting siphon action and prevented it from delivering reliable attraction flows. As a result, this attraction flow system has not been functioning since the 1960s.

A detailed evaluation by the YN (Harbor Engineering 2004) confirmed that the existing fishway does not function properly, particularly during low flows, and does not comply with federal and state fish passage criteria established by the National Marine Fisheries Service (NMFS) (NMFS 2006a and previous editions) and WDFW (WDFW 2000), respectively. The Klickitat Subbasin Plan (YN et al. 2004) identified Lyle Falls as the major obstacle preventing some species of salmon from reaching upstream spawning areas.

Currently, upstream passage through the ladder is estimated to be available 48 percent of the time by spring Chinook salmon, 14 percent of the time by fall Chinook salmon, 41 percent of the time by steelhead trout, and 31 percent of the time by coho salmon (see Table 3-9 and Section 3.3.2.2). Populations of fall Chinook and coho salmon are especially affected by poor passage conditions during the late summer and fall low-flow periods, which is most likely why they were not historically present in the Klickitat subbasin. Figure 1-1 shows the location of the fishway, and Figures 1-2 and 1-3 show representative photographs of the existing facilities.

## 1.2 Need for the Project

Development of the federal hydropower system in the Columbia River Basin has had far-reaching effects on many species of fish and wildlife. In accordance with the Pacific Northwest Electric Power Planning and Conservation Act, 16 U.S.C. 839 et seq., Section 4(h) (10) (A), BPA is responsible for protecting, mitigating and enhancing fish and wildlife affected by the development, operation, and management of the federal hydroelectric facilities on the Columbia River and its tributaries, from which it markets power. In addition, BPA is responsible for protecting and conserving listed threatened and endangered species under the Endangered Species Act (ESA) of 1973, as amended, 16 U.S.C. 1531 et seq. Finally, BPA must uphold its share of the Federal government's tribal treaty and trust responsibilities to Columbia River Basin Indian tribes, specifically as they pertain to fish and wildlife.

The underlying need for the project is to improve the fish passage facilities at Lyle Falls. Funding improvements would provide additional off-site mitigation for the effects of the Federal Columbia River hydroelectric facilities on fish populations. While the fish passage issues at Lyle Falls were not caused by BPA or the hydroelectric facilities, this project would help BPA meet its mitigation responsibilities and increase overall fish production in the Columbia Basin by enhancing fish passage into the Klickitat subbasin. This is a unique opportunity, as the Klickitat is the largest subbasin in the lower Columbia River with a partial natural passage barrier so close to its mouth. Enhancing passage past the falls may enable greater numbers of anadromous fish to reach habitat suitable for fish production. This would, in turn, reduce the number of Klickitat Hatchery-origin salmonids that stray to other Columbia River subbasins where they are thought to interfere with recovery of listed populations. Fish species most affected by these conditions are fall Chinook and coho salmon, but there would be some benefits to spring Chinook, steelhead, and possibly bull trout as well. Scientific knowledge about Klickitat River fisheries has been limited by the few safe data collection locations.

# 1.3 Purposes (Objectives) of the Project

The following objectives have been identified for the Lyle Falls Fish Passage Project and will be used to evaluate the alternatives addressed in this Environmental Impact Statement (EIS) (see Tables 2-3 and 2-4):

- To provide properly functioning and effective year-round adult fish passage facilities that would be compliant with current state and federal fish passage standards and criteria.

- To provide modern facilities to collect, monitor, and enumerate biological information that could provide a foundation for effectively monitoring success of fishery management actions in the subbasin.

- To enhance opportunities for greater numbers of non-native adult salmonids to access the upper Klickitat River and make use of abundant, available and under-utilized spawning and rearing habitat and provide nutrient enhancement to the watershed.

# 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, in preparing the EIS. The Council on Environmental Quality (CEQ) Regulations for Implementing the National Environmental Policy Act also allow for designation of state and Indian tribes as cooperating agencies where appropriate. As the funding agency, BPA is the lead federal agency for this federal action. The WDFW, YN, and U.S. Forest Service (USFS) ) are cooperating agencies with BPA in the preparation of this environmental analysis. This EIS is intended to fulfill the requirements of NEPA and State of Washington Environmental Policy Act (SEPA) by examining the reasonably foreseeable environmental effects of the proposed action and its alternatives. In addition to the Proposed Action, BPA, along with the cooperating agencies, will objectively explore the No Action Alternative (see Chapter 2). Each of the agencies involved would contribute their respective expertise. The information in the EIS, along with public comments, will be used in the decision making process. Decisions will be documented in one or more Records of Decision (RODs).

## 1.4.1 BPA Decisions

BPA will use the information contained in this EIS, and comments received from the public and other entities, to decide whether to provide federal funding for modifications to the fish ladder as proposed by the YN. BPA's decisions to fund projects such as the Lyle Falls Fish Passage Project are made in the context of a regional process conducted by the Northwest Power and Conservation Council (Council). Under the Northwest

Power Act, the Council, which represents the four Northwest states, develops a Columbia River Basin Fish and Wildlife Program that is intended in part to help guide BPA's fish and wildlife mitigation actions. Beginning in 1996, BPA began enlisting the Council to periodically solicit projects intended to help BPA meet its share of the Fish and Wildlife Program's measures and objectives through an open and public process. The Council conducts a review of project proposals and makes recommendations for BPA to fund selected projects from its annual fish and wildlife program budget. The Council accomplishes its review of the proposals with the assistance of an Independent Scientific Review Panel (ISRP). In March 2006, the Council recommended that BPA fund the preparation of an EIS on fish passage and monitoring at Lyle Falls.

BPA completed a programmatic Fish and Wildlife Implementation Plan EIS (DOE/EIS-0312, April 2003) (BPA 2003) and ROD (October 31, 2003) to guide the implementation and funding of the agency's fish and wildlife mitigation and recovery efforts. On a programmatic level, the Fish and Wildlife Implementation Plan EIS addresses the environmental impacts of projects such as the Lyle Falls Fish Passage Project. This Lyle Falls Fish Passage Project EIS addresses the site-specific environmental impacts of the proposed project and is therefore tiered to the Fish and Wildlife Implementation Plan EIS and ROD.

## 1.4.2 WDFW Decisions

WDFW WDFW owns the fishway and majority of the project site and must approve the proposed modifications. It may choose to adopt this NEPA EIS to satisfy the requirements of the State Environmental Policy Act (SEPA) and use the document as the basis for issuing its Hydraulic Project Approval (see Sections 4.6.1. and 4 6.2). SEPA is similar to NEPA in that it requires Washington state agencies to consider and disclose the environmental effects of actions prior to decisions to fund, approve, or implement them.

## 1.4.3 YN Decisions

YN operates the Lyle Falls fishway and is a co-manager with Washington Department of Fish and Wildlife of the fishery resources in the Klickitat subbasin. Therefore, the YN is included as a cooperating agency due to its fishway expertise, long-term cultural interests in, and familiarity with the project area.

## 1.4.4 USFS) Decisions

The USFS administers portions of the Klickitat River and its corridor under the National Wild and Scenic Rivers Act. USFS would use this document as the basis for determining whether this project would be consistent with Section 7a of this act. The standard for a Section 7a determination for water resources projects within the corridor of a designated river is: "Does the project have direct and adverse effects on the values for which the river was designated?" Under the National Wild and Scenic Rivers Act, no federal agency can fund or assist a project that has direct and adverse effects on the values for which a river has been designated. This Act is discussed further in Section 4.5 and the

effects of the Proposed Action and No Action alternatives on these values are examined in Sections 3.1, 3.2, 3.3 and 3.7.

Information presented in this document also may be used by other federal, tribal, state and local agencies to make decisions on permits, authorizations, and other approvals associated with the Lyle Falls fishway (see Chapter 4 for a detailed discussion).

# 1.5 Scope of this Environmental Analysis

## 1.5.1 History of the Planning and Scoping Process

Scoping is the process that occurs very early during NEPA planning in which parties interested in or affected by the Proposed Action are invited to identify relevant issues and alternatives that 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 June 26, 2006. This notice introduced the Proposed Action, invited public participation, provided contact information, and announced BPA's intent to prepare an EIS. The published notice also invited interested parties to attend a site visit on July 11, 2006 and gain a first-hand understanding of the project. The public was also invited to attend a scoping meeting that was held on the same evening at the Lyle Lions Community Center, in Lyle, Washington. Representatives from the YN provided an overview of the proposed fishway modifications and BPA explained its role in the EIS process. Approximately 20 individuals attended this open forum. The scoping comment period extended from June 26 to July 27, 2006. A BPA web site was established at http://www.efw.bpa.gov/environmental_services/Document_Library/Lyle_Falls/ to inform interested individuals about the proposed fishway modification project and to solicit public assistance during project planning stages. Additionally, information about the project was advertised in the following newspapers on the dates identified:

| Newspaper | Dates of Publication |
|---|---|
| The Goldendale Sentinel | June 29 and July 6, 2006 |
| White Salmon Enterprise | June 29 and July 6, 2006 |
| The Dalles Chronicle | July 2, 2006 |

A 45-day public comment period will follow publication of this Draft EIS. BPA and the cooperating agencies will also solicit comments on the draft at a public meeting planned to be held about three weeks following issuance of this Draft EIS. The public, agency representatives, tribal members, and all other concerned individuals are invited to attend this meeting to further assist BPA and the cooperating agencies with an evaluation of relevant issues and pertinent topics. All parties on the project mailing list will receive notification about the Draft EIS publication and will be given an opportunity to comment on the document. Comments received at the conclusion of the Draft EIS comment period will carefully be considered for incorporation into the Final EIS for this project. The final EIS is tentatively planned for August 2008.

## 1.5.2 Issues Studied in Detail

This EIS will examine the alternatives to and effects of modifying, operating (including the ability to collect and enumerate data), and maintaining the fish ladder, based on best available information. Key issues identified through the scoping process and from an interdisciplinary review of the proposed fishway modifications are highlighted in nine categories below. These issues will be examined in Chapter 3:

- Project effects on water quality and quantity
- Effects of modifications to fish passage in the Klickitat subbasin
- Project effects on threatened, endangered or sensitive wildlife species
- Effects of ladder modifications on local plant communities
- Ladder functionality
- Project effects on the Klickitat River Wild and Scenic River values
- Effects of ladder construction and operation on traditional dip-net fishing and other culturally important sites and uses
- Construction effects on the Klickitat Trail
- Project effects on regional economics

## 1.5.3 Issues Beyond the Scope of this EIS

Several issues provided to BPA in letters, emails, and orally during the June/July 2006 public scoping period are not germane to this analysis and therefore are not addressed extensively. Most of these issues fall under the umbrella of the proposed subbasin master plan. The rationales for not extensively analyzing these issues are presented below.

### 1.5.3.1 Evaluation of the Klickitat Subbasin Anadromous Fishery Master Plan

The Council, through the process described above in Section 1.4, reviewed the draft Klickitat Subbasin Anadromous Fishery Master Plan (Klickitat Master Plan) submitted by the YN in 2003. This Master Plan proposes changes to the overall fisheries management in the Klickitat subbasin, including the recent transfer of the Klickitat Fish Hatchery facilities and management from WDFW to the YN. It included the Lyle Falls fishway modifications being addressed in this EIS, as well as other improvements and new facilities such as the installation of an adult trapping and enumeration facility at Castile Falls, broodstock collection at the Lyle Falls facility for fish production, upgrades to the existing Klickitat Fish Hatchery, and a new hatchery and acclimation facility at Wahkiacus Hatchery. Based on the Council's and ISRP recommendations, the master

plan is currently being revised; however, on March 7, 2006 the Council recommended that BPA proceed with environmental review for proposed improvements to the Lyle Falls and Castile Falls fishways while revisions to the Master Plan are ongoing.

The Castile Falls Fishway is located about 62 miles upstream from Lyle Falls in the upper portion of the Klickitat subbasin. The fishway tunnel was reconstructed in 2003. The new facilities were designed to accommodate the future installation of a fish trapping and enumeration facility. Under a different project proposal than Lyle Falls, BPA was asked to fund the purchase and installation of the fish enumeration facility at Castile Falls in late 2007. Because that action has independent utility and because it provides upriver fish enumeration data that has value with or without the downriver data associated with the proposed improvements to Lyle Falls, the Castile Falls enumeration facility is being addressed separately from this EIS.

Additional facilities and potential broodstock collection at Lyle Falls fishway are being addressed in the revisions to the Master Plan. Therefore, BPA's decisions concerning these activities will be addressed if and when the Master Plan is accepted by the Council and recommended for funding. They will be addressed in a separate NEPA document because the fish monitoring and passage benefits anticipated with the proposed fishway improvements have independent utility from the other elements covered in the Master Plan.

In addition to improving fish passage, the Council recommendation to fund the fishway improvements at Lyle Falls was based on the fisheries managers' need for improved adult enumeration and other data collection activities that would allow them to fulfill their responsibilities to develop watershed and stock assessments for anadromous fish in the Klickitat subbasin. This data would provide a foundation for effectively monitoring success of all future fishery actions in the subbasin. Moreover, the ISRP recommended that this data be gathered and included in the revised Klickitat Master Plan (ISRP 2005). BPA is therefore addressing the proposed improvements of the fish trapping and enumeration facilities in this EIS. The inclusion of these facilities would also enable future broodstock collection for the Klickitat Hatchery and future proposed production programs, as essentially the same facilities could be used for both functions. However, while future Klickitat Hatchery expansions would depend upon the Lyle Falls, the current improvements now proposed at Lyle Falls, including the trapping and data collection facilities, are fully independent of and functional with or without the existing or proposed fish production programs. Therefore, the future Klickitat Hatchery expansions, including broodstock collection at the Lyle Falls fish passage facility, are outside the scope of this EIS. BPA has made no irretrievable commitment to the hatchery expansions or broodstock collection beyond funding feasibility studies. If pursued further, the changes to the fish production program would be analyzed in a separate environmental document.

The Klickitat Subbasin Plan and the Klickitat Master Plan provide the basis for the fish production and harvest goals related to the Lyle Falls Fish Passage Project. The ISRP considered the goals in the Master Plan "optimistic" and expressed concern that they "may not be consistent with the Subbasin Plan" (ISRP 2005). This DEIS uses the fisheries management goals provided in the Master Plan with the understanding that those

are the fisheries managers' goals; they do not represent a BPA mitigation or funding requirement.

### 1.5.3.2 Channelization of the Klickitat River

It was observed that the course of the Klickitat River has been constrained by armoring for the railroad right-of-way on one side and public roads on the other side. It was suggested that this channelization should be repaired to revitalize the floodplain. While the floodplain in the vicinity of the Lyle Falls Fishway is described in Sections 3.6 and 4.4 of this EIS, measures to alter the channel of the Klickitat River are not relevant in this analysis because they do not help meet the stated purposes and need for this EIS. It is beyond the scope of this project to locate channelized or armored reaches and investigate remedial actions that could be implemented.

# Chapter 2 Alternatives

This chapter describes the two potential options, or alternatives, the project location and components. Under the No Action alternative, the existing Lyle Falls fishway would continue to be operated and managed as presently occurs. Under the Proposed Action, fish passage facilities would be modified and each element is described. This chapter also identifies alternatives that were considered, but for various reasons, were determined not to meet the purposes and need for this project. A comparison table of the existing fishway features and proposed features is presented, followed by a summary of the consistency of each alternative with the defined project objectives.

## 2.1 No Action Alternative

The CEQ Regulations for Implementing NEPA requires consideration of a No Action alternative against which the effects of the Proposed Action and other alternatives can be compared. In this EIS, No Action means that the existing fishway (Figure 2-1) and current operational practices would not be changed from the present condition or management practices. WDFW would continue to own and the YN would continue to manage and maintain the facility. The existing ladder would provide the same fish passage capability as it has in the past and current fish sampling procedures would continue. Fish would continue to migrate downstream via the falls and to pass upstream via the existing inefficient ladder and falls. No features would be constructed to improve the ability to enumerate, collect, and monitor fish data, and no new storage building would be constructed. Fishway maintenance would occur at the same level as the present.

The private road to the fishway would remain a rough track. The access easement granted to the YN and WDFW for fishway operation and maintenance would remain in effect. The primary use of this 0.2-mile-long road is by tribal members to get to traditional family fishing sites adjacent to the fishway, and this would be unchanged by the No Action alternative. The gated road, controlled by a tribal allotment holder, is unlocked during fishing periods for ease of access by tribal fishers and for fishway inspections.

The existing fishway would continue to be out of compliance with federal and state fish passage guidelines. The Draft 2006 National Marine Fisheries Service' Anadromous Salmonid Passage Facility Design Guidelines are identified in Table 2-1. Specifically listed are criteria not achieved by the fishway. Among the most serious deficiencies is a fishway that is too steep with poor energy dissipation between weirs, factors limiting passability at higher flows. The current configuration allows gravel and debris to accumulate at the trashracks and inside the ladder, increasing maintenance requirements and decreasing the depth in the ladder and fishway exit, which impairs passage at lower flows.

Currently, adult fish returning to the Klickitat River can only be monitored by physically handling individual fish. Fish are captured by partially dewatering the sorting area, manually crowding them into a small area, netting them, and then sliding them into "blackout tubes" which are PVC pipes wide enough to accept a large salmon with one closed end and perforations for water flow. Fish are kept submerged in a tube while being examined and marked. This enables the identification of fallbacks and estimates of spawning escapement upriver. This procedure occurs daily, except between July and September, when trapping operations are reduced to 3-days per week to reduce the wild steelhead mortality associated with these procedures (Gray 2006).

To encourage fish to use the ladder, a 30-inch-diameter, 142-foot-long steel siphon pipe was added to the fishway in 1960 to provide additional attraction flow to the ladder entrance (Figure 1-3). The steel pipe is mounted on the surface of the fishway and extends to the downstream entrance. During operation of the attraction water pipe, the pipe accumulated air and ceased functioning; therefore, use of the siphon ceased shortly after its installation (Harbor Engineering 2004) and now serves no tangible purpose or function other than as an incidental safety barrier. The siphon pipe does not hinder ladder operation, and would not be removed under the No Action alternative. It would remain a part of the existing fishway.

Under this No Action alternative, periodic river dredging is expected to continue in the vicinity of the fishway exit. This maintenance practice was adopted by WDFW to deepen the area where fish re-enter the river channel. The sediment and rock that accumulate in this reach reduce flow into the ladder and impede fish exiting into the river. Because future hydrologic conditions are expected to be similar to current conditions, the YN likely would continue this practice under the operations and maintenance agreement enacted with WDFW in 2006. Dredging would be conducted by the YN fishway maintenance crews or contractors using a backhoe or excavator. Dredging periodically has removed about 6 to 15 cubic yards of material that is placed on the adjacent west bank of the Klickitat River, where it is thought that high river flows flush it downstream. In the last five years, dredging has been conducted twice (personal communication, J. Zendt, YN Fisheries Biologist, September 2006).

# 2.2 Proposed Action

## 2.2.1 Location of Proposed Project

The Lyle Falls fishway is on the Klickitat River in Klickitat County, Washington near the town of Lyle at T03N, R12E, Section 25 NW ¼ SW ¼ and SW ¼ NW ¼ (Figure 1-1). The site is about 2.2 miles upstream of the confluence of the Klickitat River with the Columbia River (at about River Mile 182). Lyle Falls is about three quarters of a mile outside of the Columbia River Gorge National Scenic Area (CRGNSA) boundary on a reach of the Klickitat River that is within the federally-designated Klickitat Wild and Scenic River corridor. The existing fishway is situated on the west side of the river, where the floodplain forms a relatively flat plain between the steep hillsides. The east river bank rises steeply from the river bed so access is available only from the west side (Figure 1-2). Lyle Falls is the uppermost and steepest drop in an approximately one-mile-long, deeply incised gorge. Numerous drops in the bedrock channel create highly turbulent conditions.

The proposed fishway modifications would include several major components including modifying the upstream water intake, modifying the downstream fish ladder entrance, extending the existing concrete fishway, constructing a new fish exit structure; developing a new attraction flow system, providing a fish enumeration facility and constructing an equipment storage building. The proposed fish passage improvements would facilitate improved passage for spring and fall Chinook salmon, oho salmon, steelhead trout and Pacific lamprey, but the primary benefits would be to fall Chinook and coho salmon.

## 2.2.2 Description of the Proposed Action

The YN has requested funding from BPA to modify the existing Lyle Falls fishway. Currently, the fishway does not comply with federal performance criteria to protect fish, as described in Table 2-1. Modifications would address several major components, as follows: 1) extend the existing concrete fishway approximately 330 feet farther upstream; 2) construct a new fish exit structure and water supply intake at that point; 3) modify the downstream fishway entrance; 4) develop a new attraction flow system; and 5) provide an improved fish enumeration facility by installing a Passive Integrated Transponder (PIT) tag detection station and fish video monitoring device. In addition, a coded-wire tag detection system and an infrared video system may be installed in the enumeration facility. The coded-wire tag detector would allow the automatic identification of tagged hatchery fish, and the infrared video equipment would improve visual identification of fish at night or when visibility is poor.

Currently the fishway occupies 0.3 acre within the Klickitat River floodplain. Implementation of the Proposed Action would increase this to 0.8 acres. Construction would temporarily disturb 0.74 acres, including improvements to the access road. A 0.16-acre area would be permanently altered by placement of excavated rock and soil.

An additional 1.5 acres would be within the exterior perimeter of the construction area but would not be subjected to ground disturbing construction activity. The entire 3.2-acre area is referred to as the "project area." Although the entire ladder facility is within the high flow channel of the Klickitat River, expansion efforts would be undertaken during lowest flows, so only a very limited wetted area would require isolation during the work. Expansion of the fishway would permanently occupy 950 square feet within the Klickitat River. To improve functionality, additional water would be diverted through the ladder to attract fish into the passageway. Currently, from 25 to 300 cubic feet per second (cfs) is withdrawn through the ladder; this amount would be increased to 147 to 600 cfs.

**Table 2-1 Consistency of Existing and Proposed Fishway with Federal Design Criteria**

| Description[1] | | NMFS 2006 Criteria[2] | Existing Fishway | Modified Fishway |
|---|---|---|---|---|
| ENTRANCE FACILITIES | | | | |
| Entrance Weirs (1 slot)[3] | Depth (ft) | >4.0 | <3.0 | 6.3 to 13.5 |
| | Velocity (ft/sec) | 8.0 | <8.0 | 7.3 to 12.0 |
| Entrance Chamber / Pool | Depth (feet) | >6.0 | 3.5 | 7.5 to 13.8 |
| | Velocity (ft/sec) | >1.5 | <1.0 | 2.4 to 1.8 |
| | EDF (ft-lb/s/cf)[4] | <4.0 | >4.0 | 0.6 to 2.1 |
| Auxiliary Water Supply Diffuser | Flow (cfs) | 0 to 110 | N.A. | 0 to 110 |
| | Velocity (ft/sec) | <1.0 | N.A. | <1.0 |
| FISHWAY POOLS | | | | |
| Pools | Length (ft) | >8.0 | >8.0 | 10.0 |
| | Width (ft) | >6.0 | >6.0 | 8.0 |
| | Depth (ft) | >5.0 | <3.5 | 5.0 to 15.5 |
| Pool Drop | Drop (ft) | 1.0 | >1.3 | Max 1.1 |
| EDF[5] Average | EDF (ft-lb/s/cf) | <4.0 | >6 | 4.3 to 5.7 |
| Max. Vertical Weir Velocity | Velocity (ft/sec) | 8.0 | 10 | 7.3 to 7.7 |
| ADULT TRAPPING | | | | |
| Upstream Picket | Head Differential (ft) | 0.2 | N.A. | 0.2 |
| TRANSPORTATION CHANNEL | | | | |
| Channel | Depth (ft) | >5.0 | N.A. | 5.37 to 11.45 |
| | Width (ft) | >4.0 | N.A. | 8.0 |
| | Max Velocity (ft/sec) | 1.5 to 4.0 | N.A. | 0.9 to 1.4[6] |
| FISHWAY EXIT CHANNEL | | | | |
| Depth | Depth (ft) | >5.0 | < 1.0 | 5.2 to 10.3 |
| Trash Rack | Velocity (ft/sec) | <1.5 | >3 | 1.3 to 0.9 |
| | Clear bar spacing (inches) | 10.0 | 6 | 10.0 |
| Juvenile Screens and Auxiliary Water Supply | Screen Size (mm) | 1.75 | N.A. | 1.75 |
| | Velocity (ft/sec) | <0.4 | N.A. | 0.25 to 0.42 |
| Attraction Water vs. River Flow | River Q[7] = 550 cfs (%) | 5.0 to 10.0 minimum | 2.0 | 27.0 |
| | River Q = 2,070 cfs (%) | 5.0 to 10.0 minimum | 2.0 | 9.7 |
| | River Q = 3,000 cfs (%) | 5.0 to 10.0 minimum | 2.5 | 6.7 |

[1] Designed to meet federal criteria at river flows from 550 cfs to 4000 cfs
[2] Source: NMFS (2006a)
[3] There are 3 entrance weirs totaling 8-feet wide. Under the proposed action, 2 would be blocked with stoplogs, leaving a 2'-8" opening.
[4] EDF (ft-lb/s/cf) = Energy dissipation factor (foot-pounds/cubic feet per second)
[5] Maximum pool EDF = 7.4 fps at 4,000 cfs. The existing over-energized fishway cannot be modified sufficiently to achieve these criteria.
[6] Range shown depicts transportation channel containing no bedload material. Under operating conditions with bedload present, velocities would achieve criteria.
[7] Q= Quantity of water for a unit of time
Note: The existing fishway meets high flow exceedance criteria about 60% of the time and meets low flow criteria about 15% of the time when maintenance is optimal. The modified fishway would surpass high and low flow criteria.

Additional features associated with the Proposed Action would be construction of a permanent storage and equipment building, improvement of road access to the ladder, and establishment of a rock disposal site for material removed during fish ladder modifications. Each of these project components is described below followed by an explanation of the likely construction approach and protective measures that would be taken. Operational changes that vary from current ladder functioning are then described. Figure 2-2 shows the location of the ladder and proposed modifications.

### 2.2.2.1 Ladder Modifications

The existing Lyle Falls concrete fish ladder is located on the west (right) bank of the Klickitat River and would be retained but modified at both the upstream and downstream ends. The total length of the new fish passageway would be 475 feet, from the point of water intake at the upstream end to the point where water is delivered back to the Klickitat River at the downstream end. The upstream end of the ladder would be extended 330 feet to where a new water supply intake and fish exit structure would be constructed (see Section 2.2.2.2 and Figure 2-2). A proposed 330-foot-long fish transportation channel would be cast-in-place concrete with a steel grate deck. To provide the desired elevation alignment and to reduce the visual impact, the channel would be built within an approximately 20-foot-deep by 330-foot-long bedrock trench. The 12-foot-deep by 8-foot-wide fishway would be constructed over the top of a new 4-foot-diameter attraction flow pipeline. Because much of the existing ladder is still structurally functional, the new transportation channel would be attached to the upstream end of the existing structure, maximizing use of available components.

At the interface of the new and existing segments of the ladder, a new attraction flow pipeline (see Section 2.2.2.4) would be constructed, following a different but parallel route about 30 feet west of the existing ladder, passing through a new 10-foot by 15-foot flow control structure (Figure 2-2). The water control structure would be fitted with manually operated gates and valves to direct flow downstream for attraction supply (up to 110 cfs) or to direct some water into the fish sorting area of the existing ladder. From the flow control structure, the attraction flow pipeline would extend 158 feet downstream to the fish ladder entrance chamber (see Section 2.2.2.4) (Figure 2-2). Modifications to the downstream ladder entrance are described in Section 2.2.2.3.

Measures to reduce the visual impact of the new facilities, would include placing the fish transportation channel, attraction flow pipeline, and fish exit structure largely below grade. Where facilities must be above grade for functional and maintenance reasons, the concrete would be colored to blend with the surrounding basalt outcrops. Basalt boulders would be anchored along the transportation channel to protect the concrete wall from damage potentially caused by large wood being swept downstream. The galvanized steel grate on the transportation channel, required for its ability to support the weight of vehicles and to withstand seasonal inundation, would be expected to lose its reflective quality after the first season of inundation due to the weathering effect of the water.

### 2.2.2.2 Ladder Fish Exit and Water Supply Intake

The new fish exit at the upstream end of the modified ladder largely would be submerged in a deep natural scour pool where water currents are much slower than at the present fish exit location. The new exit structure would be 13 feet tall from the streambed to the deck. During summer low flows, about 4 to  feet of the structure would be revealed, while during higher flows, only the deck would be visible (Figure 2-3). The new attraction water supply intake would be integrated into this component. The size of the structure shown on Figure 2-2 is necessary to meet the required water intake/fish exit velocity rates of one foot/second. Trashracks across the 25-foot-wide opening would preclude entry of debris and the submerged area adjacent to the trashrack would be armored with large native rock to provide protection during high flow.

### 2.2.2.3 Downstream Fish Ladder Entrance

The new fishway entrance would be designed to improve fish attraction (see Section 2.2.2.4) and meet current fish passage criteria at flows between 550 and 4,000 cfs. This range was selected because it represents flows that historically occur 10 to 90 percent of the time. In this reach of river, flows can range from 450 to 50,000 cfs, levels that reflect extreme low and high flow conditions (see Section 3.2.1.1). Water velocities in the ladder entrance would range from 7.3 to 12.0 feet-per-second under low to high flow conditions, respectively. Modifications would include three new ladder steps, a flow diffusion outlet for the new attraction water supply, and two internal resting pools. Section 2.2.2.4 further describes the attraction water component. The bottom of the entrance would be at elevation 124.00 feet mean sea level (msl), approximately 5 feet below the minimum tailwater elevation of the Klickitat River.

The existing framework of the downstream ladder entrance would be retained, but the area within the entrance pool would be deepened and enlarged, extending further into the west bank (Figure 2-2). The fishway entrance portal would be expanded based on energy dissipation needs, the velocity of water in the ladder steps, and to accommodate the additional attraction flow. An approximately 16-foot long by 36-foot wide and 23-foot deep space would be excavated into the basalt, creating three pools that would accommodate an enlarged entrance pool, a resting pool (where the energy in the water dissipates), and an attraction water stilling basin to improve fish attraction and functionality at river flows between 550 and 4,000 cfs. Attraction water would discharge from a 48-inch-diameter pipeline into the stilling well. Vertical baffles with adjustable vanes and stepped concrete walls would evenly distribute flows into the entrance pool. It is very unlikely that bedload would need to be excavated from the modified entrance pool due to the self-cleaning features of the entrance weir.

### 2.2.2.4 Attraction Flow System

Inadequate auxiliary attraction flow greatly reduces the ladder's functionality and effectiveness because fish are not attracted to the fishway entrance and they have varying abilities to jump the falls when natural river flows during late summer are very low (see Section 3.3.2.2). Because migrating salmon and steelhead instinctively know that they must swim against the dominant current in order to move upstream, and because the dominant current at Lyle Falls is on the bank opposite the ladder entrance, additional water (attraction flow) must be routed through the ladder if fish are to be able to find the entrance quickly. The flow velocity in the existing ladder is insufficient to attract migrating fish from the strong currents on the opposite bank and the attraction flow system does not function.

Under the Proposed Action, attraction flows would be diverted into a 48-inch-diameter pipe at the new upstream ladder fish exit structure to a new stilling chamber adjacent to the downstream ladder entrance pool. This 407-foot-long pipe would continuously carry 110 cfs to supplement flow carried by the ladder. Attraction flows (110 cfs), in combination with flows in the fishway, would range from 5.2 to 26.7 percent of Klickitat River flows under the Proposed Action as shown in Table 2-2. Ladder flows were determined by the elevation of the headwater and tailwater under various conditions. Multiple weir and orifice combinations were hydraulically modeled to maximize ladder flows and to optimize energy dissipation. Table 2-2 illustrates the distribution of flow through the river and ladder under a range of current and modified conditions. The fishway would be hydraulically self-regulating and flow volumes would be controlled manually only under certain management conditions. The volume of attraction flows could be manually adjusted.

**Table 2-2 Existing and Proposed River and Ladder Flows at Lyle Falls**

| Existing | | | Proposed[1] | | |
|---|---|---|---|---|---|
| River (cfs) | Flow Through Ladder (cfs) | Percent of Flow Through Ladder | River (cfs) | Flow Through Ladder (cfs) | Percent of Flow Through Ladder |
| 550 | 25 | 4.5 | 550 | 147 | 26.7 |
| 1,100 | 35 | 3.2 | 1,100 | 169 | 15.4 |
| 2,070 | 45 | 2.2 | 2,070 | 186 | 9.0 |
| 3,000 | N/A[2] | - | 3,000 | 200 | 6.7 |
| 3,500 | 100 | 2.9 | 3,500 | N/A[2] | - |
| 4,000 | N/A[2] | - | 4,000 | 224 | 5.6 |
| 5,000 | 150 | 3.0 | 5,000 | 259 | 5.2 |
| 7,000 | 200 | 2.9 | 7,000 | 600 | 8.6 |
| 10,000[3] | 300 | 3.0 | 10,000 | N/A[2] | - |

[1] Under the proposed operations, the "Flow Through the Ladder" column includes the 110 cfs of attraction flow.
[2] Data not available.
[3] At 10,000 cfs, all fish movement ceases below Lyle Falls because of extreme turbulence and water velocity.
Source: Harbor Engineers Co. 2004 (HEC-RAS model output)

### 2.2.2.5 Fish Monitoring and Enumeration Facility

The existing fish sorting bay within the ladder would be reconstructed to improve fish collection, sampling and monitoring. Currently, biologists monitor a fish trap located inside the ladder beneath secured steel grates. During periods when fish are migrating upstream, the trap is checked daily. Confined fish are measured, weighed, and tag inspected, then released to continue upstream. Under current operations, biologists must reduce flow into the collection area by manually closing off the upstream entrance. Only when two to three feet of water remain in the gated chamber can biologists safely climb down into the fishway to collect or sample. When all fish have been examined, biologists manually open the gates so full flow again enters the ladder and migrating fish can continue their upstream movements.

With the proposed modifications, hands-on monitoring would be greatly reduced, but that which is still performed would be easier and safer, both to fish and the biologists. The existing fish sorting area would be replaced by a new sampling bay that also could be used for future broodstock collection. A new water entrance would be provided from the attraction flow control box (Figure 2-2), enabling biologists to more easily control flows into the fish collection and sorting area. Within the sorting area, a new fish diverter, crowder, brail and sorting platform would be installed. Portable fish sorting facilities would be moved on site when needed and would include an electric pump-operated false weir and Denil fishway, and sorting flumes for selecting individual fish and returning non-selected fish to the river. Biologists then could visually identify fish and shunt them back to the river or to a holding area for additional sampling. This system would cause much less stress to fish than the current methods, and would not require biologists to risk injury by climbing down into the fishway.

A video monitoring system would be mounted in the fish transportation channel enabling fish escapement to be visually tracked, eliminating much of the fish handling that currently is necessary. This new system would passively collect critical biological data, such as fish run timing, size, sex ratio, and identification of natural wild versus hatchery-origin fish returning to the basin. Safe and non-stressful hands-on monitoring capabilities with the proposed systems would permit mark-recapture and radio-tagging experiments to be conducted, facilitating accurate run counts and spawning area identification. In addition, PIT-tag detection equipment would be installed in three weir and orifice walls below the sorting area. This proposed PIT-tag detection system would increase the monitoring capability of fisheries managers in the Klickitat subbasin. PIT-tagged juveniles could be monitored as they outmigrate through the adult ladder and at Bonneville Dam and when they return as adults, information that would allow detailed smolt-to-adult survival comparisons among tagged wild or hatchery groups. One approach to tracking the total escapement would be to capture and mark returning adults in the ladder. Fish ascending Lyle Falls would be unmarked and techniques could be applied that allow estimation of total escapement. To accurately make such estimates, the fish ladder would need to be operational during periods when fish are also migrating via the falls, which does not reliably occur under existing conditions. Each of these proposed systems would also enable biologists to collect statistical data on various experimental hatchery treatments.

Worker safety would be improved by installing safety railings in the enumeration facility. Safety rails would be removable and only installed when fish sorting or handling equipment is deployed.

#### 2.2.2.6 Equipment Building

Fish capture and monitoring gear used by biologists would be stored in an equipment storage building to be constructed upslope of the sorting facilities at the same location as the contractor's construction staging area (Figure 2-2). The building site is at elevation 169 feet, nearly 20 vertical feet above the existing fish ladder, out of the active flood channel. Although unlikely, during an extreme high flow event, water potentially could reach this elevation, so the structure would be designed in accordance with FEMA and county standards for such locations (see Section 4.4). This 24-foot by 40-foot drive-through building with roll-up doors would replace the existing metal storage building that is currently adjacent to the fishway. It would likely be a dark color concrete masonry unit structure with a dark metal roof, and would be set in a cleared area between groves of oak and pine.

Constructing this building on WDFW-owned land would be consistent with the August 15, 2006 Agreement between WDFW and the YN for fishway operation and maintenance. Item (5) of this Agreement authorizes the YN to pursue improvements to the fishway or additional fishway facilities at the same location. Providing a permanent instead of a temporary storage facility appears to be consistent with the intent of this recital.

#### 2.2.2.7 Power Source

An existing overhead power line operated and maintained by Klickitat County Public Utility District extends across the project property on wooden poles, although currently there is no interconnection to the fish ladder (Figure 2-2). A new transformer would be installed on an existing pole in order to provide power to the fish ladder site. Service would be 240 volts and 100 amps, delivered via a 225-foot-long buried line from the power pole to the maintenance building and then extending to the fishway. Approximately 1,010 cubic feet of material would be excavated and backfilled for the 1.5-foot wide by 3-foot deep trench. Power would be used for a variety of functions including internal building lighting, convenience power, sorting equipment and intake screen operation. No exterior lighting would be installed except motion-activated security lighting at the doors of the maintenance building.

#### 2.2.2.8 Access Road Improvements

Road access to the existing ladder would require improvements to accommodate construction vehicles and improve long-term access for maintenance and operation of the fishway. Vehicular access is via a 0.2-mile-long unpaved, primitive road extending from Klickitat County's Fisher Hill Road. The gated road and adjacent land is controlled by a tribal allotment holder. The gate is unlocked during fishing periods for ease of access by tribal fishers. Fishway managers have access as needed under the terms of a use

agreement with the tribal allottee (personal communications, Bill Sharp, YN Fisheries, March 2007). Under the Proposed Action, minor grading would be performed and approximately six inches of crushed rock would be placed over the existing access surface to provide all-weather single-lane access. No additional clearing is expected to be required for the 10- to 12-foot-wide road and no additional surfacing is proposed. It is expected that 200 cubic yards of weed-free rock would be obtained from a nearby commercial supplier of aggregate. Improving the road surface would be the initial step in project construction.

Currently there is no road access to the proposed new fish ladder exit and water supply intake area located on the upstream end of the new fish passage facility. Under the Proposed Action, heavy equipment and delivery vehicles would reach the upstream work area via a temporary haul road (Figure 2-2) during construction. The exposed basalt bedrock terrain would accommodate this temporary road without the need for vegetation clearing and with minimal filling and boulder relocation. It is expected that temporary access to this new fishway exit during construction would be surfaced (where needed) with locally available rock. At the completion of construction, the temporary road would be decommissioned by dispersing materials used to form the graded surface. During project operation and maintenance, the new fishway exit would be reached by driving on the grated fishway deck.

#### 2.2.2.9 Sediment Retention Tanks

Two to three portable settling tanks would be needed during construction to settle sediment from water that may seep into construction work areas before it can safely be released back to the river. Commercially available cylindrical fiberglass mechanical settling tanks would be placed on stable ground near the construction work areas where pumps and hoses would evacuate water from excavated areas. After appropriate retention, settled water would be evacuated from the upper level of the holding tank via a hose leading to the river. The tank locations would be determined by the contractor when infiltration calculations are performed, but are likely to be positioned as shown on Figure 2-2, as close as possible to work areas to limit the amount of pumping. When no longer needed, the rubber-tired portable tanks would be removed from the project area.

#### 2.2.2.10 Project Construction

Because of the short low flow period, construction may be accomplished in a single summer season, but for planning purposes, we evaluate the effects of conducting the work over two seasons, each extending from late-June through October. Most construction would occur out of the river; therefore, it is likely that the instream components could be accomplished within the standard July 1 – August 15 work window. Work outside of this period could expose the construction sites to high flows that typically inundate the ladder site. Limiting instream activities to within the acceptable July 1- August 15 work window would eliminate the need for the contractor to employ extensive site protection measures that would be required were the work period to extend beyond the predictably driest months (see Figure 3-2).

As shown on Figure 2-2, most construction would occur out of the active river channel. The new upstream fishway exit and water supply intake would require installation of a cofferdam during construction to protect the work site and the quality of Klickitat River water. The dewatered work area would be approximately 1,500 square feet. Once it is isolated, less than 300 cubic yards of rock would be excavated for the new fishway exit. Although cofferdam design would be the responsibility of the selected construction contractor, a likely approach would be to form it with 2-cubic yard fabric bags filled with clean sand and stacked 5- to 6-feet high. Plastic sheeting would be placed under and around the sand bags to form a complete water barrier. Submersible pumps would be placed within the isolated work area to evacuate any infiltrating river water to portable settling tanks (see Section 2.2.2.9). All excavated material would be placed in trucks and taken to the spoil disposal site (Figure 2-2) which is approximately 400 feet from the work area.

Other near-stream work areas would be modified without cofferdam protection. The interconnection of the new ladder segment with the existing ladder would be accomplished in the dry by installing stoplogs in the existing structure. Identical steps would isolate the downstream fishway entrance while it is modified. These measures would prevent Klickitat River flows from entering the work areas.

The new upstream fish exit, downstream fishway entrance, water intake, and fish transportation channel largely would be sited in areas where basalt bedrock is exposed. The basalt would be excavated by first line-drilling the excavation margins with 1.5- to 2-inch-diameter holes extending down 10 to 25 feet, depending on the location. Blasting charges would fracture the rock sufficiently for it to be removed by a backhoe. Rock charges would fracture not more than 200 cubic yards of material at one time, generating less than 100 decibels for about 3 milliseconds. Blast sites would be covered with crushed rock or sand to confine the energy within the excavation site. Drilling and blasting for these segments would occur over an approximately 4 week period (drilling 8 hours/day and blasting 1 day/week). Drilling equipment would be powered by a wagon-mounted compressor. This method of excavation would be performed in 30-to 50-foot segments, with about 6 such segments needed for the upstream intake and fish transportation channel.

Similar drilling and blasting techniques would be use to expand the downstream fishway entrance chamber. This work would be performed in the dry by dewatering the fishway and placing water-tight stoplogs at the downstream ladder entrance. No in-water work would be required at this location. Because of the depth of the excavation, this component is expected to require an additional 2 to 3 weeks to drill, blast, and remove approximately 490 cubic yards of basalt. As this material is unearthed, it will be hauled to the near-by disposal area.

All fragmented rock removed from project work areas would be transported by dump truck and placed in a 150-foot by 200-foot disposal area depicted on Figure 2-1. This disposal area would be approximately 200 feet from the Klickitat River at an elevation of about 170 feet msl, out of the active floodway channel. No trees or other significant vegetation would need to be removed as this rock disposal site is primarily composed of

exposed basalt bedrock with pockets of soil that support perennial grasses. Currently the overall project area is undeveloped. The rock disposal site is a topographic depression between the Klickitat Trail and the river's high flow channel and would accommodate the estimated 4,000 cubic yards of excavated rock needed to build the extended fishway.

During modifications of the proposed fish passage facility, it would be necessary to periodically shut down the flow of water through the existing ladder. Intermittent closures would occur for approximately 4 days every 20 days when concrete connections are made with the existing ladder. It is estimated that up to 5 such closures may be required. During these periods, upstream migrating fish would not have access to the ladder. Instead, fish would ascend the falls adjacent to the ladder. Those unable to ascend would experience delayed migration.

From 6 to 10 construction workers typically would be present during ladder modifications. In addition, it is expected that a representative of the YN would be present as a cultural resources monitor. Conventional construction methods would be employed, with cast in place concrete the primary method used to form the new fishway exit, transportation channel and entrance. Trucks would deliver steel, concrete and other materials to the site via the upgraded access road for stockpiling in the designated contractor staging area (Figure 2-2). Only one tree over 12 inches in diameter at breast height (dbh) would be removed for this temporary work site that would be occupied over two construction seasons. Up to 5 trucks per day could be expected during peak construction, delivering materials and supplies. A concrete batch plant in town of Bingen, located about 15 miles away, is an expected source for this material. Other typical construction equipment would include track hoes and dump trucks.

#### 2.2.2.11 Ladder Operations

The proposed ladder would operate more efficiently because of improved hydraulic controls and design. The modifications would meet contemporary fish passage design guidelines established by the NMFS and supported by the State of Washington (Table 2-1). In addition, the proposed fish ladder is designed to reduce annual maintenance currently required to clear debris that collects in the trashrack and within the fishway. Bedload entry into the fishway would be almost completely eliminated by the upstream inlet configuration. Both the water supply intake and the fish transportation channel would be covered with steel bridge deck grating that allows light in the ladder but precludes entry of large debris and predators. The grating would be removable so that personnel could enter to clean the fishway should storm events deposit bedload that would not flush through the structure. Small gravel would continue to enter through the grated decking, but because flow through the ladder would surpass current levels, it is expected that such deposited material would flush through.

# 2.3 Alternatives Considered But Eliminated from Detailed Analysis

Three other fishway improvement options were considered for the project, but were eliminated from detailed analysis because of technical, environmental or economic reasons.

## 2.3.1 New East Bank Fishway

To fully evaluate the fish passage options, an alternative of demolishing the existing fish ladder and constructing a new fish ladder on the east bank of the Klickitat River was considered. Fish are known to favor the east bank of the river as they migrate upstream. This approach was eliminated from detailed consideration because: 1) the restrictive terrain on the left bank would make construction very difficult; 2) State Highway 142 is perched upslope from the possible ladder site, precluding hillside excavation; 3) the terrain is near-vertical and hillside construction would not accommodate access by larger trucks to access the property. This alternative would have greater environmental effects than modifying the existing ladder, such as causing surface erosion, altering undisturbed landscapes and changing visual effects to the National Wild and Scenic River corridor, increasing probability for water quality effects, and modifying fish habitat. Costs to construct a new fish passage facility could be significantly higher than other options due to topographic relief and other logistical challenges. This alternative was therefore dismissed as being technically and environmentally infeasible.

## 2.3.2 Demolish Existing Fishway and Build a New Fishway

Demolishing the existing fish ladder and building an entirely new fish passage facility at the same site or in the same vicinity of the existing facility (right bank of the Klickitat River) was considered. A new structure was evaluated to meet current WDFW and NMFS criteria and provide for safe and effective fish passage, mostly for returning adult fall Chinook and coho. A new ladder could be positioned in the same footprint as the existing ladder to help move fish around the steepest and most challenging part of the Lyle waterfalls. An added consideration was to extend the new fishway to include several of the steepest falls in this reach. This alternative was eliminated from further review because: 1) several traditional Yakama dip net fishing sites would be rendered inaccessible during demolition and construction for a much longer period than would occur under the Proposed Action; 2) there would be much greater disruption in an area of steep cascading waterfalls; 3) it would be logistically much more challenging to extend the fishway downstream to bypass additional falls sections; 4) much more instream construction would create added environmental impacts and safety risks; 5) removal of the existing fishway and design and construction of a new facility in the river and through rock would have significantly higher costs; and 6) many existing fishway components are in good operating condition.

### 2.3.3 Modify the Waterfall

Rather than modifying the existing fishway, physically altering Lyle Falls was considered as a way to improve fish passage. Under this scenario, the cascading waterfalls themselves would be modified, likely through controlled use of explosives to widen and lengthen the falls, thereby creating a less abrupt gradient in the Klickitat River. This could theoretically lead to easier passage of returning adult fish to the Klickitat subbasin. The existing ladder would be demolished in this effort, as additional channel width would be needed. The alternative would extensively modify the natural channel gradient and bathymetry of this reach of the Klickitat River. However, it is speculative whether this modification would yield substantive fish passage improvements. Also, there would be no opportunity for biologists to enumerate, monitor, and collect information that would be valuable to fisheries management in the Klickitat subbasin. Additionally, if broodstock collection becomes a fisheries management objective in the near future, this key lower basin location would no longer be available. Both of these functions are important components in meeting BPA's objective to improve fish passage and fisheries management in the basin. In addition, it is unlikely that the USFS would approve such an action under its National Wild and Scenic Rivers Act Section 7a analysis. Therefore, this alternative was dismissed from further consideration.

## 2.4 Comparison of Alternatives

Table 2-3 compares project features of the No Action and Proposed Action alternatives. Table 2-4 compares the No Action and Proposed Action alternatives to the project purposes identified in Chapter 1. Environmental factors will be compared in Chapter 3.

**Table 2-3 Comparison of Existing Features and Proposed Facilities**

| Project Features | No Action[1] | Proposed Action |
|---|---|---|
| Ladder Entrance | Three-chamber entrance with two functional chambers. Limited attraction flow. Access difficult during low flow conditions. Velocities do not meet current state and federal fisheries criteria; non-compliant with current standards. | Enlarged entrance with three additional ladder steps and resting pools. Increased attraction flow at velocities meeting federal fisheries criteria - compliant with current standards. |
| Transportation Channel | Existing facility is an 80-foot-long ladder with 13 chambers. Fish ascend the ladder steps from the base of Lyle Falls to a point about 200 feet upstream of the falls. Ladder steps do not meet federal design criteria. | A new 330-foot-long channel with vertical slot steps would extend upstream from the existing ladder. The 410-foot ladder would transport fish from the Klickitat River around the Lyle Falls to the new exit in a deep pool of the river. |

| Project Features | No Action[1] | Proposed Action |
|---|---|---|
| Monitoring / Enumeration | Fish enumeration occurs in a sorting bay in the ladder. Monitoring is performed manually. | A new sorting bay within the transportation channel would be fitted with crowder, brail and sorting platform. Video and PIT-tag equipment would monitor escapement. Enumeration would be more efficient and safer for biologists in the new sorting area. |
| Ladder Exit | Fishway exit is 200 feet upstream of Lyle Falls in a section of rapids that cause some fish to fallback below the falls during high flows. During low flows, site is prone to bedload accumulation. It must be excavated periodically to keep the exit clear for fish and to allow adequate flow to enter the ladder. | New exit structure submerged in an existing scour pool to a minimum depth of 8-9 feet (during low flow). It has deep enough water for fish orientation. Fallback is expected to be eliminated as would the need for channel dredging. |
| Attraction Flow System | Siphon system does not function due to air entrainment and was abandoned in the early 1960s. Attraction flow consists only of ladder flow. | New intake and attraction flow pipeline would reliably provide 110 cfs to the ladder entrance to attract fish. Total flows in the ladder and in river are shown in Table 2-2. No siphon system is proposed. |
| Equipment Storage | Storage container (8-ft. by 15-ft box) is without workshop space or electricity, and has limited storage capacity. Positioned on the fishway in summer and moved out of the floodway in winter. | New 24- by 40-foot concrete block building with electric power would be built in an existing clearing above the floodway. Sized to hold fish capture/monitoring gear. |
| Ladder Operations | | |
| Flow | Does not meet current fishway criteria. Ladder flows are between 25 and 300 cfs, with no additional attraction flows. | Would meet state and federal fisheries facility design criteria at river flows between 550 and 4,000 cfs. Ladder flows would range from 147 to 224 cfs at criteria, but could reach as high as 600 cfs during peak flows (including, cont-inuous attraction flows of 110 cfs). |
| Functional Periods | Insufficient ladder flow to attract fish during both low flows and high flows (a function of poor attraction flow in the ladder). | Passage through the ladder would be possible at river flows between 550 and 7,000 cfs. NMFS design criteria would be achieved at flows up to 4,000 cfs. Over 10,000 cfs, ladder would not be ac-cessible. |
| Access Road | Rough, compacted 0.2-mile dirt road. | All-weather crushed rock surface to be placed on existing dirt road. |

[1] The No Action alternative is synonymous with the existing conditions.

**Table 2-4 Predicted Performance Summary**

| Decision Factor/Project Objective[1] | No Action | Proposed Action |
|---|---|---|
| Provide properly functioning and effective year-round adult fish passage, compliant with current fish passage standards and criteria. | Existing ladder does not meet WDFW and NMFS criteria for numerous components (see Table 2-1). | Modified fish ladder would meet state and federal criteria at flows between 550 and 4,000 cfs (Table 2-1). |
| Provide facilities to monitor and enumerate biological data as a foundation for future fishery management in the subbasin. | The existing sampling bay allows hands-on monitoring of upstream migrants with limited data collection capability. | Monitoring would be performed with less handling of fish. PIT-tag detection and video monitoring capabilities would be added. Basin fisheries management would benefit from enhanced data collection capabilities. |
| Enhance opportunities for adult fish to access the upper Klickitat River to use the spawning and rearing habitat available there. | Upstream migration of anadromous fish, either by jumping the falls or using the ladder, is impaired from 17 to 86% of the time, depending on the run. The % of time that passage is estimated to be possible via the falls under current conditions is spring Chinook 83%, fall Chinook 14%, steelhead 63%, coho 46%. | Upstream migration of anadromous fish would be improved. Percent of time that passage is estimated to be possible via the modified ladder would be: spring Chinook 95%, fall Chinook 96%, steelhead 98% and coho 94% of the time. |

1. See Section 1.3.

# Chapter 3 Affected Environment and Environmental Consequences

This chapter describes the existing environmental resources, and the potential consequences (effects) that the Proposed Action and the No Action alternative would have on those resources. The potential effects are based on existing literature, field observation by environmental specialists, information provided by agency and public comments, and ancillary information that was gathered. More specific information on methodology for examining each resource is provided. Mitigation measures are offered that, if implemented, would lessen the potential adverse effects and the effects that would be unavoidable. Finally, this chapter identifies the cumulative effects of the alternatives, followed by discussions of short-term uses and long-term productivity, irreversible and irretrievable commitment of resources, and intentional destructive acts.

## 3.1 Geology and Soils

### 3.1.1 Affected Environment

#### 3.1.1.1 Geology

The geologic history of the Lyle Falls area includes the widespread Columbia River basalt flows (approximately 15 million years ago), more recent volcanic activity and ash from the nearby Mount Adams and Mount St. Helens, and erosion and deposition of sediment by the Klickitat River (WPN and Aspect Consulting 2005). Two geologic units are present and have been mapped in detail in the project area: Wanapum Basalt and boulder alluvium (Walsh et al. 1987 and PacRim Geotechnical 1997). The Wanapum Basalt is part of the Columbia River Basalts and is massive with numerous tightly closed columnar cooling fractures. The basalt is resistant to erosion and forms stable cutbanks even at near vertical angles. Lyle Falls is formed by a very resistant area in the basalt that has withstood erosion by the river. The basalt appears at the surface at the falls, near the existing fish ladder, and at proposed new ladder intake area; it also underlies the boulder alluvium and soils in the rest of the project area.

The boulder alluvium is composed of cobbles to four-foot diameter boulders in a fine sand matrix and includes local sand lenses. This unit includes an upper unconsolidated layer and a lower cemented layer and is more susceptible to erosion in disturbed areas, and is very permeable, so excavations below river level would encounter seepage.

Geology of the Klickitat River Gorge is one of the outstandingly remarkable values which led to its designation as a National Wild and Scenic River.

> "The lower Klickitat River gorge is only a mile long and only 20 to 40 feet deep but narrows to less than eight feet at one location. No other river in the region discharges this amount of water (average daily flow of

> 1,650 cfs, measured at Pitt) through such a narrow gorge, making it a regionally significant resource. In addition, the lower Klickitat River gorge is easily viewed from many locations and has been utilized extensively as a native subsistence fishing site for generations" (USFS 1991).

The combination of geology and flow make the area interesting aesthetically as well as providing a unique site for tribal dip net fishing The existing fishway constructed to bypass the falls includes the downstream intake, fishway, and upstream exit. They are constructed of concrete with a metal grate top and disrupt the geologic aesthetics of the falls area.

### 3.1.1.2 Soils

Three soils have been mapped in the project area, which encompasses 3.6 acres at the site of the Proposed Action (Figure 3-1 and Table 3-1, NRCS 2006). Unit 13C is located on the slopes on the southwestern side of the project area. This unit is a cobbly loam, derived from weathered basalt. It has a severe erosion hazard and is subject to rutting on unsurfaced roads.

Unit 22 is formed from the boulder alluvium, and is sandy loam to very gravelly loamy sand. Erosion hazard is moderate, and it is subject to rutting on unsurfaced roads. The Natural Resource Conservation Service (NRCS) soil survey indicates that cutbanks may cave on deep excavations in Unit 22.

Unit 721 is formed on the Wanapum Basalt. This unit is composed primarily of hard rock outcrops in the project area. The NRCS rates the erosion hazard as severe, but due to the characteristic of the rock in the project area, the erosion hazard would be expected to be low.

**Table 3-1 Soil Types in the Project Area**

| Map unit | Name | Parent material | Description | Erosion hazard on roads and trails | Rutting hazard | Excavation hazard |
|---|---|---|---|---|---|---|
| 13C | Itat cobbly loam, 30 to 45 percent slopes | Weathered basalt | Cobbly loam | Severe | Severe (low strength) | Cutbanks cave |
| 22 | Fluventic Haploxerolls-Riverwash complex, nearly level | River sand/gravel (alluvium) | Sandy loam to very gravelly loamy sand | Moderate | Severe (low strength) | Cutbanks cave |
| 721 | Rock outcrop-Rubble land-Haploxerolls complex, very steep | Fresh basalt | Rock outcrop, rubble | Severe* | Slight | Rocks (hard to excavate) |

* The NRCS rates unit 721 as having a severe erosion hazard, but the basalt rock outcrops in the project area would have a low erosion hazard due to the hard, durable rock.

Source: NRCS 2006

#### 3.1.1.3 Geologically Hazardous Areas

The Klickitat County Critical Areas Ordinance (No. 0012704) has a number of designations for geologically hazardous areas. The proposed fish passage facility area is categorized as an erosion hazard area by Klickitat County definition because it contains slopes in excess of 15 degrees and has soils rated by the NRCS as having a moderate to severe erosion potential. Erosion hazard areas require revegetation and stabilization with native plant materials following disturbance.

## 3.1.2 Environmental Consequences

### 3.1.2.1 No Action Alternative

Under the No Action alternative, no planned construction would take place at or around the fish ladder. Therefore, no construction-generated geologic or soils effects would occur. Short-term soil disturbances would continue to occur periodically upstream of the ladder exit during instream gravel and sediment removal required to keep the ladder exit clear. Under existing conditions, an excavator is used to remove approximately 6 to 15 cubic yards of material from the river. The excavated gravel and sand is placed on the adjacent river bank. Sediment removal occurs on an as-needed basis, usually every year or two, and has occurred twice since 2004 (personal communication, WDFW April 2007).

### 3.1.2.2 Proposed Action Alternative

Areas that would be affected by implementation of this alternative are shown on Figure 3-1.

#### Construction Effects

##### Geology

Extending the fishway to construct a new upstream exit for fish would require excavating an approximately 330-foot-long, 12-foot-wide and up to 20-foot-deep trench in bedrock and boulder alluvium (Figure 2-2). A 60-foot-long by 30-foot-wide by 15-foot-deep excavation into basalt would be required at the upstream end of the fishway for the fish exit and water supply structure. The existing downstream fish entrance pool would be enlarged by excavating a space into the basalt that measures approximately 16A feet long by 36 feet wide and 23 feet deep. A concrete channel and structure would be poured into the fishway extension and upstream exit. The fishway would be topped with a metal grate to provide light, reduce predation, and allow access for cleaning. The concrete structures would change the geologic appearance of the river bank; the fishway extension would look similar to the existing fishway structure, although less evident since it would be recessed into the slope more than the existing fishway. Bank protection needed in the vicinity of the fish transportation channel would use native basalt boulders that would appear similar to the existing basalt boulders along the river banks. These would be

2,000 pounds or larger, rafted together, then secured with concrete grout in order to remain stationary during high flows.

Removal of the basalt would require blasting. Tunneling was considered but rejected due to the increased cost and need for the top of the fishway to be open for light and maintenance. Blasting was selected to loosen the bedrock and excavate an area for the fish ladder extension. The basalt in these areas is fresh, hard, and has tight joints between the columns. Controlled blasting would be required so that the rock outside of the areas to be excavated is not damaged (PacRim Geotechnical 1997). Uncontrolled blasting could open the joints in the surrounding rock, leaving it more susceptible to breaking and toppling during the time the excavation for the fish ladder is open for construction, and requiring the use of rock bolts to provide adequate structural support. The use of careful and controlled blasting should result in minimal disturbance to surrounding rocks.

### Soils

Soils disturbance during construction would include:

- Grading or excavating in the construction area (0.79 acres)
- Compaction, disturbance, and potential rutting of soils underlying access roads (0.26 acres) and staging areas (0.4 acres)
- Removal of approximately 6,000 cubic yards of rock and soil from the fishway extension
- Disturbance and covering of soils in the disposal area (0.16 acres)
- Regrading and adding six inches of crushed rock to the existing access road.

Approximately 1.6 acres would be disturbed by construction, introducing the potential for exposing soil and soil erosion. Disturbance would be caused by excavation, rock deposition, building construction, ground leveling and surface blading, and would continue over two years during the June through October construction season. These are normally dry months, so the potential for surface erosion is expected to be minimal. Soils underlying the site have a low to severe erosion potential (NRCS 2006) and gradients range from 0-5 percent in the staging and disposal areas, and up to 50 percent in portions of the construction area. If no erosion control measures are implemented, erosion would be expected during construction, and would likely result in eroded soils entering the Klickitat River. However, application of appropriate erosion control measures are proposed as part of construction, and would minimize erosion and contain eroded materials so they are not discharged to waterways (see Section 3.2.3).

Construction of the new fish transportation channel would require excavation of a trench, approximately 330 feet long, 12 feet wide, and 8 to 20 feet deep. A second trench for the attraction flow pipeline would parallel the existing fishway (Figure 2-2). It would be 165 feet long by 6 feet deep by 6 feet wide. The excavation would be partially in basalt (approximately 100 feet) and partially in the boulder alluvium (approximately 100 feet).

The boulder alluvium is permeable, and groundwater would flow into these excavated areas and mix with soil and sediment in the excavation. Excavation for these trenches is expected to have 100-600 gallons per minute groundwater seepage for each 50-foot-long trench section in the boulder alluvium. Seepage would only be a concern during the time between excavation and installation of the concrete liner in the boulder alluvium areas. Minimal infiltration of river water is expected in areas dominated by basalt. The excavations would need to be dewatered by pumping the water to portable settling tanks to remove sediment before the water was discharged back to the river. Dewatering and erosion control measures are discussed in Section 3.2.3, Mitigation Measures.

Excavation for the buried power line (Figure 2-2) would disturb soils in a narrow 225 foot-long corridor between an existing power pole, the proposed maintenance building and the fishway. An estimated 37 cubic yards of material would be excavated with a trencher; all material would be replaced after the power cable is laid. It is not expected that water would infiltrate in this upland area.

#### Operational Effects

##### Geology

Operation of the modified Lyle Falls fishway would not affect geologic resources.

##### Soils

Operating the modified fishway would have minor continuing effects on soil resources, including compacting soils under access roads and parking areas as project-related trucks and cars access the site.

Relocation of the fishway water intake to a point upstream where gravel is not expected to accumulate should reduce or eliminate the need for periodic dredging of river gravels. This will have a positive effect on water quality by reducing the need to remove and dispose of river sediment over the long term and restoring instream bedload movement to a more natural state.

## 3.1.3 Mitigation Measures

The following mitigation measures have been incorporated and analyzed in project planning to avoid, minimize or offset potential adverse effects on geology and soil resources:

- Use controlled blasting to minimize disturbance to surrounding rocks during blasting and excavation of the fishway.

  This measure would include the use of drilled pre-splitting holes along the proposed excavation lines. These holes would be either lightly loaded with charge or not loaded at all and would help to contain the energy of blasting to within the area of rock that would be removed for the fishway.

- Prepare and implement a blasting plan.

  The blasting plan would be designed by a qualified contractor and monitored during the blasting and excavation process so that modifications can be made as necessary based on blast performance on site. The design would minimize potential random rock fracturing. This plan would be developed during final design and construction planning.

- Prepare and implement an erosion and sediment control plan.

  Erosion control measures and best construction management practices. This would minimize erosion and transport of eroded material into the Klickitat River at all times when soil is being disturbed and through stabilization of the spoil piles. An erosion and sediment control plan would be designed as part of final engineering plans and would include measures that minimize physical site disturbance by:

  - Containing excavated materials
  - Dewatering the excavated areas
  - Treating water pumped from excavations
  - Stabilizing materials in the spoil disposal area

  Additional appropriate erosion control measures could include the following

  - Place plastic fencing to contain construction activities within designated areas.

  - Install silt fences along the river and around the soil disposal area to contain any eroded materials.

  - Limit the length of fishway being excavated at a given time.

  - Pump water that may flow into the excavations to one of the three self-contained settling tanks to remove sediment.

  - Armor, cover, and/or revegetate the soil disposal pile during and following construction. Revegetation plans are described in further detail in Section 3.4.3.3.

  - Minimize impacts to the aesthetic qualities of the geologic outstandingly remarkable value identified in the NWSRA Act by:

    - Using colored concrete in the exposed areas of the fishway exit that mimics the color of the surrounding rocks.
    - Using native basalt boulders where needed for structural protection.

These measures are described in more detail in Section 3.9.3 (Aesthetics). By implementing these measures during construction, impacts to geology and soils would be reduced to the greatest extent practicable.

# 3.2 Water Resources (Hydrology, Water Rights, Water Quality)

## 3.2.1 Affected Environment

### 3.2.1.1 Hydrology

The major hydrologic feature in the vicinity of the project is the Klickitat River. The overall watershed and hydrology of the Klickitat River are described below, focusing on the reach from the project site to the confluence with the Columbia River.

The Klickitat River is located on the east slope of the Cascade Range in Washington (on the eastern flanks of Mount Adams) and drains approximately 1,350 square miles (WNP and Aspect Consulting 2005). This river is the second longest free flowing river in Washington and in the lower Columbia River sub-region, extending about 96 miles to its confluence with the Columbia River at approximately river mile (RM) 180 (USFS 1991). Bonneville Dam influences Klickitat River hydrology, backing up flow and becoming essentially slack water to approximately RM 1.0 (U.S. Coast Guard undated).

Average annual precipitation in the lower Klickitat River subbasin where the project is located (between Wahkiacus and the Columbia River confluence) is approximately 26 inches, with 75-85 percent of precipitation falling between November and May. A persistent snow pack, typically at its maximum by April 1, contributes runoff to the mainstem Klickitat River until spring and early summer. Glacial melt-water dominates flow from late spring through summer (WNP and Aspect Consulting 2005).

The nearest stream flow gage with a long term period of record is the U.S. Geological Survey (USGS) Klickitat River near Pitt, WA gage (no. 14113000) located at RM 7.0, about 5 miles upstream of the project site. We assume that this gage accurately reflects flows at the Lyle Falls fish ladder site because only a few small named (Dillacot, Wide Sky, and Knight canyons) and unnamed streams flow into the Klickitat River between the gage location and the fish ladder. USGS flow data summarized in Figure 3-2 is derived from the entire period of record (July 1, 1909 to September 6, 2006) for the Klickitat River near Pitt gage.

Low flows in the Klickitat River occur around September, averaging about 700 cfs, and peak flows tend to occur in May (Figure 3-2). The mean annual flow, as measured near Pitt, is approximately 1,578 cfs. Common peak flows in May at this gage site are around 7,840 cfs (estimated 2-year recurrence-interval), but flows average about 2,400 cfs in May. The highest flow on record at the Pitt gage was 40,000 cfs (estimated to be an 87 year recurrence-interval event) on February 8, 1996 (WNP and Aspect

Consulting 2005). The 100-year recurrence-interval flood event is estimated to be approximately 47,200 cfs at the Pitt gage site (Table 3-2).

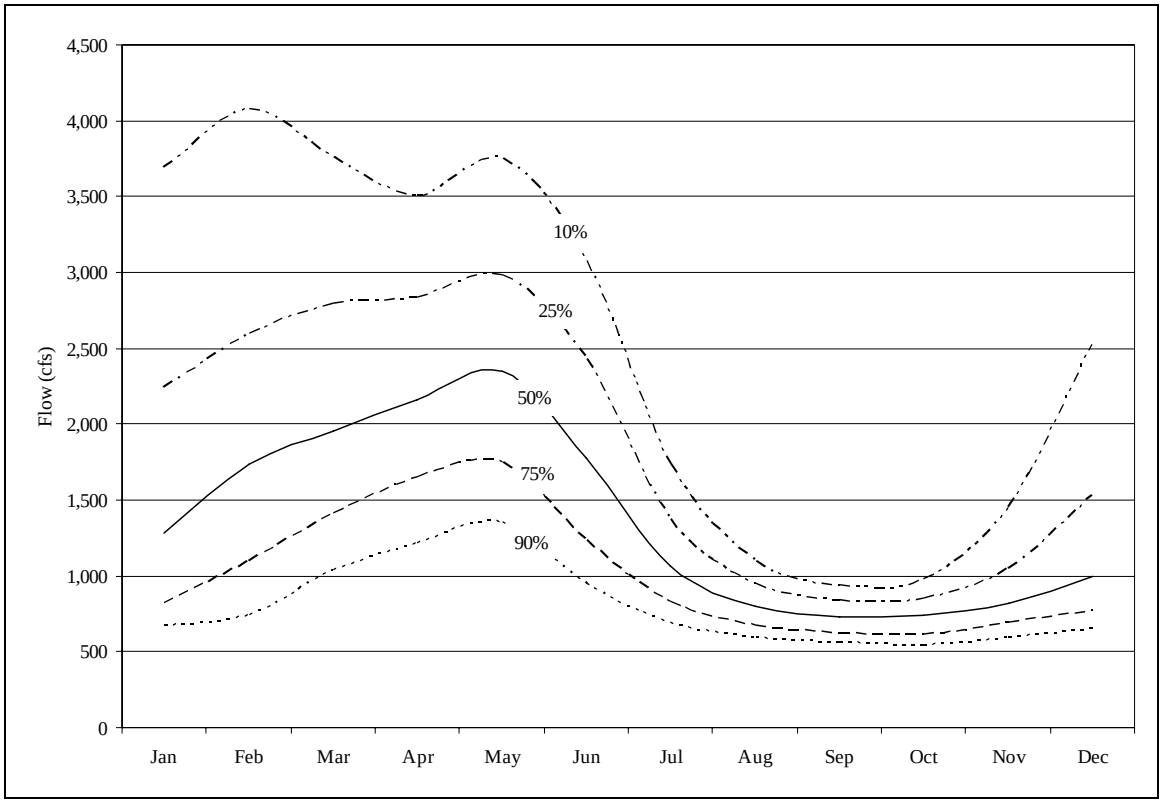



**Figure 3-2 Monthly flow exceedence for the Klickitat River near Pitt (USGS Gage No.14113000) from 7/1/1909 to1/31/1912 and 10/1/1928 to 9/6/2006.**

**Table 3-2 Estimated Peak Discharge at Klickitat River near Pitt (USGS Gage No.14113000) by recurrence interval.**

| Station | No. of peaks in analysis | Flood flow (cfs) for recurrence interval (95 percent confidence interval) | | | | |
|---|---|---|---|---|---|---|
| | | 2 year | 10 year | 25 year | 50 year | 100 year |
| Klickitat R. near Pitt, WA (#14113000) | 71 | 7,840 (6,790-9,040) | 20,500 (17,200-25,400) | 29,700 (24,100-38,500) | 37,800 (30,000-50,700) | 47,200 (36,600-65,300) |

Note: Flood flows at the fish ladder are expected to be somewhat higher than flows at the Klickitat River near Pitt gage due to accretion flow from tributaries.
Source: Sumioka et al. 1997 as cited in WPN & Aspect Consulting 2005

During low summer flows of approximately 550 cfs (approximately 90 percent exceedance level, Figure 3-2) the Lyle Falls fish ladder currently diverts about 25 cfs around the falls, or approximately 4.5 percent of the total river flow (Table 2-2). As river flows increase above 550 cfs, fish ladder flow also increases, although at a lesser percent of total river flow. The fishway ceases to meet federal design criteria at around 4,000 cfs.

At river flows of 10,000 cfs, the current diversion into the fish ladder is approximately 300 cfs, which represents 3.0 percent of total river flow (Table 2-2). At river flows above 10,000 cfs, the ladder becomes completely inundated by the river. A flow of approximately 10,000 cfs represents the 2-year storm, or in other words, has approximately a 50 percent chance of occurring each year (Harbor Engineering Co. 2004).

The Klickitat River transports sediment and wood, both of which are important for fish habitat. Gravel and cobble-sized sediment is carried as bedload. Large wood is transported during peak flow events. Although no site specific data on bedload or large wood transport was found, it is likely that peak discharges with a two-year or higher recurrence interval (Table 3-2) are required to initiate transport. This timing is consistent with WDFW reports of periodic gravel removal from the area in front of the existing fishway exit.

The streambanks in the vicinity of Lyle Falls are composed of bedrock and very old, indurated alluvium. As a result, the river channel position is stable and the river cannot migrate or measurably erode its banks in this reach.

#### 3.2.1.2 Water Rights

The Lyle Falls fish ladder operates under a 250 cfs water right. A water right certificate was issued to the WDFW on August 25, 1952 (certificate number 4802) for operation of the fishway, although the priority date of the right is June 12, 1947. This right continues to be held by the WDFW and is not transferable to the Yakama Nation, the current operators of the fishway (personal communications, Bill Sharp, YN Fisheries, June 2007). The amount of water diverted from the river through the fish ladder varies with Klickitat River flow, as discussed in Section 3.2.1.1. This is a non-consumptive diversion (i.e. all water diverted through the ladder is returned to the river) that extends about 440 feet from the point of water intake to the discharge point in the downstream fish ladder entrance.

#### 3.2.1.3 Water Quality

The Washington Department of Ecology (WDOE) applies water quality standards based on a statewide classification of designated uses. New surface water standards were adopted in 2006 (Chapter 173-201A WAC) by the State of Washington. Because only portions have been approved by the EPA, some sections of the previous standards still apply to federally funded projects requiring Section 401 certifications. At this time, the previous rule still applies to aquatic life, water temperature, dissolved oxygen, turbidity, and total dissolved gas, among other parameters. Under these water quality standards, WDOE classified the lower 19.8 miles of the Klickitat River as Class A (Excellent). Class A waters are expected to support protected uses that include: domestic and other water supply; salmonid and other fish migration, rearing, spawning and harvesting; wildlife habitat; recreation (e.g. swimming, boating, fishing and aesthetic enjoyment); and commerce and navigation. In addition, the lower 10.8 miles of the Klickitat River

are designated as a recreational river under the National Wild and Scenic Rivers Act (see Section 4.5 for more information on the National Wild and Scenic Rivers Act).

Under Section 303(d) of the Clean Water Act, states and tribes are required to develop a list of water quality-limited streams. The law requires that these jurisdictions establish priority rankings for these waterways and develop action plans, called Total Maximum Daily Loads (TMDLs) to improve water quality. There are no 303(d) listed mainstem reaches in the lower Klickitat River as of the 2002/2004 listing (http://www.ecy.wa.gov/programs/wq/ 303d/2002/2002-index.html); however, there is also a lack of current data to assess water quality conditions for this area. WDOE's Ambient Monitoring Program website database contains data from stations at Lyle and Pitt (http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?theyear=&tab=notes&scrolly=0&showhistoric=true&sta=30B070). The Klickitat River at Lyle dataset has only a short period of record (portions of 1993 to 1995, but covering only 24 dates). The WDOE station at Pitt is much more extensive and contains data from almost a 15-year period (1966-1970, 1972-1980) (Table 3-3). The last monitoring occurred at this station more than 25 years ago, thus there is no recent long-term WDOE water quality data available for the Klickitat River near the project site. More recently, water temperature data has been sporadically collected by WDFW and the YN in the vicinity of the fish ladder, which generally agree with WDOE results (see Gray 2005, YN 2006). Available WDOE water quality data is summarized in Table 3-3.

**Table 3-3 Summary of Water Quality Data from the Klickitat River at Lyle and Pitt (combined for select parameters)**

| Parameter | State Standard | Unit | Min. | Mean | Max. | Days Sampled | Years Sampled |
|---|---|---|---|---|---|---|---|
| Fecal Coliform Bacteria | Geometric mean value of <100 colonies/100 ml & <10% of all samples >200 colonies/100 ml | No. of colonies/ 100 ml | 2 | 18 | 150 | 36 | 1976-1977 1993-1995 |
| Dissolved Oxygen | Must exceed 8.0 mg/l | mg/l | 7.0 | 11.8 | 15.2 | 131 | 1967-1970 1972-1974 1976-1980 1993-1995 |
| pH | 6.5 to 8.5; human-caused variation of less than 0.5 units allowed | pH | 6.3 | 7.6 | 8.4 | 179 | 1966-1970 1972-1980 1993-1995 |
| Water Temperature | Not to exceed 18ºC due to human activities; no increases >0.3ºC when natural conditions are >18ºC | ºC | 0.0 | 9.2 | 20.5 | 181 | 1966-1970 1972-1980 1993-1995 |
| Turbidity | Not to exceed 5 NTU increase over background turbidity of <50 NTU, or <10% increase over background turbidity of > 50 NTU | NTU | 0.4 | 8.0 | 170.0 | 98 | 1976-1980 1993-1995 |

Source: http://www.ecy.wa.gov/apps/watersheds/riv/station.asp

Although there are no specific 303(d) listed reaches in the lower Klickitat River, WDOE has identified water quality problems that include stream temperatures, periodic high sediment loads, elevated fecal coliform bacteria, and nutrient loading (WNP and Aspect Consulting 2005). The bacteria have been attributed to non-point pollution sources such as homes, septic systems and cattle grazing (Cusimano 1993). The available WDOE data summarized in Table 3-3 suggests that dissolved oxygen, temperature, pH, and fecal coliform bacteria levels may not meet state standards during portions of the year in the lower Klickitat River. State standards do not set specific turbidity level targets for rivers, but allow only limited increases in turbidity over background river levels as a result of human actions. No studies to determine natural background levels of these parameters have been conducted in the Klickitat River; therefore, WDOE turbidity data cannot be compared to the state standards (WNP and Aspect Consulting 2005). High turbidity within the Klickitat River mainstem during the summer months is caused by active debris flows and glacial outwash from the east slope of Mt. Adams (WNP and Aspect Consulting 2005). Some anthropogenic sources also contribute to sediment in the Klickitat River.

## 3.2.2 Environmental Consequences

### 3.2.2.1 No Action Alternative

Under this alternative, no construction would take place at the fish ladder and therefore, no construction-generated hydrologic or water quality effects would occur. Short-term increases in turbidity would continue to occur on a periodic basis during instream gravel removal at the upstream ladder exit (see Section 3.1.2.1). Under existing conditions, sediment and gravel are dredged from the existing fishway exit vicinity using an excavator. These substrate materials are naturally deposited in this vicinity by high flow events and are excavated periodically (approximately every 1 to 2 years) to ensure that sufficient flow can enter the ladder to render it operational. From 6 to 15 cubic yards of dredged material is deposited on the adjacent west bank upland area. Excavation likely causes a short-term increase in water turbidity of the Klickitat River, although because this activity has not been monitored, there is no data to assess the extent of this effect. In addition, there is some risk that excavating equipment may leak fuel or toxic substance such as oil and grease into the Klickitat River from these operations, although the amount would be relatively minor.

The potential for operational water quality effects due to chemical or toxic substance spills would continue to be negligible under the No Action alternative. The minor hydrologic effect of diverting water through the ladder would continue, with the greatest effect in summer when Klickitat River flow is reduced by approximately 4.5 percent in the bypass reach. Periodic removal of accumulated bedload (gravel/sand) from in front of the existing water intake would remove this sediment from the system. Continued operation would have no effect on water rights or other water-user withdrawals downstream as the project is a non-consumptive use.

### 3.2.2.2 Proposed Action Alternative

#### Construction Effects

##### Hydrology

Improvements to the fish ladder would include instream work in the Klickitat River, affecting approximately 1,500 square feet (say 150 feet by 10 feet) within the wetted river channel during construction. Dewatering this area would be accomplished by constructing a cofferdam (see Section 2.2.2.10) to isolate the work area from the main river channel, then pumping any infiltration to upland settling tanks (Section 2.2.2.9). Treated water would be returned to the river. Placement of the cofferdam and water removal is expected to have a very minor effect on river flow because all work would be accomplished during lowest flow periods. All water directed to the settling tanks would be released to the river, resulting in no net effect on river flow during construction (see Section 2.2.2.9). Construction itself is not expected to affect bedload or large wood transport since the work would take place during the low flow period when transport does not occur.

##### Water Rights

Project construction would have no effect on Klickitat River water rights.

##### Water Quality

Instream and near-stream work has the potential to temporarily degrade water quality by introducing point source toxic substances such as fuel or hydraulic fluid from construction equipment and through turbidity from runoff originating from upland work sites. Construction equipment that may be present is listed in Table 3-18. Construction equipment contains diesel fuel, hydraulic fluid and synthetic motor oil. These potential sources of contamination can be minimized by keeping equipment in best working condition and performing all refueling and maintenance away from the stream and associated riparian areas (see Section 3.2.3). In the rare event that a spill was to occur, the effect would be minimized by containment procedures. A plan for spill prevention and response procedures would be developed as part of the construction permitting for this project, which will have to be approved by several regulatory agencies, including WDOE, WDFW, and the Corps of Engineers. Requirements to monitor water quality during construction also would be specified in such plans.

One instream work area would require a temporary cofferdam. It would be installed to isolate the upstream ladder exit and water supply intake area. Modifications to the downstream portion of the ladder would not require a cofferdam because the worksite can be isolated from the river within the existing structure. It is expected that a portable holding tank would be needed for each of these work areas to settle solids from infiltration water prior to discharging it to the river. The extent that cofferdam placement and removal may contribute to turbidity is unknown, but effects are expected to be limited because of the type of cofferdam proposed (see Section 2.2.2.10). Water that has been filtered in the holding tanks would not be allowed to exceed the state water quality

standards (5 NTU increase over background turbidity of <50 NTU, or <10% increase over background turbidity of > 50 NTU). Because the Klickitat River is naturally turbid in summer due to glacial runoff, exceeding these standards is thought to be unlikely. The likely construction water holding tank sites are shown in Figure 2-2, although the final number, size and location would be determined by the selected contractor. Sites to be excavated and graded would be isolated by installing silt fences or similar devices between the earth work area and the river. Such measures would prevent turbid runoff during storm events and curb erosion caused by construction. In addition, Best Management Practices would be employed to reduce suspended sediment in waters pumped from instream work areas (see Section 3.2.3), ensuring compliance with state water quality standards. Water quality effects are expected only during the construction period. It is not expected that construction would affect instream temperatures.

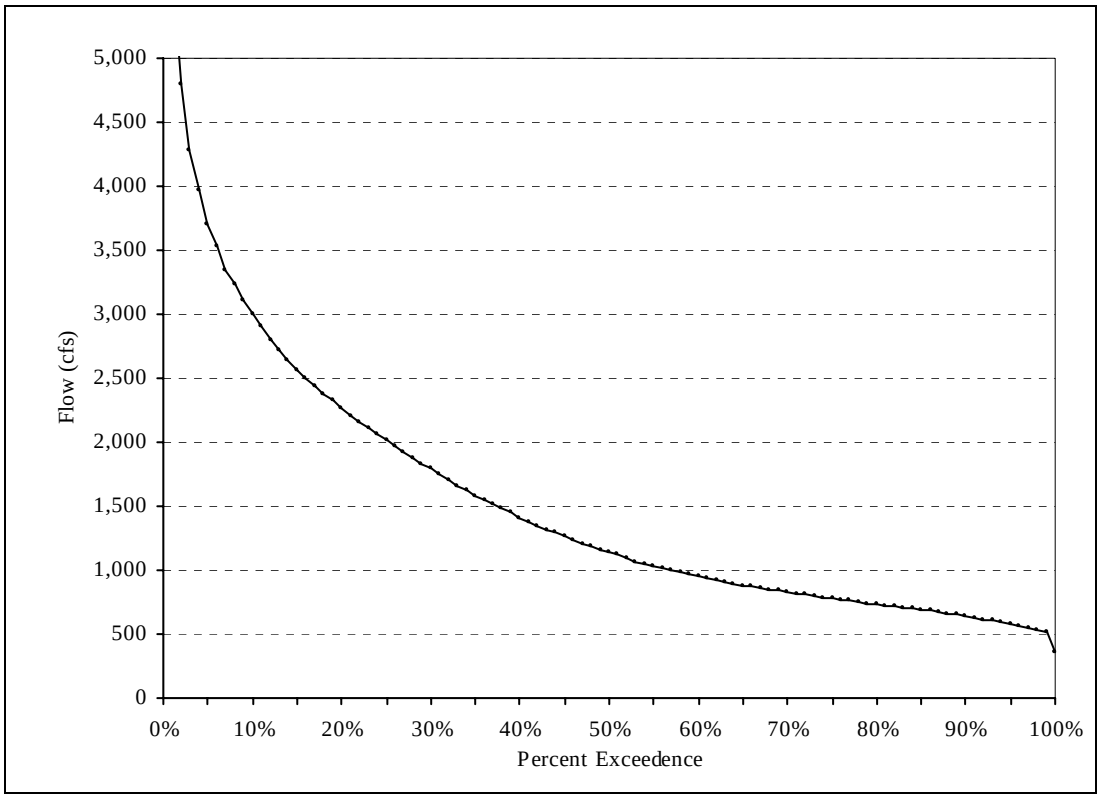
Instream work is expected to require a U.S. Army Corps of Engineers dredge-and-fill permit (Section 404 of the Clean Water Act), a Section 401 water quality certification from WDOE, and a Hydraulic Project Approval from WDFW. Local permits may be required from the County. Preparation and implementation of these plans would largely protect water quality during construction; however, a short-term decrease in water quality through inadvertent releases of sediment or petroleum products to the river still may occur. Construction crews would be trained in rapid spill response procedures. If an incident exceeds their clean-up capabilities, WDOE would be contacted for spill response assistance.

### Operational Effects

#### Hydrology

Water to operate the fish ladder would continue to be diverted from the Klickitat River; however, the diversion amount would be greater than the present in order to increase fish attraction flow at the ladder entrance (Table 2-1). Under current summer low flows, the ladder diverts 25 cfs, or approximately 4.5 percent of the river flow. During the summer under the Proposed Action, 147 cfs, or approximately 26.7 percent of the river flow, would be diverted into the fish ladder (Table 2-1). As river flow increases, fish ladder flow would increase (from the current 300 cfs to up to a proposed maximum of 600 cfs), although it would be a smaller percent of the total flow. The proposed diversion amount includes 110 cfs of attraction flow that would be routed through a pipeline adjacent to the transportation channel into the fishway entrance structure.

As the fish ladder is a non-consumptive use, the overall hydrology of the Klickitat River would be unaffected by the Proposed Action (see flow exceedance curve, Figure 3-3). Flow within this approximately 475-foot reach between the ladder entrance and exit would be reduced under the Proposed Action because of the need to increase fish attraction flow. This reach is termed a "bypass reach" because some river water that flows through the fish ladder bypasses the river before it is returned at the downstream fish ladder entrance, a total distance of about 475 feet. In the affected reach, the project would divert from 15.4 to 26.7 percent of the available flow.




Period of 7/1/09 to 1/31/12 and 10/1/28 to 9/6/06.

**Figure 3-3 Flow Exceedence for the Klickitat River Near Pitt (USGS Gage No. 14113000)**

Operation of the fishway is not expected to alter gravel or large wood transport since this movement normally takes place during peak flows when the relative percent of diverted water is low in comparison to river flows and the ladder is inundated. In addition, the project facilities would be expanded along the bank of the river; there would be no dam or instream structure to trap wood or bedload. The new ladder water supply intake would be positioned to reduce the accumulation of bedload in its vicinity. This should reduce or eliminate the need to periodically remove accumulated sediment from the river and should improve the continuity of bedload transport in the system.

### Water Rights

An additional water right would need to be secured to operate the Lyle Falls fishway at the design flows identified in Table 2-2. The current water right is 250 cfs, while the Proposed Action would direct up to 600 cfs through the ladder. An additional right for 350 cfs would be needed to operate the fishway at design capacity when river flows are 7,000 cfs or less. The YN intends to seek this right (personal communication, Bill Sharp, YN Fisheries Biologist). Although an additional water right would be needed and more flow would be diverted into the ladder, downstream water rights would not be affected because the diversion would be a non-consumptive use (i.e. does not permanently remove water from the river), and there are no other water rights or points of diversion for other water uses within the 475-foot-long bypass reach.

### Water Quality

It is unlikely that operation of the modified fish ladder would degrade Klickitat River water quality. Due to the short length of the diversion reach (about 475 feet), it is unlikely that the quality of water passing through the fish ladder would change compared to ambient conditions. For example, temperatures would be unaffected in such a short reach Water flowing through the fish ladder is shaded from solar radiation (i.e. covered by grating); the concrete channel would be almost entirely below grade; the concrete walls would have similar heat exchange characteristics as bedrock (i.e. specific heat capacity); and water detention would not occur. Another example is the potential for vehicle fuel spills to occur. Vehicles drive on the grated decking of the ladder, so fuel leaks could occur, although to our knowledge this has not occurred during past operations.

Under the Proposed Action, the new ladder water intake would be located in a natural scour hole where annual gravel removal would be unnecessary. Because excavation equipment would not be operated in close proximity to the river, the potential for chemical or toxic substance spills would be reduced. Turbidity events likewise would be reduced by eliminating the need for periodic channel excavation. Therefore, the Proposed Action would reduce the long-term potential to affect Klickitat River water quality.

### Wild and Scenic River Designation

Congress added the lower 10.8-mile segment of the Klickitat River to the National Wild and Scenic Rivers System in 1986 (PL 90-542). This river segment is classified as "Recreational" because it is readily accessible by road or railroad, has some development along its shoreline, and some reaches are channelized and rip-rapped for road and railroad protection. Management of this corridor is designed to conserve the river values that lead to its designation under the Act, and to maintain or enhance the existing character of the river corridor regardless of the classification.

The Lower Klickitat Wild and Scenic Management Plan (USFS 1991) identified the river's hydrology as one of five "outstandingly remarkable" values which must be maintained. Goal 1 of this plan is to "maintain the river's free-flowing character, and Goal 2 is to "maintain a non-degradation policy for water quality". The fish ladder was identified in the management plan with a desired future condition and goal that “improvements to the existing fish passage facility at Lyle Falls may be consistent with the intent of the Act to the extent that these enhance or reduce the potential for negative impacts to river resources” (USFS 1991). This plan also describes a desired future condition in which "existing water rights are not affected by any new river management activity".

As described above (Hydrology), improving functionality of the fishway would require diverting more water than currently occurs. These modifications would improve fish passage into the basin, consistent with USFS Goal 4: “to maintain and enhance resident and anadromous fish habitat and populations” (USFS 1991). Although flows would not

be impounded or delayed, the increased diversion of water may not be consistent with the primary goal of the Act, which is to preserve certain rivers with outstandingly remarkable values in their "free flowing condition". Part of the “free flowing“ definition states that while current diversions are acceptable, future diversions should be discouraged. The Lyle Falls diversion at times would more than double the amount of water bypassing the river and therefore, from an operational perspective, may be viewed as a "new diversion", and may be inconsistent with the intent of the Act. However, this water diversion would be non-consumptive, would affect only a 475-foot reach of the Klickitat River, would be returned to the river at the base of Lyle Falls, and is expected to benefit the fisheries resources (also a goal of the Act) that may mitigate this potential conflict.

Eliminating the need to periodically remove accumulated gravel from the Klickitat River in the immediate vicinity of Lyle Falls would reduce impacts to water quality within the Wild and Scenic reach, and improve consistency with Goal 2 of the management plan. In addition, large wood and sediment transport would not be disrupted. Therefore, as described above, modifying the existing fishway at Lyle Falls appears to be consistent with portions of the water quality objectives of the Lower Klickitat River Wild and Scenic River Management Plan (USFS 1991) (enhancing fish habitat and populations) yet potentially inconsistent with others (maintain the river’s free flowing character) (see also Chapter 4).

### 3.2.3 Mitigation Measures

The following mitigation measures have been incorporated and analyzed in project planning to avoid, minimize or offset potential adverse effects of the project on water resources:

- Implement appropriate best management practices during construction. This would reduce temporary impacts to water quality and hydrology to the greatest extent practicable. These measures would be developed in consultation with permitting agencies such as WDFW, WDOE and the Army Corps of Engineers. The approval of these agencies will be required for construction to begin.

- Follow the dewatering guidelines established by WDOE to ensure that water quality is protected while the cofferdam is placed, removed, and in use. Infiltration water would be pumped to the sediment detention tanks (Figure 2-2) to settle before release to the Klickitat River, minimizing water quality degradation during construction.

- Ensure that chemicals and fuels are not released into the work area. This would be accomplished through proper operation and maintenance of equipment; installation of secondary containment around the generator and equipment fuel tank; and availability of a spill kit for emergency use.

- Ensure that appropriate best management practices are implemented during instream work to eliminate or reduce turbidity to the greatest extent practicable (see Section 3.1.3).

- Ensure that appropriate best management practices are implemented during upland work to eliminate or reduce erosion to the greatest extent practicable (see Section 3.1.3).

- Ensure that the contractor follows all conditions set forth in construction permits to protect water quality (e.g., WDFW's Hydraulic Project Approval; Corps of Engineers' Section 404 permit; and WDOE's Section 401 certification).

# 3.3 Fisheries

Anadromous and resident fisheries in the Klickitat subbasin have been designated as "outstandingly remarkable values" under the National Wild and Scenic Rivers Act. The anadromous fishery was accorded this status because it was considered to be the second "most important" fishery between Bonneville Dam and the Snake River (USFS 1991). It was considered important because of the traditional Native American fishery, high quality river habitat, and a large and diverse run of salmon and steelhead (USFS 1991).

## 3.3.1 Affected Environment

### 3.3.1.1 Fish Populations

The Klickitat River contains a variety of native and introduced fish species. Table 3-4 lists the fish species in the riverine habitats of the basin and their protected status.

**Table 3-4 Fish Species Occurring in the Klickitat River**

| 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 a |
| Westslope cutthroat trout | *Oncorhynchus clarki lewisi* | | | N |
| Coho salmon | *Oncorhynchus kisutch* | | | I |
| Rainbow trout | *Oncorhynchus mykiss* | | | N |
| Middle Columbia River steelhead trout (summer and winter run) | *Oncorhynchus mykiss* | T | C | N |
| Sockeye salmon | *Oncorhynchus nerka* | | | N a, b |
| Fall Chinook salmon | *Oncorhynchus tshawytscha* | | | I |

| Common Name | Scientific Name | Federal Status | State Status | Native (N) or Introduced (I) |
|---|---|---|---|---|
| Spring Chinook salmon | *Oncorhynchus tshawytscha* | | | N |
| Mountain whitefish | *Prosopium wouldiamsoni* | | | N |
| Bull trout | *Salvelinus confluentus* | T | C | 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* | | C | 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 confusus* | | | N |
| Torrent sculpin | *Cottus rhotheus* | | | N |

Sources: J. Zendt, YN Fisheries, pers. comm. 12/19/06; Wydoski and Whitney 2003
T – Federal threatened species
C – Washington State candidate species
a - Occasional occurrence
b-Not native to Klickitat River Basin; only occasional occurrence

## Anadromous Fish

The Klickitat River supports five anadromous stocks including fall and spring Chinook, middle Columbia River steelhead, coho and Pacific lamprey (Table 3-4). 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 Klickitat subbasin should be considered anomalous (personal communication, Bill Sharp, YN Fisheries, June 2007).

The descriptions of the existing anadromous populations that follow are organized similarly, to the extent information was available. The status of the population in the subbasin is described, as is its social and economic importance; population levels, the ratio of natural and hatchery-origin fish; any known management objectives; concluding with life history information (where available).

### Spring Chinook Salmon

The Klickitat subbasin historically supported large runs of native spring Chinook salmon (YN 2004a). According to the 2002 Salmon and Steelhead Stock Inventory (SASSI), this

population is now considered depressed due to chronically low numbers of adults returning to the Klickitat River (WDFW 2002). Spring Chinook are culturally significant to the YN for ceremonial and subsistence purposes. They are also important to recreational and commercial fisheries in the Klickitat and Columbia rivers.

The current Klickitat spring Chinook population is a mixture of native and hatchery origin fish. In the spring, the Klickitat Hatchery releases over 600,000 spring Chinook (YN 2004a). Returning adults are composed of approximately 75 percent hatchery-origin and 25 percent natural-origin fish (YN 2004a). Since 1977, adult fish counts in the lower Klickitat River have averaged 1,900 returning spring Chinook, ranging from 500 to 5,300 fish (YN 2004a). In-river harvest has averaged 800 fish annually, ranging from 100 to nearly 1,800 fish. These fish are caught in the lower river recreational fishery and in the tribal dip net fishery at Lyle Falls. Other returning adults are collected for hatchery broodstock at the Klickitat Hatchery (at RM 42.5), or they spawn naturally in the Klickitat River.

The Yakima-Klickitat Fisheries Program (YKFP) has identified objectives for this population (YN 2004a). The short-term goal is to have from 5,000 to 10,000 adult spring Chinook return to the Klickitat River each year. The long-term goal of the YKFP is to have 20,000 returning adults. With an average of 1,900 returning adults, this goal currently is not achieved.

Adult spring Chinook enter the Klickitat River in May and June (WSCC 1999). The adults hold in the mainstem until mid- to late-August, when spawning begins. They spawn in the mainstem Klickitat 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). Spawning occurs from mid-August to mid-September above the Klickitat Hatchery (RM 42.2) and from mid- to late-September below the hatchery. Juveniles have been documented rearing in the lower reaches of Swale Creek, Little Klickitat River, and Canyon and White creeks (YN 2004a). Out-migration of naturally-produced juvenile spring Chinook is believed to occur from late March through April (WSCC 1999).

### Fall Chinook Salmon

Fall Chinook salmon are not native to the Klickitat River because prior to construction of the Lyle Falls fishway in the 1950s, low flows prevented adult fish passage from late spring through early fall. Fall Chinook were introduced to this basin in 1946 through hatchery releases and this largely hatchery sustained population is classified as healthy by the Salmon and Steelhead Stock Inventory (WDFW 2002). These fish play a significant role in meeting *US v. Oregon* harvest allocation and regional mitigation goals.

This population currently is dominated by hatchery fish from two stocks, Upriver Bright and Tule stock. Tule stocking ceased in 1986, yet a small naturally spawning population averaging 675 adults annually (ranging from 500 to 2000 fish [YN 2004a]) persists in the mainstem Klickitat River between RM 5 and RM 42 (YN 2004a). Broodstock for Upriver Brights is collected at Priest Rapids Hatchery, then eggs are brought to the

Klickitat Hatchery with a goal to release 4.5 million fingerlings into the Klickitat River annually. An average of 14,000 Klickitat fall Chinook subsequently are harvested each year in the combined ocean, Columbia and Klickitat river fisheries (YN 2004a). From 1989 to 2002, from 2,500 to almost 15,000 adult fall Chinook have returned to the lower Klickitat River each year (YN 2004a). A small number of these hatchery-origin fish, averaging 675 adults from 1995 to 1999 (based on redd counts), successfully reached the spawning habitat and reproduced naturally (YN 2004a).

Since they were introduced, fall Chinook have migrated past Lyle Falls from mid-July through November when flows are sufficient. Both Tule and Upriver Bright stocks are reported to spawn in the Klickitat River between RM 5 and RM 42 from late October to mid-December (YN 2004a). Juveniles outmigrate in the spring and early summer.

### Coho Salmon

Coho salmon are not native to the Klickitat subbasin. Prior to construction of the existing Lyle Falls fish ladder, low flow conditions blocked the upstream passage of coho. As a result of hatchery releases that began in the 1950s, a small naturally spawning population has been present. Klickitat coho are classified as depressed by the Salmon and Steelhead Stock Inventory (WDFW 2002) due to chronically low adult returns. These fish have a significant role in meeting *US v. Oregon* harvest allocation and regional mitigation goals.

Coho are sustained in the Klickitat subbasin by hatchery production. Approximately 3.5 million smolts are released annually (YN 2004a). A large percentage of these (up to 2.5 million) are brought in from the Washougal Hatchery and are released at RM 12 and RM 29 of the Klickitat River. The remainder (up to 1 million) are reared and released from the Klickitat Hatchery at RM 42.5. From 1987 to 2002, approximately 100 to 4,000 adult coho have returned to the Klickitat River each year. A naturally spawning population (estimated to be approximately 500 adults, based on redd counts) is established in the mainstem Klickitat from RM 5 to RM 42 and in the lower reaches of several tributaries that include Swale, Canyon, Summit and White creeks and the Little Klickitat River (YN 2004a).

### Steelhead Trout

Summer and winter steelhead trout are native to the Klickitat subbasin and are included within the Middle Columbia River (MCR) steelhead Distinct Population Segment (DPS)[1], which is listed as threatened under the federal Endangered Species Act (ESA). Summer steelhead are also classified as a Washington State Candidate species (http://wdfw.wa.gov/wlm/diversity/soc/candidat.htm). The native Klickitat winter steelhead is one of only two populations of inland winter steelhead in the United States

[1] The NMFS developed a policy on the Definition of Species under the Endangered Species Act (56 FR 58612-58618; November 20, 1991). The policy applies only to species of salmonids native to the Pacific. Under this policy, a stock of Pacific salmon is considered a DPS if it represents an evolutionarily significant unit (ESU) of a biological species. A stock must satisfy two criteria to be considered an ESU: 1) it must be substantially reproductively isolated from other con-specific population units; and 2) it must represent an important component in the evolutionary legacy of the species.

(WDFW 2002). Steelhead are important to recreational and tribal fisheries in the Klickitat and Columbia rivers.

Reliable estimates of the adult steelhead population in the Klickitat River have been difficult to obtain because steelhead spawn primarily in the late winter and spring, both periods of high runoff in this system. Population numbers are extrapolated from redd counts which are difficult to obtain in this river. Steelhead abundance upstream of Lyle Falls was calculated to be about 630 fish between 1987 and 2004 (YN 2004a). Gray (2006) captured and marked steelhead in the Lyle Falls fish ladder. His estimates of summer and winter steelhead abundance above Lyle Falls in 2005-2006 were 2,983 and 3,410 fish respectively, figures thought to be more accurate than early estimates based on redd counts.

A hatchery program supplements the native steelhead population by releasing approximately 100,000 smolts annually. Summer steelhead from the Skamania River are released in the Klickitat at RM 10, 18, 25 and 28 (WDFW 2004). The Yakima-Klickitat Fisheries Program has identified objectives for this population (YN 2004a) that include phasing out Skamania hatchery stock and shifting to the offspring of naturally spawning Klickitat steelhead that would be reared at the Klickitat Hatchery.

The run timing of naturally produced summer steelhead is lengthy, with at least a few adult fish entering the Klickitat every month of the year (personal communication, B. Sharp and C. Frederickson, YN Fisheries, January 2007). Peak upstream passage of summer steelhead adults at Lyle Falls is believed to occur between July and September, tapering off substantially from November to early January. Spawning occurs from about March through early April.

Winter steelhead migrate primarily from November through March or early April, spawning from late March through June (personal communication, B. Sharp and C. Frederickson, YN Fisheries, January 2007). Juveniles of both runs generally outmigrate from early spring through June. Within the Threatened and Endangered Species subchapter, Section 3.5.1.2 includes detailed information on the steelhead DPS status and their distribution, abundance, and life history in the Klickitat River.

### Pacific Lamprey

Pacific lampreys are an important traditional food source for the Yakama Nation and other tribes (YN 2004a). While there has been increasing concern over the declining abundance of this species in the Columbia River Basin, little is known about its current status or distribution in the Klickitat River. Pacific lamprey are known to negotiate Lyle Falls, but they do not use the existing fishway because it does not have rounded corners[2] (personal communication, B. Sharp, YN Fisheries, September 13, 2006). Adults have been observed as far upstream as RM 57 (YN 2004a). The naturally high glacial sediment load in the basin provides good rearing conditions for juveniles.

[2] Lamprey do not jump or swim up waterfalls, but "climb" them by sucking onto rocks and wriggling upwards.

The YKFP goal for this species includes gathering baseline data on the abundance, distribution, limiting factors and carrying capacity of the Klickitat subbasin to develop a self-sustaining lamprey population capable of being harvested (YN 2004a).

## Resident Fish

There are 18 native resident fish species and one introduced species in riverine habitats in the Klickitat subbasin (Table 3-4). 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 on June 10, 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 subbasin, and since 2000, 9 bull trout have been captured and released between the river's mouth and Castile Falls (personal communication, S. Gray, WDFW, March 2007). The most recent confirmed capture of a bull trout in the Klickitat mainstem occurred in 2005 at RM 1.3, just below Lyle Falls. Captured bull trout have ranged from 120 millimeters (mm) to over 600 mm in size. Resident populations within the West Fork drainage have potential to give rise to multiple life history types including migratory fluvial (river-rearing) forms, although little information exists about their population densities or emigration rates within the West Fork drainage (personal communication, Steve Gray, WDFW, March 2007). 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). Section 3.5 provides detailed information on the Columbia River bull trout DPS status and their distribution, abundance, and life history in the Klickitat River.

### Other Resident Species

A naturally reproducing population of rainbow trout is found throughout the Klickitat subbasin. Every June, the YN plants 4,500 catchable triploid[3] 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; Spring, Outlet and Bird creeks; and other small tributaries (YN 2004a and WDFW 2006b).

Resident cutthroat trout were documented in McCreedy and Summit creeks as recently as the 1980s (YN 2004a); however, they have not been observed in these drainages since the late 1990s and may be extirpated. Habitat degradation, hybridization with rainbow trout and competition with brook trout may have contributed to their decline (YN 2004a).

Leopard dace, a Washington state "Candidate" species, may also be present in the lower Klickitat subbasin (personal communication, J. Zendt, YN Fisheries, December 19, 2006). This species was listed by the State of Washington in 1998 due to

[3] "Triploid" fish contain not two but three copies of each gene. Such fish are produced by a form of genetic engineering and are not able to reproduce in nature.

its discontinuous distribution and its unknown status (Wydoski and Whitney 2003). Leopard dace prefer stream habitats with currents less than 1.5 feet per second.

One introduced species, the brook trout, has the potential to damage the endemic fish community (Wydoski and Whitney 2003). Brook trout were introduced into high mountain lakes of the Klickitat subbasin in the 1970s and 1980s (YN 2004a). Natural production currently occurs in the upper Klickitat mainstem and in major tributaries upstream of Big Muddy Fork and the Diamond Fork system (YN 2004a). The presence of brook trout is a management concern in areas where they overlap with bull trout and cutthroat trout because of potential hybridization and competition.

#### 3.3.1.2 Fish Habitat

Major salmonid producing tributaries in the Klickitat subbasin include Swale Creek, Little Klickitat River, Outlet Creek, Big Muddy Creek, West Fork Klickitat River, and the Diamond Fork (WSCC 1999). Salmonid production is limited by natural barriers, numerous road culvert barriers, high water temperatures, high sediment and turbidity, riparian degradation, diminished base flows and decreased habitat diversity.

The lower Klickitat River flows through a bedrock-confined gorge with steep canyon walls reaching heights up to 98 feet in some areas (Brown and Geist 2002). The resistant basalt bedrock creates many impassable or marginally passable falls and cascades that limit access to potential anadromous fish habitat. Access to habitat in many tributaries is also limited by impassably high gradients that are present near the confluences with the mainstem Klickitat River (WSCC 1999). Lack of access to potential habitat due to natural barriers, particularly Lyle and Castile falls, has been identified as a major factor limiting the anadromous salmonid production potential of the Klickitat subbasin (WSCC 1999) (Section 4.6.9.4).

Side channels and meandering stream reaches are naturally limited in the mainstem Klickitat River, much of which is composed of 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 YN 2004a). Habitat in the lower and middle basin tributaries has been severely degraded from intensive logging and road construction, livestock grazing, and water diversions (Sharp 2000 in YN 2004a). These land uses have reduced base flows and riparian cover and increased temperature, sediment, turbidity, bacteria and nutrients.

Several tributaries to the Klickitat are 303(d)-listed as water quality impaired for temperature (WSCC 1999), creating thermal barriers that limit access to anadromous fish, especially steelhead. Elevated stream temperature is attributed to an absence of riparian shade (WSCC 1999).

No flow regulation occurs within the mainstem Klickitat River; however, several tributaries have irrigation and domestic water diversions (WSCC 1999). Portions of some tributaries have insufficient flows to support anadromous and resident fish

populations and are 303(d)-listed as water quality impaired for instream flows (YN 2004a).

Active debris flows and glacial outwash originating from Mount Adams enter the Klickitat River via Big Muddy Creek (RM 53.8) and the West Fork (RM 63.1) via Little Muddy Creek during the summer months. These are the primary source of the high suspended sediment load that has adversely affected natural production for all fish species that spawn in the mainstem Klickitat below the Muddy Creek confluence (YN 2004a). For example, high sediment loads result in decreased egg survival of spring Chinook salmon (YN 2004a). In addition to natural sources, sediment is elevated by logging, logging roads and livestock grazing.

#### 3.3.1.3 Fish Passage

Lyle Falls consists of a series of five waterfalls ranging from 4 to  feet high; the largest is Lyle Falls. When WDFW installed a vertical slot fishway here over 50 years ago (see Section 2.1), their intent was primarily to aid in the introduction of fall Chinook and coho to the Klickitat subbasin. It is thought that these species historically were precluded from establishing a population in the watershed because adults have great difficulty jumping Lyle Falls due to low flow conditions during their upstream migration periods.

The existing fishway has never functioned properly during normal late-summer low flows. Functionality has deteriorated because erosion below the ladder entrance now partially obstructs fish trying to enter the ladder and the auxiliary attraction flow system is non-functional (see Section 2.2.2.4). The ladder exit is located in relatively shallow and swift-flowing water. This location causes fish to hesitate before leaving the ladder and probably causes some level of fallback. YN fisheries staff report recapturing 6 spring Chinook and 15 steelhead that had been marked and released at the existing ladder after sampling (personal communication, J. Zendt, YN Fisheries, June 2007). Furthermore, accumulation of bedload material at the ladder exit (deposited during high flows) reduces water flow through the ladder, which in turn reduces attraction flow during low flow periods. In combination, these conditions result in a facility that does not meet NMFS fish passage facility criteria (see Table 2-1).

Although most spring Chinook and steelhead currently pass Lyle Falls, the same cannot be said for fall Chinook and coho. In many years, very few of the latter species pass above the falls, either by jumping the falls or using the fishway. In 2001, Brown and Geist (2002) found that none of the 35 fall Chinook they radio-tagged and released near the mouth of the Klickitat River were detected above the falls. In addition, local biologists report that fall Chinook and coho are frequently observed “stacking up” and spawning below the falls at times when live fish or redds are scarce above the falls (personal communication, B. Sharp, YN Fisheries, May 2007).

Currently, the majority of salmon and steelhead that make it over the falls do so by jumping the falls instead of swimming through the ladder. Gray (2006) estimated that only 24 percent of hatchery summer steelhead, 4.9 percent of spring Chinook, and less than 1.0 percent of fall Chinook use the ladder to reach habitat above the falls. Thus,

most or all spring Chinook and steelhead reach the upper river by jumping Lyle Falls. The proportion of fall Chinook and coho that pass upstream frequently is quite low, and for fall Chinook, the successful route is almost always by jumping the falls. Lamprey have been observed ascending the falls, but not the ladder (personal communication, B. Sharp, YN Fisheries, September 13, 2006).

Passage conditions in the existing ladder are only suitable within a relatively narrow range of flows (personal communication, John Hutchins, P.E., Harbor Engineering, June 2007). When river flow drops below approximately 900 cfs, flow in the ladder is inadequate for passage, and when river flows exceed approximately 2,000 cfs, passage is precluded by excessive velocity inside the ladder (Table 3-5). Critically low flows are most common in the summer and fall, while critically high flows are most common in the winter and spring.

As demonstrated by the Brown and Geist (2002) study, a salmon or steelhead run can be seriously affected by a passage impediment, even if passage is only delayed or made more strenuous. The reproductive success – the number of smolts produced per spawner – of a population can be depressed if returning adults are forced to negotiate a difficult migratory path, or are significantly delayed in reaching spawning grounds. This is because salmon and steelhead do not eat on their spawning run and therefore must make do with the caloric resources (fat deposits and muscle tissue) they had when they entered fresh water. If the caloric resources of females fall below about 20 percent of their value at freshwater entry before they reach the spawning grounds, they are unlikely to have enough energy to dig redds deep enough to protect their eggs, to prevent other females from spawning on top of their redds and dislodging their eggs, and they may even die before depositing all of their eggs (Idler and Clemens 1959).

Brown and Geist found that Klickitat fall Chinook expended about 35 percent of their caloric reserves by the time these fish reach Lyle Falls, but then expended an additional 47 percent in moving the approximately 8 km from the falls to their spawning grounds. Brown and Geist speculated that the energetic cost of the relatively short final leg of the spawning migration was so high because the mainstem Klickitat is a high gradient, fast flowing river with relatively few deep resting holes. Such an expenditure of energy left the Klickitat fall Chinook with only about 18 percent of their caloric reserves and put them at serious risk of decreased reproductive success or pre-spawning mortality. The caloric status of steelhead and, to a lesser degree spring Chinook, may be similarly precarious by the time they reach their spawning grounds in the Klickitat River and its tributaries, especially because spring Chinook and steelhead spawn farther upstream than fall Chinook.

There is no direct empirical evidence of fish passage at Lyle Falls adversely impacting the reproductive success of spring Chinook and steelhead, but there are theoretical reasons to believe such impacts occur, especially for steelhead. Summer steelhead enter the Klickitat River throughout the year, but primarily from February through October, peaking between July and September (personal communication, C. Frederickson, YN Fisheries, June 2007). Winter steelhead enter the river from November through April, peaking in January and February. As shown in Table 3-6, an analysis of flow and

passage relationships indicates that flows are incompatible with passage (usually too low) about 70 percent of the time from July through January both at the existing fishway and the falls. This corresponds with the time when about 39 percent of steelhead runs pass Lyle Falls (Table 3-7). It is reasonable to assume that some loss of reproductive success may be associated with delaying 39 percent of the steelhead below the falls for 70 percent of the time over 7 months.

The bioenergetic effect of the existing ladder on spring Chinook is likely to be less than the impact on steelhead. Most of the spring Chinook run occurs during the spring and early summer when flows are high and passage is relatively easier. Consequently, only about 17 percent of the fish in the spring Chinook run encounter the ladder when passage is not possible, usually because of excessive flows.

Clearly, coho and fall Chinook are the runs most affected by passage problems at Lyle Falls. The existing fishway and Lyle Falls have been documented to block passage of these two runs in some years and bioenergetic considerations suggest passage delay could lead to pre-spawning mortality for fall Chinook. Passage impacts on other species, such as lamprey and bull trout, are unknown.

#### 3.3.1.4 Harvest

Subsistence fishing by the YN 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 the Klickitat River dip net fishery at Lyle Falls. There are approximately 20 dip net platforms along a one-mile section of the Klickitat River from the Fisher Hill Bridge upstream to Lyle Falls. When fish runs are large, per *U.S. v. Oregon*, the parties negotiate for commercial fishing opportunities. All fishing is prohibited within 25 feet of the Lyle Falls ladder entrance and exit in accordance with YN tribal fishing regulations. Recreational fishing occurs in the lower Klickitat River and in reaches upstream of Lyle Falls.

The tribal harvest season is open weekly Tuesday through Saturday from the second week of April through December 31. The heaviest use occurs in April through May and September through October (personal communication, B. Sharp, YN Fisheries, September 13, 2006). The season may be closed temporarily during June to allow adequate spring Chinook escapement to the Klickitat Hatchery to meet brood stock needs. Dip net fishing is active 24 hours a day when fish are running, tapering off in mid-November as the quality of the fish deteriorates. Tribal harvest management does not distinguish between hatchery- and natural-origin fish.

The spring Chinook tribal fishery occurs from early April through the end of May. In years of low returns, the Yakama Nation may shorten its fishing season by limiting fishing to three instead of five days per week (YN 2004a). The recreational fishery is generally open one to three days per week below the Fisher Hill Bridge (RM 1.8) and may be open between Lyle Falls and the Klickitat Hatchery during years of higher abundance. The in-basin harvest goal for spring Chinook in the combined sport and tribal fishery is 3,000 fish (YN *in press*); however, the total in-river harvest between 1996

and 2005 was 894 fish, or about 30 percent of the goal. In-basin spring Chinook harvest rates average 35-40 percent of the annual returns (YN 2004a). Since 1977, in-basin harvest of spring Chinook has averaged 800 fish each year, ranging from 100 to nearly 1,800 fish. Tribal harvest accounted for 75 percent of these fish (YN 2004a).

The annual in-river harvest goal for Klickitat River steelhead is 1,400 fish in the sport fishery and 1,000 fish in the tribal fishery. Estimated harvest rates since 1986 have averaged 1,146 in the tribal fishery and 1,398 fish in the sport fishery (YN *in press*). Both hatchery-origin and natural-origin fish may be retained in the tribal fishery. The recreational fishery is selective, allowing retention of only marked hatchery-origin steelhead. The treaty and recreational fisheries are closed January through March and December through May, respectively, to protect winter run steelhead.

Fall Chinook salmon released in the Klickitat River provide an important contribution toward the *US v. Oregon* harvest allocation and regional fishery mitigation goals. In recent years, the average annual harvest of Klickitat River fall Chinook across all fisheries (marine, Columbia and Klickitat rivers) has exceeded 19,000. Sport and tribal harvest in the Klickitat takes approximately 3,500 fish annually (YN *in press*). Fall Chinook harvest goals have increased from 14,000 (YN 2004a) to 18,000 fish (YN *in press*) across all fisheries. Although current harvest surpasses these goals, managers are concerned that the harvest rate is still only 35 to 40 percent of the returning fall Chinook, meaning that 60 to 65 percent of returning fish are not being harvested. Poor upstream passage conditions at Lyle Falls limits access to the upper Klickitat River, causing some fish to stray to other basins to spawn. For example, stray Klickitat fall Chinook have been documented in the Little White Salmon River, which concerns managers because this habitat supports an ESA-listed population of fall Chinook (personal communication, Bill Sharp, YN Fisheries, October 2007).

Coho salmon released from the Klickitat River also contribute substantially to the *US v. Oregon* harvest allocation and regional fishery mitigation goals. The harvest goal for these fish is 14,000 across all fisheries (YN 2004a), while actual harvest rates from 1987 to 2005 have averaged 15,700 coho (YN *in press*). The YN estimates that since 1987, 95 percent of the returning coho have been harvested, with almost 84 percent caught in the Klickitat subbasin. While of lesser concern than with fall Chinook, to preserve the fitness of a population, the maximum proportion of hatchery strays in a natural population should not exceed 5 percent (HSRG 2004). If even a few hundred Klickitat coho are straying into other subbasins, recovery of small natural coho populations in the lower Columbia Evolutionarily Significant Unit (ESU) could be affected.

## 3.3.2 Environmental Consequences

### 3.3.2.1 No Action Alternative

Under this alternative, the Lyle Falls fishway would continue to function and operate as it currently does. Passage of fall Chinook and coho at the existing facility would continue to be impaired by the 1) non-functional vertical slot at the entrance, 2) inadequate

attraction water and non-functional auxiliary water supply system, 3) location of entrance in turbulent water, 4) location of fishway exit in swift water, causing fallback, 5) upstream trashrack that accumulates debris, 6) river shoaling conditions at the fishway exit that limit water depth and fishway flow, and 7) accumulation of bedload during high flows within the fish ladder. For these reasons, compliance with federal fish passage criteria (see Table 2-1) would not be achieved under the No Action alternative.

Poor passage at the existing structure would continue to depress the reproductive success of those runs that migrate through the summer and early to mid-winter, affecting primarily fall Chinook, coho and about 33 percent [4] of summer steelhead. Increased delay at the fishway due to poor passage conditions, lack of attraction flow and higher rates of fallback would continue to deplete the limited energy reserves of the returning adults, reducing the reproductive success, fitness and productivity of affected individuals. Stocks and individuals that arrive at the falls during periods of low flow would continue to be the most severely affected (see Section 3.3.2.2, Operations, for more detailed analysis of this effect). In order to spawn, some of these hatchery fish would continue to stray into other river systems, negatively affecting natural populations of ESA-listed fish.

Under the No Action alternative, population monitoring would continue to be difficult and relatively imprecise. Due to the lack of reliable monitoring data, WDFW (2002) declared that it is not possible to determine abundance trends for summer steelhead, winter steelhead, or coho in the subbasin. Lack of accurate abundance estimates can lead to poor management decisions, such as inadvertent over-harvest. Under the No Action alternative, the productivity of Klickitat salmon and steelhead could be depressed because of compromised reproductive success and over-harvesting due to poor or lacking data upon which to base harvest levels. To the extent that productivity is depressed, the abundance of salmon and steelhead also would be depressed. This nutrient deficiency has been identified in the Klickitat Subbasin Plan as one of the major limiting factors for all anadromous salmonids in the subbasin.

Under the No Action alternative, some degree of reproductive impairment associated with difficulties and delays in passing the falls would continue to affect both races of steelhead as well as fall Chinook, coho and possibly Pacific lamprey and bull trout.

Under current conditions, natural selection would continue to favor the development of larger and/or “more athletic” fish, and/or more “bioenergetically efficient” fish. Such individuals would be more likely to clear the falls without a fishway and may have sufficient energetic reserves to reach the spawning grounds in good condition. On the other hand, fewer fish would be able to spawn (likely only the larger or more athletic fish), and their reproductive success might be reduced such that the number of recruits per spawner (the productivity) would be less than with improved passage.

[4] Because Klickitat steelhead return throughout the year, a sizeable portion of the run occurs in months when passage conditions at the falls and existing ladder are the best. The proportion of the entire run affected by impaired passage conditions is estimated as 33.4%. This estimate was derived by adding the product of the proportion of steelhead returning monthly and the proportion of time that flows are too low or too high to pass steelhead.

Harvest opportunities would continue at current levels, varying with salmon and steelhead returns. Taking no action would continue to allow the annual accumulation of bed load at the upstream ladder exit during high flows. In-channel excavation of the accumulated material would continue to occur periodically, although this activity likely has a negligible effect on Klickitat fish population productivity due to the relatively small affected area and volume of material removed (6 to 15 cubic yards).

Taking no action would be inconsistent with fishery management goals for the Klickitat subbasin, including the following:

- Achieving harvest goals for fall Chinook and coho identified in the Klickitat River Subbasin Plan (YN et al. 2004) and the Klickitat Subbasin Anadromous Fishery Master Plan (YN 2004a).

- Improving monitoring and evaluation of salmon stocks identified in the Subbasin Recovery Plan for the Middle Columbia River Steelhead ESU (NMFS 2006b) and in the Klickitat Subbasin Anadromous Fishery Master Plan (YN 2004a).

- Moving towards the population recovery objectives defined in the Klickitat River Subbasin Plan (YN et al. 2004) and the Klickitat Subbasin Supplement (YN 2004b).

- Improving fish passage, identified as one of the five key limiting factors in the Klickitat Limiting Factors Analysis (WSCC 1999) (Section 4.6.9.4) and as a key limiting factor in the Klickitat Lead Entity Salmon Recovery Strategy (Section 4.6.9.5).

#### 3.3.2.2 Proposed Action Alternative

The Lyle Falls fishway would be modified to provide passage for all salmonids throughout the year, with the primary benefit occurring during low flows in the summer, fall and early winter. The proposed improvements are described in Chapter 2 and listed in Table 2-3. The effect of these modifications on fish populations, habitat and harvest are described in this section, first by describing construction-related impacts and then by describing the impacts of operating the modified fish ladder. In summary, consistency with federal fish passage criteria (NMFS 2006a) would be achieved by modifying the following:

- Entrance chamber depth and velocity

- Ladder pool depth and velocity

- Fishway exit depth, velocity and trashrack bar spacing

- Ratio of attraction flow to river flows.

Adopting the Proposed Action alternative would contribute to achieving fishery management goals for the Klickitat subbasin, including the following:

- Harvest goals for fall Chinook and coho identified in the Klickitat River Subbasin Plan (YN et al. 2004), the Klickitat Subbasin Anadromous Fishery Master Plan (YN 2004a), and the Klickitat Lead Entity Salmon Recovery Strategy (Section 4.6.9.5). Improved passage is expected to increase the abundance of fish produced in the watershed and subsequently the number of harvestable adults.

- Monitoring and evaluation of salmon stocks identified in the Subbasin Recovery Plan for the Middle Columbia River Steelhead ESU (NMFS 2006b) and in the Klickitat Subbasin Anadromous Fishery Master Plan (YN 2004a). Improved population information would lead to better stock management decisions.

- Population recovery and productivity objectives defined in the Klickitat River Subbasin Plan (YN et al. 2004) and the Klickitat Subbasin Supplement (YN 2004b), including salmon carcass abundance goals. Monitoring and facilitating access into the subbasin would enable managers to better estimate the percentage of hatchery vs. natural origin salmonids on the spawning grounds and for use as hatchery broodstock.

- Fish passage improvements would target one of the five key limiting factors identified in the Klickitat Limiting Factors Analysis (WSCC 1999) (Section 4.6.9.4) and would achieve an objective of the Klickitat Lead Entity Salmon Recovery Strategy (Section 4.6.9.5). Improved passage is a specific objective for each of these plans, leading to healthier levels of the targeted fish populations.

### Construction Effects

Most of the proposed construction would occur out of the active river channel. Instream work would be required only at the upstream ladder exit (Section 2.2.2.2) and would be carried out during the in-water work window (July 1 to August 15). This component is expected to be complete in a single season, but other project components would require a second construction season as explained in Section 2.2.2.10. Active construction is expected to extend from June through October.

Typical effects of instream construction can include temporary increases in sediment-laden runoff with attendant effects on downstream fish habitat, and the introduction of pollutants from operating heavy equipment in stream courses. However, these effects would be avoided or reduced by implementing measures identified in Section 3.2.3 (Water Resources), and would likely have a negligible effect on individual fish and fish habitat in the lower Klickitat River.

Construction of the new ladder exit, water intake and fish transportation channel would require the drilling, blasting and removal of basalt bedrock (see Section 2.2.2.10). Fish present adjacent to work areas would be temporarily displaced and could be harmed by acoustical impacts. Data from explosive blast studies indicate that very fast, high-level acoustic exposures (common from overpressure events) can cause physical damage or

mortally wound fish (personal communication, J. Volk, Jones and Stokes, August 24, 2007). Such effects are not well documented and the number of species tested is very limited. It is likely that the lower sound levels associated with underground blasting at Lyle Falls would be less potentially damaging, but there is insufficient research to predict actual effects. There is potential to have a significant effect on fish holding in areas adjacent to below-grade blasting.

Intermittent closures of the existing ladder would be necessary for approximately 4 days every 20 days when concrete connections are made with the existing ladder. It is estimated that up to 5 such closures may occur, each within the WDFW-approved in-water work window. The typical in-water work period (July 1 to August 15) coincides with the peak of the adult summer steelhead migration (July to October), therefore the passage of summer steelhead would be delayed to some degree because of construction disturbances and the closure of the ladder. The extent of this effect attributable to an inoperable fish ladder is reduced because 76 percent of steelhead currently pass upstream via the falls (Gray 2006). The falls would continue to be available as a passage route during all phases of construction, especially at night when construction activity ceases. Passage of fall Chinook and coho also would be delayed during the periods in which the ladder was shut down, but the magnitude of this effect would be minimal because very few fall Chinook and coho are able to negotiate the falls even when the ladder is operating.

When the existing ladder is dewatered, a relatively small proportion of the steelhead spawning run and smolt outmigration may be handled during fish salvage operations. Approximately 85 percent of the steelhead smolt outmigration normally passes Lyle Falls by June 1 each year (YN 2004a). Some portion of the remaining 15 percent of outmigrants could be affected by fish salvage handling, by disturbances associated with construction noise, or by delayed passage. Little direct mortality is anticipated from handling the juvenile or adult fish in salvage operations.

The risk to lamprey ammocetes or other juvenile fish associated with use of the sediment retention tanks would be minimal. All sediment and gravel in the existing fishway would be sluiced into the river before construction begins. Any new sediment generated by construction would be suspended in groundwater percolating into the work site; little streamflow is expected to enter the work areas. Therefore, juvenile fish or lamprey would not be affected.

Construction is unlikely to affect bull trout. Tribal fishermen report that bull trout adults have never been seen at Lyle Falls, and no bull trout were observed in 2005-2006 during a near-continuous monitoring of a fish trap in the Lyle Falls fishway (Gray 2006). Bull trout juveniles have not been observed in the area during extensive sampling efforts spanning multiple years (personal communication, B. Sharp, YN Fisheries, December 2006). Nonetheless, a few bull trout (less than 10 individuals) have been documented in the mainstem Klickitat River (Gray 2006), and if they were present, construction potentially could delay their passage. See Section 3.5 for further analysis of potential effects on bull trout.

Some traditional fishing sites in the vicinity of the ladder would be temporarily disrupted during construction. Modifications to the downstream ladder entrance would disrupt up to three fishing sites for about three to four months. Access to these sites would be blocked by heavy equipment and partial demolition of the existing ladder in an area currently used to reach these traditional fishing sites.

### Operations Effects

#### Fish Passage

Modification of the fishway is expected to improve passage conditions over a wider range of flows and reduce passage delay for all migrating species. In addition to the physical facility modifications described in Chapter 2, changes in flow patterns described below, including an improved attraction flow, would have a major beneficial effect.

An analysis of the velocity of water flowing over Lyle Falls, through the existing fishway, and through the proposed fishway, compared known maximum burst swimming speeds of salmon and steelhead with the velocities, vertical heights and total distances that would have to be overcome to reach the top of the falls by these three pathways at various river flows (personal communication, J. Hutchins, P.E., Harbor Engineering, June 2007). The results indicated that the falls and ladder become impassible to Chinook salmon, coho salmon and steelhead beyond a high flow and a low flow threshold. At flows below the lower threshold, passage becomes impossible because the height of the falls becomes excessive and the water depth in the fishway becomes too low. Passage is precluded at flows above the upper threshold because the velocities are too high for fish to sustain over the required vertical and horizontal distances. The lower and upper thresholds for passage at Lyle Falls are 1,000 cfs and 5,000 cfs, respectively; lower and upper thresholds at the existing ladder are 900 cfs and 2,000 cfs, respectively (Table 3-5).

**Table 3-5 Maximum and Minimum Passage Flows at Lyle Falls over Three Migration Pathways: Jumping the Falls, Ascending the Existing Fishway, or Ascending the Proposed Fishway**

| | Natural Falls | Existing Fishway | Proposed Fishway |
|---|---|---|---|
| Lower Flow Threshold (cfs) | 1,000 | 900 | 500 |
| Upper Flow Threshold (cfs) | 5,000 | 2,000 | 5,000 |

Table 3-6 summarizes the proportion of days per month in which passage would be compromised. The frequency of flows above or below the passability thresholds indicates the degree to which passage would be adversely affected for all species by month. For example, in January, flows through the existing ladder are too high to pass fish 30.4 percent of the time and too low 35.6 percent of the time, and therefore are impaired 66 percent of the time. With the proposed ladder modifications, in January, flows would be too high to pass fish 3.7 percent of the time, too low 1.5 percent of the time, and therefore would be impaired only 5.2 percent of the time. Passage is most

impaired by low flows in the summer and fall, but Table 3-6 also shows that high flows during the winter and spring can be a problem in the existing ladder.

**Table 3-6 Proportion of Days by Month of Passage Impairment at the Falls, Existing Fishway and Proposed Fishway**

| | NATURAL FALLS | | | EXISTING LADDER | | | PROPOSED LADDER | | |
|---|---|---|---|---|---|---|---|---|---|
| | Excessive Flow | Inadequate Flow | Total Impaired | Excessive Flow | Inadequate Flow | Total Impaired | Excessive Flow | Inadequate Flow | Total Impaired |
| JAN | 3.7% | 38.9% | 42.6% | 30.4% | 35.6% | 66.0% | 3.7% | 1.5% | 5.2% |
| FEB | 9.5% | 22.0% | 31.5% | 40.4% | 19.8% | 60.1% | 9.5% | 0.6% | 10.1% |
| MAR | 3.4% | 11.6% | 15.1% | 48.4% | 9.1% | 57.5% | 3.4% | 0.0% | 3.4% |
| APR | 1.1% | 7.3% | 8.4% | 52.2% | 4.7% | 56.9% | 1.1% | 0.0% | 1.1% |
| MAY | 0.6% | 3.9% | 4.5% | 50.0% | 2.4% | 52.4% | 0.6% | 0.0% | 0.6% |
| JUN | 0.0% | 21.2% | 21.2% | 27.6% | 16.8% | 44.3% | 0.0% | 0.0% | 0.0% |
| JUL | 0.0% | 55.5% | 55.5% | 2.2% | 48.5% | 50.6% | 0.0% | 0.0% | 0.0% |
| AUG | 0.0% | 84.7% | 84.7% | 0.0% | 75.7% | 75.7% | 0.0% | 3.4% | 3.4% |
| SEP | 0.0% | 93.4% | 93.4% | 0.0% | 85.8% | 85.8% | 0.0% | 6.6% | 6.6% |
| OCT | 0.0% | 94.3% | 94.3% | 0.1% | 87.0% | 87.1% | 0.0% | 2.8% | 2.8% |
| NOV | 0.3% | 74.3% | 74.7% | 3.0% | 66.3% | 69.3% | 0.3% | 1.3% | 1.7% |
| DEC | 2.5% | 51.5% | 54.0% | 14.8% | 45.2% | 60.0% | 2.5% | 1.4% | 3.9% |

Note: Flows from record period 1977- 2006 measured at the USGS Pitt gage.

Figure 3-4 graphically depicts the percent of time per month that passage would unimpeded for each passage route derived from flow and fish passage characteristics modeling.

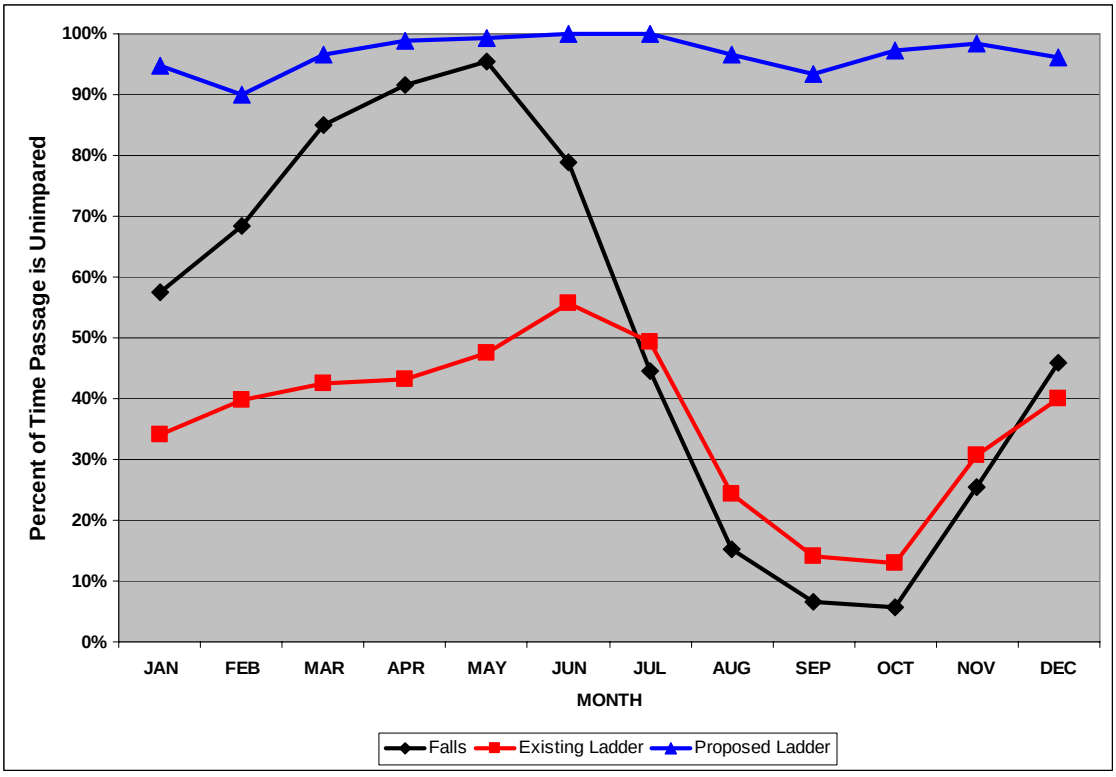


**Figure 3-4 Percent of Time per Month that Passage at Lyle Falls is Unimpaired in Three Migration Pathways: the Falls, Existing Fishway, and Modified Fishway**

When the information in Figure 3-4 is combined with the mean monthly passage percentages of Klickitat salmon and steelhead stocks, the degree to which each stock is adversely affected by the natural falls and the existing fishway can be estimated, as can the degree to which the proposed fishway modifications would improve conditions.

Table 3-7 summarizes the run timing for Klickitat spring Chinook, fall Chinook, steelhead and coho, based on a very limited period of record. This data depicts the monthly proportion of all fish captured in the Lyle Falls trap over a one-year period.

**Table 3-7 Percent of Fish That Pass Through Lyle Falls Fishway by Month (3/1/2005 – 2/28/2006)**

| | Spring Chinook Passage | Fall Chinook Passage | Steelhead Passage | Coho Passage |
|---|---|---|---|---|
| JAN | | | 5.3% | 49.0% |
| FEB | | | 7.7% | 14.1% |
| MAR | | | 14.6% | 0.1% |
| APR | 2.8% | | 13.0% | |
| MAY | 66.3% | | 11.2% | |
| JUN | 27.4% | | 14.9% | |
| JUL | 2.5% | | 17.9% | |
| AUG | 1.0% | | 4.5% | |
| SEP | | 49.8% | 3.7% | 1.5% |
| OCT | | 50.2% | 6.7% | 27.9% |
| NOV | | | 0.5% | 7.4% |
| DEC | | | 0.0% | 0.0% |

Source: Steve Gray, WDFW
Note: Trap was inoperable 12/2005 – 1/24/2006.

Table 3-8 summarizes the proportion of time that passage would be impaired in the existing and modified fishway and over the natural falls for four runs of Klickitat salmon and steelhead. The compiled data depicts the proportion of a run returning in a given month and the percent of time during that month that flows are unsuitable for passage.[5] The table indicates that the natural falls affect the passage of all stocks to some degree. Although it is impossible to translate these "impaired passage proportions" into quantitative decreases in reproductive success (smolts/spawner), it is likely that some impact occurs given the high caloric cost of migrating to the upper Klickitat River. For spring Chinook and steelhead, such effects would be greatest for fish attempting to

[5] If, for example, 50% of a run returned in September and 50% returned in October, and flows were unsuitable 50% of the time in September and 75% of the time in October, the proportion of the run affected by impassible flows would be calculated as (0.5 X 0.5) + (0.5 X 0.75) = 62.5%.

colonize the newly accessible habitat above Castile Falls because of the additional distance they must travel.

**Table 3-8 Proportion of Time Fish Passage is Impaired by Species at Lyle Falls**

| | Falls | Existing Fishway | Proposed Fishway |
|---|---|---|---|
| Spring Chinook | 17% | 52% | 5% |
| Fall Chinook | 94% | 86% | 4% |
| Steelhead | 37% | 59% | 2% |
| Coho | 54% | 69% | 6% |

Table 3-9 summarizes the degree to which the proposed fishway would improve passage over Lyle Falls. The maximum passage rates at the falls and the existing fishway are used because it is assumed fish will select the path with the best passage. The data in Table 3-9 indicate a modest increase in the proportion of time passage is unimpeded for spring Chinook (14 percent), a more significant proportional improvement for steelhead (54 percent) and very large degrees of improvement for coho and fall Chinook (107 percent and 609 percent, respectively).

**Table 3-9 Estimated Percent of Time Passage is Unimpeded at Lyle Falls Via Three Different Pathways, and the Expected Percent Improvement with the Proposed Fishway**

| | Falls | Existing Fishway | Proposed Fishway | % Improvement with Proposed Fishway* |
|---|---|---|---|---|
| Spring Chinook | 83% | 48% | 95% | 14% |
| Fall Chinook | 6% | 14% | 96% | 609% |
| Steelhead | 63% | 41% | 98% | 54% |
| Coho | 46% | 31% | 94% | 107% |

Source: Harbor Engineering

*Percentage improvement is calculated by comparing passage percentage for the proposed fishway to the better of the passage percentages for either the falls or existing fishway.

As stated in Section 3.3.1.1, the average spring Chinook escapement at the mouth of the Klickitat River since 1977 has been 1,900 fish. This return rate falls considerably below both the short-term escapement goal (5,000 to 10,000 adults) and the long-term escapement goal (20,000 adults) (YN 2004a). Similarly, the average steelhead spawning escapement from 1986 to 2006 was 710 fish, less than half of the 1,500-fish short-term goal and about 28 percent of the long-term goal (YN *in press*). Improved passage at Lyle Falls would lead to an immediate, if relatively small, increase in spawning escapement for both spring Chinook and steelhead, and an additional small increase in productivity over time.

Under the Proposed Action, delays associated with periods of inadequate or excessive river flow would thus be fewer, and the likelihood of fish exhausting their energy reserves before spawning would decrease. Consequently, it is expected that more redds would be constructed deep enough and guarded long enough to increase reproductive success (smolts/spawner), and thus the productivity of all naturally spawning fish. Although these benefits are clearly greatest for fall Chinook and coho, they would also benefit steelhead, spring Chinook, and possibly bull trout and Pacific lamprey. Benefits to Pacific lamprey are expected because, unlike the existing fishway, the new fishway would have rounded corners, allowing them to maintain continuous suction and gradually work their way upstream.

The deep holding pool at the new ladder exit would allow upstream migrants to rest and recover. The current facility exits into a shallow, high velocity area. Fish often shy away from entering the exposed area outside the exit, lingering inside the ladder until they are so exhausted when they finally emerge that they are swept back over the falls. Fallback currently is an issue for fish using the ladder, which increases stress, delay and pre-spawning mortality, especially for fall Chinook and coho.

Modifying the ladder exit and expanding the fishway would result in the permanent loss of 950 square feet of seasonal fish habitat. At low flows, this area provides no habitat, while at medium flows the boulder, cobble and bedrock provide some interstitial escape habitat potentially used by juvenile fish. This small loss would have little or no effect on habitat function and overall fish populations. On the contrary, all migratory fish would benefit from the creation of two resting pools at the entrance and a deeper pool at the ladder exit (Section 2.2.2.3). The new upstream fish ladder exit would be largely submerged below the surface of a deep natural scour pool where water currents are much slower than at the present exit location (during summer low flows, the structure would be in 7 to 8 feet of water). These features would provide important resting habitat for migrating adult salmon and steelhead, reducing their energy expenditure and potentially reducing pre-spawning mortality.

Improved passage and reduced pre-spawning mortality would increase the effective population size and therefore the viability of the populations, aiding in rebuilding spring Chinook salmon and Pacific lamprey populations as well as recovery of ESA-listed Mid-Columbia River steelhead. The long-term genetic effect on the Klickitat salmon and steelhead populations is difficult to determine. On one hand, more spawners would increase the effective population size, which would increase within-population variability and bolster genetic fitness. On the other hand, easier passage would reduce selection for jumping ability and large size, both of which are traits that bolster the fitness of populations subject to difficult spawning migrations (YN 2004a). Improved passage at sites such as Lyle Falls may entail tradeoffs between increased reproductive success and a population of smaller fish due to a relaxation of selection pressure for size and/or jumping ability.

Although a very small migratory population of bull trout may or may not exist in the lower Klickitat River, improved passage would provide an opportunity for migratory bull trout to colonize the Klickitat subbasin, expanding the distribution of the Columbia River

bull trout DPS and helping meet recovery objectives. Recent fish passage improvements at Castile Falls have opened access to habitat that previously was only sporadically accessible in the upper Klickitat subbasin. This reach contains suitable spawning habitat for migratory fish. Although impossible to demonstrate empirically unless passage gets improved at Lyle Falls, fisheries managers expect that improving passage at Lyle Falls could increase the numbers of fish that migrate further upstream and use the habitat above Castile Falls.

Nutrient enrichment from decaying carcasses would increase in the Klickitat River above Lyle Falls, benefiting all fish species by increasing primary aquatic productivity. The salmon carcasses that remain after spawning provide direct insect and fish forage (decaying flesh) and introduce valuable marine-derived nutrients to the ecosystem. Cederholm (2000) reported that 82 species of animals were predators or scavengers of salmon carcasses. Fisheries biologists have not determined the optimal biomass of salmon carcasses to increase primary productivity of the aquatic ecosystem of the Klickitat River, but food availability is thought to be a major limiting factor under current conditions (YN 2004a).

While improved passage conditions would increase salmonid production in the upper river, the modified fish ladder might also provide access to non-target native and non-native species that may not be able to negotiate the existing fishway or falls. Non-target native fish could be adversely affected by stress associated with sorting fish in the adult trap (see below). It is not known how many non-target fish may enter the ladder annually during its operation. Improvements in the fish ladder are not expected to affect the ability of northern pikeminnow residing in the Columbia River to access the Klickitat River above Lyle Falls. The extreme turbulence and water velocity below Lyle Falls already prevent pikeminnow from reaching the base of the falls. Tribal fishermen report that they never capture pikeminnow in the dip net fishery (personal communication, B. Sharp, YN Fisheries, September 13, 2006).

#### Competition and Predation

Predation within the fishway is not anticipated to affect fish migrating through the facility. The proposed design includes grated bridge decking over the water supply intake and fish transportation channel to preclude entry of terrestrial predators and human poachers.

Increasing anadromous fish production in the upper Klickitat subbasin may increase competition and predation between spring Chinook and steelhead (native to the Klickitat subbasin) and naturally produced coho and fall Chinook (species not historically present).

Many watersheds in the Pacific Northwest contain all four species as they generally have co-evolved and exhibit differences in their life-history to partition habitat and resources among themselves, limiting competition between species. The distinct, species-specific partitioning of the environment caused by differences in preferred microhabitat would limit competition between non-native fall Chinook and coho and the native spring Chinook and steelhead populations at all life stages. Competition between adults during

spawning can decrease reproductive success because of females being chased off their redds and/or redd superimposition and dislodgment of previously deposited eggs. Such a scenario is very unlikely in the Klickitat. In the first place, species-specific differences in spawning substrate size and velocity suggest that spawning competition would be minimal because the species would not be seeking the same spawning sites. In the second place, competition for spawning sites and redd superimposition is impossible between steelhead and either fall Chinook or coho, because steelhead spawn much earlier in the year and their fry have emerged before salmon spawning begins. Similarly, spawning interactions between spring Chinook and either fall Chinook or coho are very unlikely because the lower extent of the spring Chinook spawning distribution (~RM 53) is upstream of the upper extent of the spawning distribution for coho and fall Chinook (~RM 42; personal communication, Bill Sharp, YN Fisheries, June 2007). Competition between fall Chinook and coho juveniles and juvenile spring Chinook or steelhead would be limited by distribution differences at the level of microhabitat. For example, juvenile coho prefer side-channels and floodplain ponds in the winter, while juvenile steelhead prefer cobble-boulder riffles and juvenile spring Chinook prefer rocky interstices on the channel margin and pools with large wood. Therefore, competition between these juveniles during the winter (as well as at other life stages) would be minimal because each prefers different microhabitat[6].

In general, competition between oho, spring and fall Chinook and steelhead in the Klickitat River under improved passage conditions at Lyle Falls would be expected to occur at levels seen in other Pacific Northwest rivers. That degree of competition has not limited population viability of any particular run in other rivers in which the four different runs co-occur. The productivity of the endemic spring Chinook and summer steelhead populations in the Yakima River has not been compromised by the re-establishment of a natural population of coho salmon, or by the attempt to expand the spawning distribution of fall Chinook in the lower river (Pearsons et al. 2006).

### Disease

It is possible that increased passage of hatchery-reared and wild salmon and steelhead could increase the concentration of fish pathogens in the water and/or sediments of the habitat above Lyle Falls. If such a situation occurred, the potential for disease-related mortality among wild resident and anadromous fish would depend on a number of factors. First, for any particular pathogen there must be a susceptible "host." Second, the host population density must be high enough to favor fish-to-fish transfer of the pathogen or to facilitate contact of the water-borne pathogen with the host. Third, the pathogen concentration should be high enough to make it likely that it would contact the host. Finally, the immune status of the potential host population would influence susceptibility to infection. Immune status is affected by a number of factors—nutrition, water quality, the degree of stress (particularly chronic stress) incurred by fish during rearing, and

[6] Juvenile competition between coho and any other species in the Klickitat should be negligible because the low gradient, wood-rich, pool- and pond-dominated rivers they prefer are very different from the Klickitat. Significant natural production of coho in the Klickitat is very unlikely because of habitat incompatibility.

inherited resistance or susceptibility to specific pathogens (Schreck 1996). For a disease outbreak to occur within a wild population, all of these factors must occur.

It is much more likely that transmission of disease to wild populations would occur as a result of hatchery production within the watershed than as a result of increased accessibility of the watershed. This is so because the densities of fish in hatcheries are much higher than those found in the wild, and because high rearing densities and other factors characteristic of hatcheries usually entail a substantial level of chronic stress.

However, even for hatcheries, the transmission of disease into wild populations has not been frequently documented. Transplants of infected hatchery fish have been strongly implicated in the spread of at least one important salmonid pathogen (*Myxobolus cerebralis*) in California (Modin 1998), but studies to document the spread of salmonid diseases from hatchery to wild fish via hatchery effluents have apparently not been done. Indeed, a recent unpublished review on this topic by the Aquaculture Effluents Task Force of the Joint Subcommittee on Aquaculture concluded that "the biological significance of aquatic animal pathogens in effluents is unknown."

### Adult Monitoring and Fish Management

The Klickitat River is difficult and dangerous to access and collecting data under current conditions is extremely difficult. For example, until recently, even basic fisheries run timing was largely unknown. The existing fish sorting area would be replaced by a new sampling bay that also could be used to collect broodstock in the future. A new water entrance would be provided from the attraction flow control box. Within the sorting area, a new fish diverter, crowder, brail and sorting platform would be installed. Portable fish sorting facilities would be moved on site when needed and would include an electric pump-operated false weir and Denil fishway, and sorting flumes for selecting individual fish and returning non-selected fish to the river.

This new infrastructure would substantially reduce the stress fish experience when being physically examined during routine monitoring. The pump-operated "steep-pass" false weir and sorting flumes would eliminate the stress associated with chasing, netting and placing fish in the blackout tubes. Attraction water flowing from the Denil fishway would induce fish to ascend the ladder voluntarily, pass over the dewatering weir, and drop via a wet flume into a small handling tank. The video monitoring and PIT-tag detection equipment incorporated into the new facility would eliminate the current need to physically examine every fish, as species counts can be estimated from images of unhandled fish passing the camera. Certain monitoring activities would require handling of fish, such as biological sampling, but fish collection would be less stressful. The blackout tubes would still be used because sampling can be accomplished without administering anesthetics.

The addition of adult and juvenile PIT-tag detectors would make precise estimates of smolt-to-adult survival routine. Currently, smolt-to-adult survival rates for Klickitat salmon and steelhead are very imprecise, often being based on extrapolations from near-by, better monitored systems, such as the Hood River (personal communication,

Chris Frederickson, YN Fisheries, October 2006). Video monitoring systems could be used for the bulk of run timing and species count data, with the adult traps being used only occasionally to collect biological samples and to track periodic changes in hatchery/wild composition of runs.

### Harvest

Harvest opportunities, particularly for non-tribal anglers, may improve upstream of Lyle Falls because more fish would be capable of successfully migrating upriver. This is consistent with a goal of the YN to increase tribal and sport fishing opportunities by allowing more fish to pass upstream (personal communication, B. Sharp, YN Fisheries, September 13, 2006). With improved passage at Lyle Falls, more Klickitat fish would be harvested in the sport fishery between Lyle Falls and the Klickitat Hatchery. A likely secondary effect would be increased spawning by fish that now are able to access this habitat, an effect that would reduce the number of Klickitat-origin fish thought to stray to other subbasins, where they interfere with the recovery of listed populations (YN *in press*). Modifications to the Lyle Falls fish ladder could be expected to both increase harvest benefits and reduce negative interactions on listed populations in other subbasins. Spring Chinook tribal harvest rates would likely continue to average 35-40 percent of the annual return and would rarely exceed 50 percent. Harvest would be managed to be consistent with *U.S. v. Oregon* (YN 2004a). The turbulent nature of the Klickitat River gorge causes fish to hold in numerous staging areas, followed by bursts of swimming. Tribal fishing scaffolds are located throughout the gorge at these staging areas. The downstream entrance to the fishway is adjacent to or just upstream of four such fishing sites, three to four of which may experience a change in fishing success. As attraction flow in the ladder increases, fishermen at these sites may have access to fewer fish if more fish quickly find and then ascend the ladder instead of jumping the falls. The remaining tribal fishing scaffolds at sites further downstream would not be affected by changes in flow from ladder modifications.

ESA-listed steelhead and bull trout could be incidentally affected in the long term by the increased recreational fishing pressure in the upper Klickitat subbasin if the number of returning adults increases. The recreational harvest would be selective; all non fin-clipped fish other than coho would be released. Data from 1987 to 2001-2002 indicate that harvest in the Klickitat takes 77 percent of the steelhead run annually, with fishermen directly taking 13 percent of the wild, ESA-listed steelhead. In addition, delayed mortality of any captured ESA-listed fish may occur from handling stress or injury. NOAA Fisheries has estimated up to a 30 percent incidental take from harvest and delayed mortality (63 Fed. Reg. §11801). Fisheries management plans being negotiated in *US v Oregon* will probably allow harvest-related mortality to remain in approximately the same proportion as existed through 2001-2002, with or without the proposed ladder improvements.

Although the occurrence of bull trout in the mainstem Klickitat River is rare, they can be easily caught by anglers (Wydoski and Whitney 2003). Additional information on ESA-listed species is provided in Section 3.5.

Under the current operations, gravel accumulates at the upstream exit area of the ladder (see Section 3.2.1.1 and 3.2.2.2). Following practices established by WDFW, the YN periodically excavate this material, placing it in the adjacent floodplain. Under the Proposed Action, the fish exit and water intake structure would be moved further upstream to a location where bedload does not accumulate during high flows. Small gravel would continue to enter the fish ladder, but is expected to be transported through the structure by the higher flows. Racks would preclude entry of any large material. These modifications would eliminate the need for periodic excavation in the active river channel and eliminating this source of fish habitat disturbance.

Operation of the modified ladder would be monitored to ensure that it functions in consistency with federal fishway criteria (Table 2-1). Passage effectiveness would be monitored daily. If ladder function is not achieving design specifications, specialists from the YN, WDFW and NMFS would be consulted to resolve the issue. Depending on the severity of the problem, a decision would be made whether to continue operating or to close the ladder. Monitoring measures would include video monitoring of fish behavior and movement at the ladder entrance and exit, tracking radio-tagged fish captured in the ladder and released downstream at various distances, and checking the condition of fish for descaling and other physical injuries.

## 3.3.3 Mitigation Measures

The following mitigation measures have been incorporated and analyzed in project planning to avoid, minimize or offset potential adverse effects on aquatic resources:

- In-water work would adhere to the WDFW instream work window in order to avoid disturbance when the majority of juvenile salmon and steelhead would be moving past the project site.

- In-water work effects on fish would be minimized by using controlled blasting and erosion control measures (Section 3.1.3, Geology and Soils), and by implementing BMPs to limit water quality degradation during construction (Section 3.2.3, Water Resources).

- Cofferdams would temporarily isolate the area required to construct the new fish ladder exit structure.

- No construction would occur at night in order to allow fish to migrate without disturbance over the falls.

- During dewatering of work areas, a qualified fish biologist with experienced fisheries technician support would be present to conduct salvage operations for any fish that become stranded in the dewatered zone.

# 3.4 Vegetation and Wildlife

## 3.4.1 Affected Environment

### 3.4.1.1 Vegetation

The project site 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. Vegetation in the project area can be characterized as a ponderosa pine (*Pinus ponderosa*)/Oregon white oak (*Quercus garryana*) savannah plant association (Chappell et al. 2001; Larsen and Morgan 1998). Most trees range from 4 to 8 inches in diameter at breast height (dbh), although numerous saplings (1 to 2 inches dbh) and mature individuals (12 to 20 inches dbh) are also present. Shrubs are scattered in the understory. The most common species are poison oak (*Rhus diversiloba*), Oregon grape (*Berberis nervosa*), serviceberry (*Amelanchier alnifolia*), birchleaf spiraea (*Spiraea betulifolia*), and oceanspray (*Holodiscus discolor*). Herbaceous species include both native and introduced forbs and grasses. The most common of these are buckwheats (*Eriogonum* spp.), lomatiums (*Lomatium* spp.), cheatgrass (*Bromus tectorum*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), needlegrasses (*Stipa* ssp.) and bentgrasses (*Agrostis* spp.).

Very little riparian vegetation grows along the Klickitat River at the project site, except in small patches where sediments have accumulated in pockets between rock outcrops and boulders. Plants in the riparian zone include shrubby willows (*Salix* spp.) and alders (*Alnus* spp.), mock orange (*Philadelphus lewisii*), water sedge (*Carex lenticularis*), common horsetail (*Equisetum arvense*), and the invasive, non-native reed canarygrass (*Phalaris arundinaceae*).

One small seasonal wetland (approximately 1,350 square feet in size) was observed within the project area, at a topographic low point within a high-flow channel northeast of the existing ladder exit (Figure 3-5). The dominant plants at this site are creeping spikerush (*Eleocharis palustris*) and toad rush (*Juncus bufonius*). Section 3.6.1.1 (Wetlands and Floodplains) further discusses the identified wetland at the proposed project.

#### Priority Habitats

In its Priority Habitats and Species program, the WDFW has designated several habitats and species as management priorities (WDFW 2006a). Priority habitats are those that have unique or significant value to a diverse assemblage of wildlife species. Priority habitats in the Lyle Falls project area include oak woodlands, wetlands, and riparian habitats.

### Oak Woodlands

Oregon white oak is Washington's only native oak species. Almost 200 wildlife species are associated with Oregon white oak, using both live and dead trees for foraging, arboreal movement, hiding, roosting or nesting (Larsen and Morgan 1998). WDFW has designated Oregon white oak woodland as a priority habitat because of its high value for wildlife, its naturally limited distribution, and vulnerability to loss as a result of development, timber harvest, conifer encroachment, grazing, and fire suppression. WDFW's management recommendations for oak woodland are intended to protect and enhance this habitat type (Larsen and Morgan 1998).

The WDFW defines priority Oregon white oak woodlands 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 (Larsen and Morgan 1998). The Lyle Falls project area meets the second criteria. A large proportion of the Klickitat River subbasin is characterized by ponderosa pine/Oregon white oak woodland, and thus meets WDFW's 5-acre criteria for the size of stands that are considered priority woodlands east of the Cascades.

### Wetlands and Riparian Habitats

WDFW designates wetlands and riparian areas as priority habitats, based on their limited availability across the landscape and their vulnerability to habitat alteration. The seasonal wetland in the project area, while small, could provide a breeding area for some amphibian species, such as Pacific treefrog (*Pseudacris regilla*) or long-toed salamander (*Ambystoma macrodactylum*). Section 3.6 provides additional information about the soils, hydrology, vegetation, functions and values of this wetland. It would also provide water and forage for numerous species of songbirds and gamebirds, and a variety of mammals for a few weeks following flood events that are estimated to occur at approximately two-year intervals.

Many studies show the importance of riparian habitat in the arid west. More wildlife species use riparian habitats than any other vegetation type (Kauffman et al. 2001). Riparian habitat in the Lyle Falls project area, however, occurs in small and scattered patches along the river bank, and would not support many of the functions that a wider, denser band of vegetation could provide, in terms of its influence on microclimate, primary productivity, plant species, and structural diversity.

## Rare Plants

The Washington Natural Heritage Program (WNHP) database indicates that 66 rare plants are known to occur in Klickitat County. The Forest Service evaluated the potential for many of these species and several others (including species designated as sensitive in Forest Service Region 6) to occur along the Klickitat Trail between Lyle and Pitt. Table 3-10 shows rare plants that could occur at the Lyle Falls Project area, given each species' range, typical elevation, and potential habitat.

**Table 3-10 Rare Plants That May Occur or are Known to Occur in the Lyle Falls Project Area**

Species shown in bold have been documented along the Klickitat Trail; asterisked species were not observed, but are known to occur in Klickitat County.

| Common Name (*Scientific Name*) | Federal/State/Forest Service Status | Typical Habitat | Best Identified |
|---|---|---|---|
| Tall agoseris (*Agoseris elata*)* | --/S/FS | Meadows, open woods, low to mid-elevations | June-August |
| Hood River milkvetch (*Astragalus hoodianus*) | --/W/-- | Dry, open grass or oak woodlands in east Gorge | April-May |
| Oregon bolandra (*Bolandra oregana*)* | --/S/FS | Waterfalls, moist cliffs | May-June |
| Long-bearded sego lily (*Calochortus longebarbatus var. longebarbatus*)* | FCo/S/FS | Open or lightly wooded areas | June-July |
| Green-fruited sedge (*Carex interrupta*) | --/W/-- | Rocky banks and beds of streams | April-May |
| Large-awned sedge (*Carex macrochaeta*) | --/T/FS | Moist open places near coast or along Columbia River | Mid-May-July |
| Few-flowered collinsia (*Collinsia sparsiflora var. bruceae*) | --/S/FS | Thin soils over basalt, flat to steep slopes, openings in pine/oak stands | Mid-March-April |
| Beaked cryptantha (*Cryptantha rostellata*)* | --/T/FS | Barren south facing slopes in east Gorge | Late April-mid-June |
| Snake River cryptantha (*Cryptantha spiculifera*) | --/S/-- | Open, dry slopes in east Gorge | May-June |
| Shining flatsedge (*Cyperus bipartitus*) | --/W/-- | Wet places in lowlands | August-September |
| Giant helleborine (*Epipactis gigantea*) | --/W/-- | Low elevation stream banks or wet areas | April-July |
| Common blue-cup (*Githopsis specularioides*)* | --/S/-- | Dry, open or lightly wooded slopes | Mid-April-mid-June |
| Gooseberry-leaved alum-root (*Heuchera grossulariifolia var. tenuifolia*)* | --/S/FS | Shady cliffs and talus slopes | May-early August |
| Suksdorf's desert-parsley (*Lomatium suksdorfii*)* | FCo/S/FS | Grasslands and open woods | Late March-May |
| Broad-leaf lupine (*Lupinus latifolius var. thompsonianus*) | --/W/-- | Open or wooded areas in east Gorge | June-August |
| White meconella (*Meconella oregana*)* | FCo/T/FS | Open or lightly wooded areas | March-April |
| Marigold navarretia (*Navarretia tagetina*)* | --/T/FS | Open rocky areas | May-June |

| Common Name (*Scientific Name*) | Federal/State/Forest Service Status | Typical Habitat | Best Identified |
|---|---|---|---|
| Pine broomrape (*Orobanche pinorum*) | --/W | Woods and brushy areas | July-August |
| Obscure buttercup (*Ranunculus reconditus*)* | FCo/E/FS | Open grasslands | March-April |

Legend:

Federal Status
- FCo Federal species of concern

Forest Service Region 6 Status
- FS Sensitive

State Status
- E State endangered
- T State threatened
- S State sensitive
- W State watch

Source: USFS 2003a; WDNR 2005

Six of the species shown in Table 3-10 were documented along the Klickitat Trail between Pitt and Lyle (USFS 2003a). None of these species were observed during a site visit in September 2006; however, the time of year when these species can be readily observed and identified ranges from March through August, and it is possible that they are present in the project area.

### Noxious Weeds

The State of Washington defines noxious weeds as aggressive non-native plant species and classifies them according to the risk they pose to environmental and economic resources[7]. Noxious weeds are a growing threat to Washington's environment because of their potential to degrade native plant communities, out-compete rare species, impair wildlife habitat values, and reduce productivity of agricultural lands (Gamon 2007). The Klickitat County Weed Control Board indicates that as many as 47 noxious weeds are known to occur in Klickitat County (Klickitat County Noxious Weed Control Board 2006). No systematic surveys have been conducted in the Lyle Falls project area, but 23 noxious weed species are known to be present in the Klickitat watershed (YN et al. 2004). These include yellow starthistle (*Centaurea solstitialis*), diffuse knapweed (*Centaurea diffusa*), puncturevine (*Tribulus terrestris*), rush skeletonweed (*Chondrilla juncea*), Dalmatian toadflax (*Linaria genistafolia*) and hedge parsley (*Torilis arvensis*). Surveys along the Klickitat Trail confirmed the presence of Dalmatian toadflax, longspine sandbur (*Cenchrus longispinus*), and houndstongue (*Cynoglossum officinale*) between Pitt and Lyle (USFS 2003a). Most occurrences were small and scattered, but three sites supported more extensive infestations.

A few scattered occurrences of three Class B noxious weed species – houndstongue, erect (or sulfur) cinquefoil (*Potentilla recta*) and diffuse knapweed – were observed in the Lyle Falls area during the project site inspection in September 2006. Reed canarygrass, a

[7] Class A weeds are designated for eradication, because they represent a serious threat throughout the state. Class B weeds also pose a serious threat, but are limited in distribution. Class B species may be designated (Class B-designates) for control in areas where they are not yet widespread. Class C weeds are those that are already widespread, and long-term control programs are determined on a local level.

Class C noxious weed species, is found on site. Other species may have been overlooked due to the late timing of the visit in relation to their life cycle.

Under existing conditions, vehicles and foot traffic regularly disturb soils around the fish ladder parking area and may serve as vectors for the introduction and spread of weeds. High flows disturb soils along the river bank, and weed seeds and fragments from upstream locations could colonize these sites.

#### 3.4.1.2 Wildlife

Over 230 wildlife species are thought to be associated with ponderosa pine forests and oak woodlands, such as those in the vicinity of the fish ladder (Chappell et al. 2001). Many of the animals found in woodlands adjacent to the Klickitat River would also likely use riparian habitat along the river margin and a small seasonal wetland within the high flow channel on the right bank. The following sections identify some of the species that are commonly observed, or that have special importance because of their ecological role or cultural or recreational value.

Few amphibian species would be expected to occur in the project area, due to the absence of riverine backwaters, lakes, ponds, marshes, or extensive riparian areas that are preferred habitats for these species. Pacific treefrogs were the only amphibians identified during the 2003 Klickitat Trail surveys (USFS 2003a). Long-toed salamanders and western toads may also be present.

Ponderosa pine and oak woodlands support a diverse reptile community, and approximately 20 species are likely to occur in these habitat types (Chappell et al. 2001). Biologists conducting the Klickitat Trail surveys observed western diamondback rattlesnake (*Crotalus viridis*), gopher snake (*Pituophis catenifer*), and southern alligator lizard (*Elgaria multicarinata*), and biologists observed more than 10 western fence lizards (*Sceloporus occidentalis*) during the September, 2006 project site inspection.

At least 131 bird species are associated with ponderosa pine woodlands (Chappell et al. 2001), and 122 have been confirmed in the Klickitat subbasin (YN et al. 2004). WDFW reports that species commonly seen in the Klickitat Wildlife Area (which includes land adjacent to the fish ladder and several parcels upstream between the fish ladder and Soda Springs, at about RM 15) include Vaux's swift (*Chaetura vauxi*), acorn woodpecker (*Melanerpes formicivorus*), Lewis's woodpecker (*Melanerpes lewis*), ruffed and blue grouse (*Bonasa umbellus* and *Dendragapus obscurus*), Merriam's turkey (*Meleagris gallopavo*), California quail (*Callipepla californica*), western bluebird (*Sialia mexicana*), American kestrel (*Falco sparverius*), and numerous cavity nesting birds associated with oak woodlands (Ellenburg and Dobler 2006). During the Klickitat Trail surveys, biologists observed great blue heron (*Ardea herodias*), golden eagle (*Aquila chrysaetos*), merlin (*Falco columbarius*), Vaux's swift, common merganser (*Mergus merganser*), spotted sandpiper (*Actitis macularius*), cliff swallow (*Petrochelidon pyrrhonota*), violet-green swallow (*Tachycineta thalassina*), rough-winged swallow (*Stelgidopteryx serripennis*), turkey vulture (*Cathartes aura*) and belted kingfisher (*Ceryle alcyon*). Several of these species (great blue heron, golden

eagle, common merganser, and belted kingfisher) were also observed during the September 2006 project site inspection. In addition, biologists observed red-tailed hawk (*Buteo jamaicensis*), American crow (*Corvus brachyrhynchos*), Steller's jay (*Cyanocitta stelleri*), northern flicker (*Colaptes auratus*), and American dipper (*Cinclus mexicanus*).

WDFW and YN biologists report frequent sightings of Lewis woodpeckers, bald eagles (*Haliaeetus leucocephalus*) during the winter, and osprey (*Pandion haliaetus*) during the nesting season. An osprey nest, located on top of a power pole about 225 feet north of the proposed ladder exit, has been active for about 10 years (personal communication, B. Sharp, YN Fisheries, September 26, 2006).

Almost 70 mammal species are associated with ponderosa pine woodlands (Chappell et al. 2001). Based on the Klickitat Subbasin Plan (YN et al. 2004) and WDFW's draft Klickitat Wildlife Area Management Plan (Ellenburg and Dobler 2006), mammals in the Lyle Falls project area likely include black-tailed deer and mule deer (*Odocoileus hemionus*), black bear (*Ursus americanus*) and cougar (*Puma concolor*). Yakama Tribal fisheries staff report frequent observations of river otters (*Lutra canadensis*) (personal communication, B. Sharp, YN Fisheries, September 26, 2006), and biologists observed deer tracks and several California ground squirrels (*Spermophilus beecheyi*) during the project site inspection in September 2006. Bobcat (*Lynx rufus*), coyote (*Canis latrans*), mink (*Mustela vison*), long-tailed weasel (*Mustela frenata*), and many small mammals, such as western harvest mouse (*Reithrodontomys megalotis*), deer mouse (*Peromyscus maniculatus*), and bushy-tailed woodrat (*Neotoma cinerea*) are also likely to occur.

The subbasin plan indicates that as many as 14 bat species breed in the Klickitat watershed (YN et al. 2004). Caves and crevices in cliffs along the Klickitat River likely provide numerous roost opportunities and nursery sites, and bats may forage in the vicinity.

### Priority and Special Status Species

WDFW has designated a number of species as priorities for management or monitoring. The list of priority species includes state endangered, threatened, sensitive and candidate species, and wintering, breeding, or roosting aggregations or concentrations of some animals. Other special status species include those that WDFW monitors and manages to help prevent them from becoming listed in the future. Over 70 priority species are known to occur in the Klickitat subbasin (YN et al. 2004). However, the subbasin covers 1,350 square miles, and contains an enormous variety of habitat types not found in the Lyle Falls project area. Table 3-11 shows the special status species likely to occur in the Lyle Falls project area, based on the habitats available at the site, species known to occur, priority habitat species (PHS) mapping or site-specific observations. Federally listed species that may occur in the project area are discussed in Section 3.5 (Threatened and Endangered Species).

**Table 3-11 WDFW-Designated Priority Species That May Occur or are Known to Occur in the Lyle Falls Project Vicinity**

| Common Name (*Scientific Name*) | Federal/State/Forest Service Status | Habitat |
|---|---|---|
| REPTILES | | |
| California mountain kingsnake (*Lampropeltis zonata*)* | --/SC/FS | Pine/oak woodland, rocky riparian |
| Sharptail snake (*Contia tenuis*)* | --/SC/FS | Pine/oak woodland |
| Striped whipsnake (*Masticophis taeniatus*)* | --/SC/FS | Pine/oak woodland |
| BIRDS | | |
| Great blue heron (*Ardea herodias*) | --/SM/-- | Colonial nester in large trees; forages in wide range of wetlands and riparian habitats |
| Bald eagle (*Haliaeetus leucocephalus*) | PDL-M/ST/-- | Nests in large trees, usually within clear view of water, near concentrated forage resource |
| Ferruginous hawk (*Buteo regalis*) | FCo/ST/FS | Open prairie and steppe |
| Osprey (*Pandion haliaetus*) | --/SM/-- | Nests in large trees or on artificial platforms within clear view of water, near concentrated forage resource |
| Golden eagle (*Aquila chrysaetos*) | --/SC/-- | Nests in large trees or on cliffs, forages in open country |
| Merlin (*Falco columbarius*) | --/SC/-- | Forests, grasslands, marshes. |
| Peregrine falcon (*Falco peregrinus*) | FCo/SS/FS | Variety of vegetation types; nests in tall cliffs within 1 mile of water |
| Prairie falcon (*Falco mexicanus*) | --/SM (B)/-- | Variety of vegetation types; nests in tall cliffs |
| Chukar (*Alectoris chukar*) | --/--/-- | Sparsely vegetated rocky canyons, slopes and hillsides |
| Mountain quail (*Oreortyx pictus*) | --/--/-- | Open forests and woodlands with ample undergrowth of brush |
| Merriam's wild turkey (*Meleagris gallopavo merriami*) | --/--/-- | Open oak or mixed oak/conifer woodlands with grassy openings, hilly terrain, and water |
| Band-tailed pigeon (*Columba fasciata*) | --/--/-- | Conifer forests and woodlands |
| Lewis' woodpecker (*Melanerpes lewis*) | --/SC/-- | Open pine/oak woodland |
| Acorn woodpecker (*Melanerpes formicivorus*) | --/SM/-- | Open oak/conifer woodlands |
| Loggerhead shrike (*Lanius ludovicianus*) | FCo/SC/-- | Dry grassland and sagebrush deserts |

| Common Name (*Scientific Name*) | Federal/State/Forest Service Status | Habitat |
|---|---|---|
| MAMMALS | | |
| Big brown bat (*Eptesicus fuscus*) | --/SM/--(B, CR) | More common in deciduous than conifer forests, but forages over open areas; roosts and breeds in hollow trees and cliff crevices |
| Small-footed myotis (*Myotis ciliolabrum*) | FCo/SM/--(B, CR) | More common in cliffs and rocky canyons; also found in pine and mixed conifer forests. Roosts in rock crevices and under boulders. |
| Long-eared myotis (*Myotis evotis*) | FCo/SM/--(B, CR) | Most common in forests and forest edges, including pine woodlands. |
| Fringed myotis (*Myotis thysanodes*) | FCo/SM/FS (B, CR) | Forests and riparian areas |
| Long-legged myotis (*Myotis volans*) | FCo/SM/-- (B, CR) | Ponderosa pine forest, oak and mixed woodlands; roosts in cliff crevices |
| Pallid bat (*Antrozous pallidus*) | --/SM/--(B, CR) | Open ponderosa/oak woodland; roosts in cliff faces |
| Townsend's big-eared bat (*Corynorhinus townsendii*) | FCo/SC/-- | Found in a variety of vegetation types; roosts in buildings, caves, mines and bridges. |
| White-tailed jack rabbit (*Lepus townsendii*) | --/SC/-- | Sagebrush deserts and grasslands, open areas in conifer forests |
| Western gray squirrel (*Sciurus griseus*) | FCo/ST/FS | Oak and pine/oak woodlands |
| Mink (*Mustela vison*) | --/--/-- | Associated with water and riparian habitats in a variety of vegetation types. |
| Columbian black-tailed deer (*Odocoileus hemionus columbianus*) | --/--/-- | Brushy areas at forest edges, early successional forests; lower valleys in winter |
| Rocky Mountain mule deer (*Odocoileus hemionus hemionus*) | --/--/-- | Open woodlands and sagebrush; lower valleys in winter |
| Rocky Mountain elk (*Cervus elaphus nelsoni*) | --/--/-- | Variety of vegetation types; lower valleys in winter |

Legend:

Federal Status

| | |
|---|---|
| FE | Federally endangered |
| PDL-M | Proposed de-listed monitor species |
| FCo | Federal species of concern |
| B, CR | Breeding locations or communal roosts |

Forest Service Status

| | |
|---|---|
| FS | Region 6 Sensitive Species |

State Status

| | |
|---|---|
| E | State endangered |
| T | State threatened |
| SC | State species of concern |
| SS | State sensitive |
| SM | State monitor |

Note: Species shown in **bold** have been documented along the Klickitat Trail (USFS 2003a), or at the fish ladder site by WDFW or YN staff, or during the September 2006 site visit. Asterisked species were not observed, but are known to occur in the vicinity.

PHS mapping indicates that sharptail snakes (*Contia tenuis*) and California mountain kingsnakes (*Lampropeltis zonata*) have been observed in nearby drainages; these species may also be present at the project site. The maps also show a golden eagle nest site

approximately one mile upstream of the project site (WDFW 2006a). Two golden eagles were observed in flight over the project site during the September 2006 site visit.

WDFW and YN fisheries biologists report seeing bald eagles frequently at the fish ladder site during the winter, but have not observed them during the spring or summer. PHS mapping shows the nearest bald eagle nest to the Lyle Falls project area is approximately 1.5 miles downstream of the fish ladder. This nest was occupied in 2005, but did not produce any young (WDFW 2006a). PHS mapping shows a communal roost site approximately 1.5 miles to the northwest. The roost site was used by four eagles in 1991-1992, with a history of use during several earlier years (WDFW 2006a). The project site is approximately 0.2 miles outside the edge of the communal roost buffer zone as depicted on the WDFW PHS maps. Bald eagles that use the winter roost in the Silva Creek drainage may forage at Lyle Falls, where they could prey on fall and spring Chinook, coho, and summer steelhead in shallow water upstream of the fish ladder exit. The narrow chute, high flows and turbulent conditions would likely prevent foraging below the falls.

By comparison, salmon and steelhead spawning between RM 5 and RM 42 would be easily visible in riffles and shallows, and carcasses washing up on gravel bars and banks would be readily available. For this reason, areas upstream of Lyle Falls would likely provide a more important and more concentrated prey base for bald eagles during the winter, while foraging at Lyle Falls may be somewhat incidental.

PHS mapping shows numerous western gray squirrel (*Sciurus griseus*) occurrences northeast of the project area. The western gray squirrel may be one of the most important mammals in the project vicinity, because the Klickitat River basin supports one of the largest populations remaining in Washington. Western gray squirrels are considered a US Fish and Wildlife Service (USFWS) species of concern and are listed as threatened in the State of Washington.

The western gray squirrel is a large arboreal squirrel that is generally solitary and reclusive in its habits. Western gray squirrels often forage on the ground, but avoid large openings, and use arboreal routes for escape. Their diet consists of truffles (underground fungi), acorns, pine nuts, seeds, green vegetation, and fruits.

Once common in dry, warm forests along the Columbia River, the western gray squirrel is currently distributed in three geographically isolated populations. The largest of these is located in Klickitat County and eastern Skamania County. The total breeding population in the Klickitat region is roughly estimated at about 565 squirrels (Linders and Stinson 2006). The highest concentration of gray squirrels in this region occurs along the Klickitat River and its tributaries. PHS mapping indicates a concentration of at least 35 nests in the ponderosa pine forest about 0.25 miles northeast of the fish ladder, but no gray squirrels are known to occur in the Lyle Falls project area (WDFW 2006a). Habitat in the project area is not suitable for this species.

## 3.4.2 Environmental Consequences

### 3.4.2.1 No Action Alternative

Under the No Action alterative, no new construction would occur at the fish ladder and no vegetation would be removed. Changes in vegetation would occur over time, as a result of natural succession or events such as floods or wildfire. Invasive weeds would likely continue to spread, reflecting a general trend throughout the U.S. (Gamon 2007).

Regular facility maintenance, fish management activities, dip-net fishing, camping, and hiking would continue to cause low levels of noise disturbance in the project area. Wildlife that uses the area under current conditions are species that tolerate these types of activities. Any changes in the wildlife community would likely occur over a long period of time, in response to changes in vegetation.

### 3.4.2.2 Proposed Action Alternative

#### Construction Effects

Construction of the fish ladder improvements would disturb a total of 1.6 acres. This total includes clearing, grading and excavation of about 1.45 acres, plus disposal of excavated materials that would cover about 0.16 acres of rock outcrop and herbaceous vegetation. Of the 1.6 acres, slightly more than 0.80 acres would be permanently occupied by the new facilities. Approximately 0.65 acres potentially could be revegetated following construction. The 0.16 acre disposal area would not be planted, because excavated materials are anticipated to consist almost entirely of basalt. For this reason, excavated materials would be placed to match the contours of the existing rocky terrain to the extent possible.

Most of the vegetation that would be removed or buried consists of a mix of native and non-native forbs and grasses, with scattered shrubs and oak trees. Two priority habitats would be affected: oak woodland and riparian habitat. Construction would not directly affect the wetland, because it is located 60 feet from the nearest construction activity, and excavated materials would not be deposited in this habitat type. No secondary or indirect effects would occur, because construction would not alter hydrologic support or drainage patterns associated with this wetland.

Ten oak trees and four ponderosa pines would be felled to clear vegetation along the fish ladder alignment. The felled trees would be used to construct brush piles along the margin of the contractor staging area, adjacent to the woodland, to provide cover for birds, reptiles and small mammals. Table 3-12 shows the sizes of oak and ponderosa pine trees that be adversely affected by construction.

Construction would remove two to three alder saplings and a small patch of reed canarygrass and common horsetail (less than 50 square feet) growing along the river bank at the proposed ladder exit site. These species would likely recolonize disturbed soils

along the shoreline, in addition to any higher-value species (e.g., willow, mock orange) that may be planted following construction.

**Table 3-12 Oregon White Oaks and Ponderosa Pines to be Removed Within 20 Feet of the Proposed Fishway Centerline**

| Estimated DBH Class | Oregon White Oaks | Ponderosa Pines |
|---|---|---|
| 1 to 4 inches | 2 | 3 |
| 4 to 8 inches | 6 | 1 |
| 8 to 12 | 1 | 0 |
| Over 12 | 1 | 0 |

The effects of project construction on wildlife would vary from species to species. Animals that are mobile (such as deer and birds) would likely avoid the immediate area temporarily, while localized species that are less mobile (such as snakes and mice) would experience adverse effects (possible injury or mortality, permanent loss of about 0.8 acres of habitat that would be occupied by project facilities) as a result of clearing, grading, excavation, and disposal of excavated materials.

Construction traffic and activity would also cause noise that could disturb wildlife. Modifications would be made to the ladder over two summer seasons, between late-June and October. As described in more detail in Section 2.1, from 6 to 25 truck trips (round trips) per day would be needed to deliver construction workers, material and supplies. Drilling and blasting would occur over an approximately 4-week period at the fishway exit. Drilling would occur for approximately 8 hours per day during the construction period, with blasting scheduled for 1 day per week. Excavation at the fishway entrance would require drilling and blasting for an additional 2 to 3 weeks, with approximately the same daily schedule.

Potential wildlife disturbance around these types of activities would depend on several factors. The sound produced by conventional construction equipment ranges from about 80 to 90 decibels (dB), as shown in Table 3-18, up to about 104 dB for a skill saw. Sound from a point source attenuates by about 7.5 dB as distance doubles, where vegetation is present to absorb noise (WSDOT 2007). Atmospheric conditions and topography also strongly influence attenuation.

The zone of effect is considered to extend from the source of the noise to the point at which the noise attenuates to ambient levels. Ambient noise levels at the project site are unknown. Conditions are likely noisier than a typical rural area, which would have an ambient noise level of 35 to 40 dB (WSDOT 2007), because of the background noise contributed by the Klickitat River in this reach. Ambient noise would also include regular intrusions from traffic on the Fisher Hill Road and from airplanes. Based on the formula above for attenuation over distance, a bulldozer operating at the Lyle Falls site could be heard above ambient noise as much as 0.5 mile away; however, the actual extent of disturbance around the Lyle Falls site would likely be much smaller, because it would be significantly contained by steep hillsides to the west and east.

The noise of blasting would be about 94 dB at 50 feet (FHWA 2006), about the same as the noise of other construction equipment and tools. Multiple small charges would be set, rather than one large charge. All blasting would occur underground, and blast noise would be directed upward more than horizontally. Blasting would occur near the river, where ambient noise levels are already relatively high. Noise levels associated with warning horns (sounded 5 minutes and 1 minute prior to blast initiation, and an all-clear signal sounded after the blast) are about 85 dB at 50 feet (FHWA 2006).

Audible disturbance could adversely affect some species that breed in the project area. The disturbance has potential to impair breeding success of several raptor species, including osprey, the only raptor known to nest in the immediate vicinity of the fish ladder. As mentioned above, the osprey is designated as a state "monitor" species.

In Washington, ospreys usually arrive in their nesting areas in March or April and lay eggs in April or May. The young can generally forage independently by the end of July. Osprey return to wintering areas in southern California and central and south America between late August and November (Poole et al. 2002). Although osprey pairs and individuals vary in their responses to human activity, their sensitivity to disturbance is generally highest during courtship, nest building, egg laying, and incubation. WDFW's management recommendations for osprey note that the critical period for osprey is April 1 through June 30 (Rodrick and Milner 1991). Disturbance during these early phases of nesting can cause osprey to abandon their nests permanently. Even temporary absence of adults can expose eggs or young to overheating, hypothermia, predation, and injury.

To prevent disturbance, wildlife management agencies typically recommend implementation of timing restrictions within specified distances from osprey nest sites during the breeding season. The existing osprey nest at Lyle Falls is located on a power pole about 225 feet north of the fish ladder exit, and about 725 feet from the ladder entrance. WDFW recommends implementing timing restrictions within 660 feet of an active osprey nest from April 1 to October 1; avoiding tree cutting within 200 feet of a nest; and retaining three to five dominant live trees or snags and some younger trees suitable for future roosting or nesting within 660 feet of a nest (Rodrick and Milner 1991). If construction cannot be designed to prevent loss of a nest site, WDFW notes that artificial platforms may be useful.

Work at the Lyle Falls site is planned to occur between late-June and October, overlapping the period of time when WDFW would ordinarily recommend timing restrictions for work within 660 feet of a nest. However, work would begin at a point when eggs have hatched and osprey are less sensitive to disturbance (Rodrick and Milner 1991). For this reason, it may be possible to modify timing restrictions for the first year of construction, and monitor nesting success to determine timing restrictions for the second year of construction. Alternatively, it may be possible to move the nest to a location farther from the project site, since osprey readily use man-made structures. In any case, consultation with WDFW would be needed to identify appropriate mitigation measures to protect osprey.

Construction would not affect bald eagle nest or roost sites. No large-diameter live ponderosa pine, cottonwood, or Douglas-fir trees or snags, that could be preferred eagle nest or roosting sites, would be removed during construction. Construction would require removal of several small ponderosa pine trees and Oregon white oak trees near the river bank. One of these, a 20-inch-dbh oak, may be large enough to serve as a suitable perch, but is too small to meet WDFW's 24-inch-dbh criteria for retention of known perch trees and conifers (Watson and Roderick 2001). Construction would not occur during the winter, the only time of year when bald eagles have been observed in the Lyle Falls project area.

It is unlikely that project construction would adversely affect the western gray squirrel. Studies in the Klickitat watershed showed that squirrels in this population use pine trees more frequently than oak trees for nesting, foraging, and cover, and tend to select the largest conifer trees for nesting (Linders and Stinson 2006). Linders and Stinson (2006) found that the mean dbh of 110 nest trees was 15.6 inches for pine, and 17.9 inches for oak. Except for one oak, no trees that would be removed during construction are large enough to provide suitable nest sites.

Squirrels in the Klickitat study area preferred stands with 25 to 75 percent canopy cover, and tended to avoid large openings. Trees in the project area are situated between the river and open grassland with very sparse cover of pines and oaks. Trees that would be removed for construction are not contiguous with other forest stands and no arboreal routes are available that would allow movement between stands. For these reasons, habitat conditions do not appear suitable for western gray squirrel nesting or foraging.

Western gray squirrels generally avoid human activity and noise (Rice in Linders and Stinson 2006), and may be sensitive to disturbance. Distance (0.25 miles), steep topography, and vegetation would provide a buffer between the nesting stand to the northeast of the fish ladder and construction noise and activity. Construction traffic would use the Fisher Hill Road, west of the river, and would not affect the known nesting stand.

### Operational Effects

As discussed in Section 3.1.2.2, disturbance of soils and vegetation would be about the same during operation of the improved fish ladder as under existing conditions. Vehicle and foot traffic would continue to disturb vegetation around the margins of the parking area and at informal campsites. High flows would disturb soils along the river bank during flood events.

Disturbance of wildlife would be about the same as under current conditions. The potential for disturbance to wildlife could be slightly reduced, because annual gravel and sediment removal from the ladder exit pool would no longer be necessary. Regular maintenance of the fish ladder, fishing and camping near the ladder facility, hiking and biking on the Klickitat Trail, and vehicle traffic on the Fisher Hill Road would continue at their current levels. Wildlife in the area, including nesting osprey, has habituated to these activities.

To the extent it improves passage, operation of the fish ladder would increase the abundance of salmon carcasses in the upper Klickitat watershed. Bald eagles are scavengers, as well as predators, and could take advantage of this additional food resource. An increase in carcass abundance would add marine-derived nutrients to the upper watershed. The addition of nutrients would provide more support for juvenile salmonids. Foraging bald eagles could take advantage of increases in the number of juveniles and subsequently, in any increases in adult returns. Over the long term, improved fish passage is expected to increase the population size, genetic fitness and viability of salmonid populations, which would in turn improve the prey base for bald eagles that nest and winter in the Klickitat subbasin.

Wildlife displaced during construction would likely make use of the project area again upon completion of the project, as vegetation is re-established on disturbed soils. The area of potential habitat for various species would be slightly reduced and would support slightly fewer individuals. However, there would be no change in habitat types (i.e., basalt bedrock; riverine pools, runs and cascades; sparse alder, willow and herbaceous vegetation along the shoreline; seasonal wetland; and pine/oak savannah), and the wildlife community would remain about the same.

## 3.4.3 Mitigation Measures

The following mitigation measures have been incorporated and analyzed during project planning to avoid, minimize or offset potential adverse effects on vegetation and wildlife:

- Temporary fencing would be installed around the small wetland area to prevent accidental disturbance during construction.

- Trees felled to clear areas for construction would be placed along the margins of the site to provide cover for birds, reptiles and small mammals.

- Construction timing restrictions would reduce potential disturbance of the nearby osprey nest. Consultation would be undertaken with WDFW and could result in the relocation of the next platform.

Several additional mitigation measures could be implemented prior to or during construction to prevent or minimize project effects on vegetation and wildlife. These measures are described below.

- Vegetation Protection Objectives
  - Conduct a systematic rare plant survey on probable disturbed areas prior to beginning construction.
  - Fence the wetland to avoid accidental damage.
  - Schedule construction during the dry season.
  - Minimize the areas of disturbance to only those which are necessary.
  - Dispose of excavated reed canary grass in a manner that prevents reestablishment.

- Minimize the area of soils exposed at any one time to reduce dust that can bury native plants.
- Use flagging and fencing to protect oak trees adjacent to the ladder footprint that are to be retained.
- Provide temporary revegetation if construction activity takes place in two seasons, as proposed.
- Avoid disposal of excavated materials or other debris in high flow channel.
- Place excavated materials in disposal area to match existing contours.
- Stockpile felled trees on site.

- Wildlife Protection Plan

  Effects of construction on wildlife are anticipated to be minor and temporary; however, implementation of a Wildlife Protection Plan would address potential disturbance to osprey, minimize the risk of adverse interactions between humans and wildlife, and take advantage of enhancement opportunities.

  - Consult with WDFW to identify and implement measures (e.g., timing restrictions, monitoring, nest relocation) to prevent, minimize or mitigate disturbance to nesting osprey.
  - Maintain clean work areas with proper litter control and sanitation in order to prevent wildlife attraction.
  - Dispose human refuse in containers that can be sealed and protected from wildlife.
  - Use felled trees to construct brush piles along the western margin of the construction staging area adjacent to the existing woodland to provide cover for reptiles, birds and small mammals.

- Revegetation Plan

  After construction, implementing a revegetation plan would be valuable to minimize erosion, restore native plant communities, provide wildlife habitat, reduce the risk of weed introduction and establishment, and restore, inasmuch as possible, the natural landscape character of the project area. This plan is outlined below.

  - Consult with WDFW and Yakama Nation to identify appropriate revegetation species, using within-watershed sources of seeds or live plant material wherever possible.
  - In developing revegetation plan, emphasize replanting Oregon white oak and ponderosa pine to replace those lost or disturbed during construction.
  - Use certified weed-free seed mixes and mulches.
  - Use natural tackifiers if necessary to reduce wind removal of loose mulch.

- Develop standards and methods and a monitoring schedule for measuring the success of revegetation and identify measures to be implemented if standards are not met, including measures for controlling noxious weeds.
- Develop a schedule for monitoring and maintenance of revegetated areas.

# 3.5 Threatened and Endangered Species

## 3.5.1 Affected Environment

A list of federally proposed and listed threatened or endangered species, and critical habitat that may occur in the project area was compiled from the USFWS and NMFS species list websites and critical habitat designations. In addition, maps were obtained from the WDFW Priority Habitats and Species program that show documented occurrences of listed species in the project area.

As shown in Table 3-13, the USFWS Western Washington website indicates that six federally proposed or listed species may occur in Klickitat County (http://www.fws.gov/easternwashington/documents/Klickitat%20Cty%2009-19-06.pdf). These include bull trout, Ute ladies'-tresses, gray wolf, Canada lynx, northern spotted owl, and bald eagle[8]. The Washington state status of each of these species also is identified in Table 3-13. Klickitat County contains designated critical habitat for the northern spotted owl. The Klickitat River at the project site is designated as bull trout critical habitat. The NMFS website indicates that the Klickitat River is also inhabited by Middle Columbia River (MCR) steelhead trout, an ESA-listed threatened species (http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Steelhead/STMCR.cfm). Lyle Falls is within a reach designated as critical habitat for MCR steelhead.

**Table 3-13 Species Listed by USFWS as Threatened or Endangered That May Occur in Klickitat County**

| Common Name (*Scientific Name*) | Federal Status | State Status |
|---|---|---|
| Bull trout (*Salvelinus confluentus*) | Critical Habitat, Threatened | Candidate |
| Middle Columbia River steelhead trout (*Oncorhynchus mykiss*) | Critical Habitat, Threatened | Candidate |
| Ute ladies'-tresses (*Spiranthes diluvialis*) | Threatened | Endangered |
| Gray wolf (*Canis lupus*) | Endangered | Endangered |

[8] On June 28, 2007, USFWS announced its decision to remove the bald eagle from the federal list of threatened and endangered species, effective within 30 days of publication in the Federal Register (USFWS 2007). USFWS will coordinate with other federal agencies, tribes, and the states to monitor bald eagles at five-year intervals for a period of 20 years after de-listing.

| Common Name (*Scientific Name*) | Federal Status | State Status |
|---|---|---|
| Canada lynx (*Lynx canadensis*) | Threatened | Threatened |
| Northern spotted owl (*Strix occidentalis caurina*) | Threatened | Endangered |
| Bald eagle (*Haliaeetus leucocephalus*) | De-listed, Monitor Species | Threatened |

### 3.5.1.1 Columbia River Bull Trout

Based on the best available information, bull trout (*Salvelinus confluentus*) may be sporadically present in the project area (i.e. from Lyle Falls to the mouth of the Klickitat River) although at extremely low abundance levels. Portions of the Klickitat River (including the project reach) are designated as bull trout critical habitat.

#### Columbia River Bull Trout Distinct Population Segment Status and Distribution

Bull trout are native to the Pacific Northwest and western Canada, historically ranging from northern California and Nevada to the headwaters of the Yukon River in Northwest Territories (63 FR 31647). They are widespread throughout tributaries of the Columbia River Basin, but are patchily distributed at the local level (Whitesel et al. 2004). Historically, bull trout were estimated to occupy about 60 percent of the Columbia River Basin, and presently occur in 45 percent of their historical range (63 FR 31647). The USFWS listed the Columbia River bull trout DPS as threatened under the ESA on June 10, 1998. Final critical habitat was designated by the USFWS for the Columbia River bull trout DPS on September 26, 2005 (70 FR 56212). The Lower Columbia River Recovery Unit team identified two bull trout core areas, the Lewis and Klickitat rivers (USFWS 2002a). WDFW characterizes the status of bull trout in the Klickitat River as unknown (WDFW 2002).

The USFWS draft bull trout recovery plan (USFWS 2002a) identifies factors contributing to bull trout decline in the Columbia River DPS including the fragmentation and isolation of local populations caused by dams, diversions, and other land uses; degradation of spawning and rearing habitat; introduction of nonnative fish; and historical over-harvest. In addition to these factors, a drastic reduction of the prey base, such as juvenile salmon, may have contributed to the decline of the Columbia River DPS (USFWS 2002a).

#### Bull Trout in the Klickitat River

Little information is available on the actual life history of bull trout in the Klickitat River, but based on the size of bull trout observed in the subbasin, a resident life history likely dominates (Thiesfeld et al. 2001, Gray 2006). The only local population in the Klickitat River core area identified by the USFWS recovery unit team is in the West Fork (RM 63 of the mainstem), upstream of a series of waterfalls that form an upstream migration barrier. Studies by Thiesfeld et al. (2001) also concluded that the West Fork

bull trout population was an isolated stream resident population. No observed fish were greater than 300 mm, whereas migratory bull trout generally are larger than 300 mm (e.g. Fraley and Shepard 1989; Thiesfeld et al. 1996, Pratt 1992; Hemmingsen et al. 2001).

Except for the resident West Fork bull trout population, only a few bull trout (less than 20) have ever been observed in the mainstem 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) compiled all known references to bull trout in the Klickitat River; however, the observations outside the West Fork were not very well documented. Five of ten references were anecdotal reports from anglers, and 4 provided no fish length. In addition, some of the information on bull trout location reported in Gray (2006) did not match the source documentation. The reports by anglers are especially suspect as brook trout are commonly misidentified as bull trout by untrained anglers and brook trout are found throughout the Klickitat River basin (Thiesfeld et al. 2001). Schmetterling and Long (1999) reported in Montana that of those anglers attempting to identify fish to the species level, brook trout were misidentified as bull trout 48 percent of the time.

Of the bull trout observations reported by Gray (2006), six were reported to be larger than 300 mm in length, which suggests potential migratory individuals. These observations include one 430 mm long bull trout caught downstream of the Little Klickitat River in 1991; two 350 mm long bull trout caught in the lower Klickitat River in 1990 (location unknown); a 330 mm bull trout caught at RM 8 in 2003; a 610 mm bull trout from RM 43 in 2001; and a 457 mm bull trout from about RM 1.3 in 2006.

These few observations of potential migratory bull trout (i.e. fish greater than approximately 300 mm in length) suggests that some bull trout within the Klickitat River basin 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 2002b). This type of migration behavior has been documented in Puget Sound tributaries (Goetz et al. 2004; Brenkman and Corbett 2005). At this time, it is also unknown whether bull trout have ever migrated over Lyle Falls or through the fish ladder. There is no documentation of bull trout passing Lyle Falls or of being captured in the fish ladder trap, although the trap has captured thousands of other salmonids during the time frame that migratory bull trout would be moving upstream (April to August).

#### 3.5.1.2 Middle Columbia River Steelhead

The Klickitat River supports summer and winter steelhead (*Oncorhynchus mykiss*), both of which are native to the basin and included within the Middle Columbia River (MCR) steelhead DPS. Lyle Falls is within a reach designated as critical habitat for MCR steelhead.

### Middle Columbia River Steelhead DPS Status and Distribution

The MCR steelhead ESU was originally listed as threatened under the ESA on March 25, 1999. Subsequent court rulings led NMFS to redefine the ESU as a DPS, and on January 5, 2006, NMFS reaffirmed the threatened status of the MCR steelhead DPS (71 FR 834). The MCR steelhead DPS includes all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers in streams that include the Klickitat River. Hatchery summer steelhead in the Klickitat River are not listed under the MCR steelhead DPS, but the progeny of these hatchery-derived fish that spawn naturally are listed as threatened and included in the DPS. Therefore, hatchery steelhead are discussed in this section because their naturally-spawned progeny are protected under the ESA. NMFS designated final critical habitat for MCR steelhead on September 2, 2005, (70 FR 52630), effective January 2, 2006, and includes the Lyle Falls reach.

The NMFS Biological Review Team could not conclusively identify a single population in the MCR steelhead DPS that is naturally self-sustaining (BRT 2003) and most of the populations in the DPS are in decline and in relatively low abundance (no population has a recent mean abundance of greater than 750 spawners). WDFW considers Klickitat River summer and winter steelhead to be native stocks that are maintained by natural production ( 2002), although the abundance of hatchery summer steelhead adults exceeds naturally produced populations. The status of these two stocks is unknown due to lack of abundance data (WDFW 2002). Natural steelhead production is severely reduced in the Klickitat River due to harvest ( which on average takes about 76 percent of returning adults between the sport and tribal fisheries ) (YN 2004a), tributary habitat degradation by land uses such as grazing and water withdrawals for water supply and irrigation (WSCC 1999).

The run-timing of naturally produced summer steelhead is protracted in the Klickitat subbasin, with at least a few adult fish entering the river every month of the year (personal communication, B. Sharp and C. Frederickson, YN Fisheries, January 2007). Peak upstream passage of summer steelhead adults at Lyle Falls is believed to occur between July and September, tapering off substantially from November to early January. Occasionally, substantial numbers of naturally produced summer steelhead enter the Klickitat River from January through March or April, just prior to or during the spawning period of March through early April (personal communication, B. Sharp and C. Frederickson, YN Fisheries, January 2007). Hatchery summer steelhead adults have an earlier run timing, March through August, peaking in June and July (Gray 2006). Hatchery summer steelhead also spawn earlier than their naturally produced counterparts, typically from November through January (personal communication, B. Sharp and C. Frederickson, YN Fisheries, January 2007).

Naturally produced winter steelhead migrate from November through March or early April, with a peak in January and February. Winter steelhead spawn from late March through June (personal communication, B. Sharp and C. Frederickson, YN Fisheries, January 2007). In the Klickitat River subbasin, fry are believed to emerge from April through mid-June and rear for two years (Myers et al. 2003). Steelhead juveniles

generally migrate to the ocean from early spring through June after 2 to 3 years of rearing in freshwater. Smoltification and outmigration in the Klickitat River occurs in April and May, peaking in May (WSCC 1999).

### Steelhead in the Klickitat River

Limited survey work has shown very low utilization of the available spawning habitat. Estimated escapement ranged from 1,335 (1985) to 5,972 (1981) adults, averaging 2712 adults. Naturally produced fish comprised about one-third of the total escapement, with hatchery fish comprising the remainder (WSCC 1999). Based on redd count data in YN 2004, the total escapement of steelhead in the Klickitat subbasin has averaged only 630 adults since 1987, although other analyses suggest that these red counts may substantially underestimate spawner abundance (personal communication, J. Zendt, YN Fisheries, January 2007). Based on 2005/2006 mark-recapture estimates, abundance of adult summer steelhead upstream of Lyle Falls was 2,983 fish and the population for winter steelhead adults was 3,410 fish (Gray 2006); however, only hatchery fish were marked and it is unknown how these estimates relate to naturally produced fish. The annual harvest of steelhead in the Klickitat River has averaged 2,100 fish between 1987 and 2002. Total harvest of steelhead in the Klickitat River between May 1, 2001 and April 30, 2002 was 3,896 fish (WNP and Aspect Consulting 2005). An escapement goal of 2,965 has been established for the summer steelhead stock (WDFW 2002); no escapement goal is set for the winter stock.

Steelhead spawn in the mainstem Klickitat between RM 5 and RM 50 (YN 2004a), and redds have been documented in several tributaries (YN 2004a; WDFW 2002; WSCC 1999). Most spawning takes place in the Klickitat and Little Klickitat rivers (WDFW 2002). There is little information about juvenile rearing in the subbasin; steelhead juveniles are assumed to be rearing in all areas where spawning occurs (WSCC 1999).

The historic presence of winter steelhead in the watershed has been inferred from bright steelhead observed in late winter and early spring steelhead catches (WSCC 1999). No information exists on winter steelhead spawning locations, although it is believed that they spawn in the lower mainstem, perhaps as far upstream as Castile Falls (RM 64) (WDFW 2002).

The Klickitat River has been planted with non-native hatchery summer steelhead each year since 1960 (WDFW 2002). There is concern about the genetic impact of potential interbreeding between hatchery fish and naturally produced summer steelhead (WDFW 2002). WDFW also indicates that hatchery winter steelhead have been released into the Klickitat subbasin, but no details were given.

Gray (2006) reported that 24 percent of hatchery summer steelhead calculated to be upstream of Lyle Falls came through the fish ladder, which means that 76 percent of these steelhead jumped the falls. These percentages should not be viewed as total passage rates because there is no data on the number of hatchery steelhead that approached Lyle Falls, but that did not ascend either the falls or the fish ladder.

However, the data does indicate summer steelhead are more likely to jump the falls. It is unknown if passage data for native summer and winter steelhead can be extrapolated from hatchery fish counts.

### 3.5.1.3 Ute ladies'-tresses

Ute ladies'-tresses (*Spiranthes diluvialis*) is a perennial orchid that the USFWS listed as a threatened species in 1992 (57 FR 2048). At that time, Ute ladies'-tresses was known from only 10 sites in three states. Documented populations of Ute ladies'-tresses occur at elevations ranging from 720 feet (three occurrences in Chelan County) to 7,000 feet. No populations have been documented below 720 feet. Located at approximately 200 feet in elevation, the Lyle Falls Fish Passage project area is situated below the elevational range for Ute ladies'-tresses.

Ute ladies'-tresses occurs primarily in moist to wet meadows. In their rangewide status review, Fertig et al. (2005) noted that all the occupied sites had in common was the presence of moist soils through the flowering season (typically late July through late August, or sometimes through September). Soils in the Lyle Falls project area are likely too dry to support this species. The subbasin plan indicates that 75 percent of annual precipitation falls between November and May, with rainfall being lowest in July and August (YN et al. 2004). Soils in the seasonal wetland observed near the proposed fishway, which likely represent the wettest conditions in the area throughout the year, were completely dry at a depth of 12 inches in September 2006, providing further indication that the hydrologic regime would not support this species.

Although Ute ladies'-tresses is typically found in grass/forb-dominated meadows, some occurrences have been documented in riparian habitats with a cottonwood, Russian olive, or willow overstory. This plant species is not known to occur in ponderosa pine, oak woodland, or dry grassland habitats.

In the Klickitat Trail Biological Evaluation, the USFS concluded that the trail corridor between Pitt and Lyle (including the project area) does not contain habitat that would support Ute ladies'-tresses. USFS biologists did not observe this species during several surveys conducted between 1993 and 2003 (USFS 2003b). Based on a comparison of the elevations, soil moisture conditions, general distribution, and plant communities that are known to support Ute ladies'-tresses with site characteristics at Lyle Falls, it is unlikely that this species is present in the project area.

### 3.5.1.4 Gray Wolf

After near-total eradication, the USFWS listed the gray wolf (*Canis lupus*) as an endangered species in most of the U.S. in 1978 (43 FR 47). The USFWS continues to consider wolves in Washington as endangered, although reintroduced wolves in Idaho south of Interstate 90 and in the Yellowstone area are designated as nonessential experimental populations (USFWS 2006).

Occasional wolf sightings in Washington may be the result of dispersal southward through the Cascades from British Columbia, and westward from Idaho (WDFW 2006c). The nearest sighting (considered "moderately reliable") to the project area is mapped about 20 miles northwest of Lyle Falls (PBI undated).

The Klickitat River subbasin currently does not support any wolves. Large blocks of contiguous forest habitat in the upper watershed that are in federal or tribal ownership could support wolves in the future, as their populations in Idaho increase. Wolves could use the lower river corridor for dispersal, but the lack of contiguous forest habitat, land uses on private ownerships outside the National Wild and Scenic River corridor, and the level of regular activity at the fish ladder from April through December, would likely limit its suitability for the establishment of any wolf packs.

#### 3.5.1.5 Canada Lynx

The USFWS listed the Canada lynx (*Lynx canadensis*) as a threatened species in 2000 (65 FR 68), and designated critical habitat in 2006 (70 FR 216). One critical habitat unit is designated in Washington, at the north end of Chelan County, about 175 miles north of Lyle Falls.

The upper Klickitat River subbasin encompasses cool, moist conifer forest at high elevations that may have supported Canada lynx at one time, but none of the Klickitat subbasin is considered to be within the current range of this species (68 FR 128). The only existing lynx populations in Washington occur in the north Cascades and northeastern counties (Stinson 2001). There is no evidence that a lynx population ever occurred in Oregon (68 FR 128), and none have been documented in recent years. The project area is located outside the range of this species and does not contain suitable habitat. For these reasons, Canada lynx would not be present at Lyle Falls.

#### 3.5.1.6 Northern Spotted Owl

The USFWS listed the northern spotted owl (*Strix occidentalis caurina*) as a threatened species in 1990 (55 FR 123) and designated critical habitat in 1992 (57 FR 10). Critical habitat nearest the Lyle Falls Project area is located on the Gifford Pinchot National Forest, just east of the Skamania/Klickitat County border and about 20 linear miles northwest of Lyle Falls. Northern spotted owls are known to nest about 18 miles north of Lyle Falls in the upper Klickitat River subbasin, but this area is thought to be at the extreme southern and eastern edge of the species' range in Washington (66 FR 84).

The northern spotted owl is strongly associated with old-growth and mature conifer forests for nesting, and may use younger conifer stands for roosting, foraging and dispersal (Blakesley in Courtney et al. 2004). This species is not known to use open ponderosa pine/Oregon white oak woodlands, and typically avoids edge habitats (Blakesley in Courtney et al. 2004). For these reasons, the northern spotted owl would not be present in the Lyle Falls project area.

## 3.5.2 Environmental Consequences

The following sections discuss the effects of the alternatives on federally listed species that are likely to occur in the project area. In addition to the analyses below, BPA is preparing a Biological Assessment that will serve as the basis for consultation with USFWS and NOAA-Fisheries regarding project effects and any conservation measures that should be implemented to prevent, minimize, or mitigate such effects.

As discussed in Section 3.5.1, the Lyle Falls project area does not contain suitable habitat for four listed species that may occur at other locations in Klickitat County and these species have not been observed at the project site. These are Ute ladies'-tresses, northern spotted owl, Canada lynx, and gray wolf. Therefore, these species are not discussed further in this document.

In the following sections we analyze the effects of the alternatives on MCR steelhead, and Columbia River bull trout.

### 3.5.2.1 No Action Alternative

#### Middle Columbia River Steelhead

The Lyle Falls fishway would continue to operate as it currently does under the No Action alternative. Fish passage would continue as described in Section 3.3.1.2. Based on the lack of empirical data, it is unknown to what degree the current fish passage facility limits winter or summer steelhead migration into the Klickitat River. While data suggests that most hatchery summer steelhead (approximately 76 percent) that migrate upstream of the project site jump the falls instead of ascending the ladder, jumping the falls may deplete their energy reserves and reduce their reproductive success to some degree. Based on the fish jumping performance and hydrologic analysis presented in Section 3 3.2.2 (Fish Passage), up to about 37 percent of the steelhead run (winter and summer combined) may encounter impaired passage conditions at Lyle Falls (i.e. where low or high flows create passage conditions at the ladder or falls that are outside the jumping ability of steelhead). There is no data regarding the number of steelhead that approach the ladder, but are not able to jump the falls.

As described in Section 3.3.1.2, passage conditions limit fall Chinook and coho access to the upper watershed, in turn limiting the nutrients contributed by their carcasses. This nutrient limitation may keep natural fish production levels low and limit forage resources for naturally-produced juvenile steelhead rearing in the Klickitat River.

Fish monitoring and enumeration would continue to occur manually in the sorting bay, with intensive handling of MCR steelhead that enter the fish ladder. This handling has caused steelhead mortalities in the past (Gray 2006). Under the No Action alternative, the ability of fish management agencies to monitor Klickitat steelhead population trends would continue to be limited. In fact, due to the lack of reliable monitoring data, WDFW (2002) declared that it is not possible to determine the population abundance trend for summer and winter steelhead in the Klickitat River subbasin. While other

strategies could be developed to address population monitoring needs, the Klickitat River presents safety and logistical constraints, such as narrow steep canyons with difficult access and whitewater rapids, which make conventional fish population surveys difficult and hazardous.

#### Columbia River Bull Trout

Bull trout have never been observed at the Lyle Falls fish ladder, and less than 10 have been observed in the mainstem Klickitat River downstream of the West Fork (RM 63) (Gray 2006). It is unknown what effect the fishway has on the few bull trout that have been observed in the mainstem Klickitat River. The overall lack of abundance of large migratory bull trout in the lower river suggests that the falls may be a passage barrier or at least a substantial upstream passage challenge for bull trout and may limit the expression of a migratory life history in this river. Passage at Lyle Falls may also hinder other nearby populations (i.e. Hood River) from expanding their distribution into suitable habitat, such as newly available habitat upstream of Castile Falls, and potentially hindering attainment of some of draft recovery goals (USFWS 2002b).

### 3.5.2.2 Proposed Action Alternative

#### Construction Effects

Middle Columbia River Steelhead

Temporary construction effects on juvenile and adult steelhead are described in Section 3.3.2.2 and include potential displacement during in-water work, upstream migration delay, or potential handling of steelhead during fish salvage operations associated with in-water work. Up to approximately 34 percent of upstream migrating adult summer steelhead and 15 percent of downstream migrating juvenile steelhead may encounter the fish ladder site during construction. Construction may cause some migration delay of adult steelhead and result in some handling of juvenile steelhead that may be trapped, but rescued during in-water work. However, by following the mitigation measures as described in Section 3.3.3, these potential effects would be reduced to the greatest extent practicable. Construction could also affect water quality by introducing sediment laden water or a spill of toxic substances (see Section 3.3.2.2); however, the potential for these effects would be eliminated or reduced by following standard construction best management practices. Construction effects are not expected to substantially reduce successful upstream and downstream migration and survival of steelhead during the construction period when compared to existing passage and survival conditions.

The Klickitat River at Lyle Falls is designated as critical habitat for MCR steelhead. A critical habitat analysis determines whether a Proposed Action might destroy or adversely modify critical habitat by examining any change in the conservation value of the essential features (i.e. primary constituent elements [PCEs]) of that habitat). The Lyle Falls reach is primarily a migration corridor for adult, juveniles and post-spawn adult steelhead (i.e. kelts). The PCEs for upstream and downstream migration include appropriate depths and velocities to provide an unobstructed migration corridor for successful passage. The

limited impact of replacing 950 square feet of habitat with the passage facility and resting pools would likely improve fish habitat conditions and migratory corridor PCEs overall. The resting pool inside the ladder at the base of the falls would allow upstream migrating steelhead to recuperate before either ascending the fish ladder or jumping the falls. The pool at the upstream fish ladder exit would provide slow water resting place for steelhead, which would presumably reduce fallback over the falls. Under existing conditions the ladder exits into fast water. The fish ladder improvements would also result in a substantial increase in the proportion of time that the fish ladder flow conditions are within the range of swimming ability for steelhead, and may result in an increase steelhead passage of up to 54 percent, assuming the fish use the easiest passage route.

Altering the fish ladder is not expected to affect downstream migrating steelhead because it would not obstruct the falls (the likely the primary downstream passage corridor) and the fish ladder itself would provide an unobstructed downstream migration corridor.

Therefore, because upstream and downstream fish passage conditions would be improved over existing conditions and migratory corridor PCEs would be improved, the Proposed Action would not be considered destruction or adverse modification of critical habitat.

#### 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 project reach during construction from late-June through October. However, if an individual bull trout were present during in-water work, the effects would be similar to those described for upstream migrating steelhead adults or downstream migrating juvenile steelhead (see Section 3.3.2.2). The effects on bull trout during construction include potential displacement of an individual fish during in-water work, upstream migration delay, or potential handling of an individual bull trout during fish salvage operations associated with in-water work. These effects are not expected to rise to a local population or DPS-level effect on bull trout.

The project reach of the Klickitat River is designated bull trout critical habitat. Proposed instream work would permanently replace 950 square feet of instream habitat with the new fish ladder components. A critical habitat analysis would determine whether the Proposed Action might destroy or adversely modify designated critical habitat for listed species by examining any change in the conservation value of the essential features (i.e. PCEs) of that habitat. If migratory bull trout are occasionally present at the fish ladder, they would most likely use the habitat around the fish ladder as a migration corridor. Based on the lack of knowledge of bull trout passage at the falls, it is unknown how habitat modification would affect passage. Presumably the fish ladder would provide an easier passage route for any migratory bull trout that may attempt to ascend the falls. Therefore, while altering the instream habitat at the falls may affect designated bull trout critical habitat, it most likely would improve passage conditions, resulting in an improvement to migratory corridor PCEs. As such, this effect would not be considered destruction or adverse modification of designated bull trout critical habitat.

### Operational Effects

#### Middle Columbia River Steelhead

The effects of implementing the Proposed Action alternative on steelhead are discussed in detail in Section 3.3.2.2. Beneficial effects include reduced handling stress during enumeration, improved population monitoring capabilities, increased marine-derived nutrients (salmon carcasses) that would increase forage for juvenile steelhead, and an unobstructed route past Lyle Falls that could be less stressful and increase reproductive success. Adverse effects would include potentially reducing the fitness of the steelhead population by allowing small (i.e. potentially weaker) fish to spawn upstream of Lyle Falls and increasing competition between all fish species due to increased abundance. However, the overall operational effect to steelhead is expected to be beneficial. Improvements would provide an unobstructed upstream migration route through nearly all of the winter and summer steelhead run, and would improve long-term population monitoring capabilities.

#### Columbia River Bull Trout

Providing unobstructed fish passage at the Lyle Falls would benefit bull trout to the extent that the improved fish ladder may provide a less stressful passage route around Lyle Falls (note that no bull trout have ever been observed at Lyle Falls, either in the fish ladder or ascending the falls). Improved fish passage could also provide opportunity for migratory bull trout from the Hood River to naturally explore and expand their distribution into the Klickitat River subbasin, if suitable habitat exists. Migratory bull trout, likely from the Hood River, have been documented in the Columbia River near the mouth of the Klickitat River (Starcevich et al. 2006). Improving passage at Lyle Falls is also consistent with one of the actions of the draft bull trout recovery plan, which is to provide unobstructed migratory corridors to facilitate metapopulation dynamics and gene-flow between local populations, and to allow bull trout to expand their distribution to suitable unoccupied areas, which may increase local populations within the Lower Columbia River bull trout recovery unit (USFWS 2002a).

## 3.5.3 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 Middle Columbia River steelhead and bull trout are the same as those identified in Section 3.3.3 to protect other aquatic resources.

- Consultation would be undertaken with the NMFS and the USFWS prior to construction to ensure that appropriate measures are implemented to protect any listed species in the project area.

# 3.6 Wetlands and Floodplains

## 3.6.1 Affected Environment

### 3.6.1.1 Wetlands

Formation of floodplains and wetlands in much of the Klickitat River watershed is dictated by climate (i.e. low rainfall) and topography (deeply incised canyons with narrow valley floors). These factors limit hydrologic connection with surrounding lands, thereby inhibiting wetland formation. There is little published information about wetlands in the project area (WNP and Aspect Consulting 2005); therefore, the entire project site was investigated for wetland presence/absence in September 2006. This investigation followed the routine methods described in the U.S. Army Corps of Engineers Wetland Manual (1987) and Washington State Wetlands Identification and Delineation Manual (WDOE 1997). These guidance documents largely focus on hydrology, vegetation, and soils. One small wetland identified in the project area is in a topographic depression within a flood-prone high flow channel adjacent to the main Klickitat River channel (Figure 3-5).

This wetland was delineated at approximately 1,350 square feet in area. It is located about 110 feet from the top of the bank of the active channel and about 350 feet upstream from the upstream end of the existing fishway. Although sparse, vegetation is dominated by wetland species. The dominant plants identified during the survey are listed in Table 3-14. Scattered sloughgrass plants were present as was a single willow. According to the Wetland Indicator Status (WIS) rating system, OBL-rated plants occur almost always in wetlands (estimated 99 percent probability) and FACW-rated plants usually occur in wetlands (estimated 67 to 99 percent probability) (Corps of Engineers 1987).

**Table 3-14 Wetland Plants Observed at Project Site**

| Scientific Name | Common Name | Wetland Indicator Status Rating |
|---|---|---|
| *Eleocharis palustris* | Creeping spikerush | OBL |
| *Juncus bufonius* | Toad rush | FACW |
| *Beckmannia syzigachne* | Sloughgrass | OBL |
| *Juncus effusus* | Soft rush | FACW |
| *Salix* spp. | Willow | FAC-FACW |

Key:
FAC: facultative
FACW: facultative wet
FAC-FACW: facultative – facultative wet
OBL: obligate wetland

Soils in this wetland area are sandy and showed no indicators of hydric conditions (i.e. conditions that lead to oxygen-deprived soils in the root-zone). However, sandy soil may not exhibit indicators of hydric conditions within a frequently flooded area and may be considered as a naturally atypical situation (Corps of Engineers 1987).

No standing water or saturated soils were evident during the site visit in September 2006, but watermarks on boulders indicate that the wetland periodically inundates with standing water to a depth of about 18 inches. Based on the location of the wetland in a high flow channel near the river, and the stage/discharge relationship documented at the fish ladder site, the wetland has a surface water connection with the river, and is likely inundated by high flow events greater than approximately 10,000 cfs. Flows of this magnitude occur approximately every other year (i.e. 10,000 cfs is estimated to be the river flow at the fish ladder during the 2-year storm, see Section 3.2.1.1), generally in the late spring.

In the State of Washington, WDOE uses a rating system to evaluate the relative importance of wetlands (Hruby 2004). The system is based on factors that include a wetland's ability to perform a variety of wetland functions, such as protecting water quality, moderating flood flows, and providing wildlife habitat. The rating system has not been calibrated for wetlands that are less than 0.10 acre in size (Hruby 2004), but it can provide information about the functions and values of even small wetlands. Application of the rating system to the Lyle Falls project area wetland results in a classification of Category III. This category includes wetlands that are generally disturbed, small, and/or not very diverse, and have a moderate level of functions. According to the Klickitat County Critical Areas Ordinance, wetlands smaller than 2,500 square feet, are exempt from management regulations (personal communication, J. Sheridan, Klickitat County Senior Planner, November 27, 2006).

#### 3.6.1.2 Floodplains

Executive Order 11988 (Floodplain Management) directs federal agencies to identify and evaluate the potential effects of actions they may take in areas that are subject to a one percent or greater chance of flooding in any given year. Such areas are defined as the 100-year flood zone by the Federal Emergency Management Agency (FEMA) and are depicted on flood insurance maps that it produces. The entire project site is within a FEMA-designated flood zone, including the floodplain previously identified. As shown on Figure 3-5 and in Section 4.4, the FEMA flood zone extends upslope from the river to the edge of the old railroad grade, which is now the Klickitat Trail.

## 3.6.2 Environmental Consequences

#### 3.6.2.1 No Action Alternative

Under the No Action alternative, fishway operations would continue with no effect to the existing 1,350-square-foot wetland. Late spring flows would continue to inundate the small wetland located in the high flow channel approximately every two years. Similarly, the FEMA-designated floodplain would continue to be affected as it has in the past with periodic inundation. The existing ladder is designed to be, and frequently is submerged during high flow events.

### 3.6.2.2 Proposed Action Alternative

#### Construction Effects

##### Wetlands

The small wetland identified in the project area would not be disturbed during construction (Figure 3-5). It lies between the proposed water supply intake structure and the spoil disposal site. By following standard best management practices, such as installing silt fences around construction work areas and by clearly marking and fencing the perimeter of the wetland, there should be no impact to this small area (see also Section 4.4). Fencing the sensitive habitat in this small area would prevent inadvertent encroachment by construction personnel.

##### Floodplains

All facility upgrades would take place within the FEMA-designated 100-year floodplain, including the proposed maintenance building (Figure 3-5). There are no practical alternatives to locate the ladder outside of the floodplain. By definition, the fish passage facility must be in close proximity to the river in order to serve its function. Hydrologic effects of the proposed facility construction are discussed in Section 3.2.2.2. All construction would occur during the driest portion of the year when flooding is not anticipated. No equipment or supplies would be stored on site between work periods and all disturbed areas would be stabilized; therefore, construction-related effects during flood events are not expected.

#### Operational Effects

##### Wetlands

Fish passage facility operation would have no effect on the existing wetland which is located upstream of the proposed fishway extension. The natural passage of flood flows would be unimpeded through the high flow channel that supports the wetland.

##### Floodplains

Additional operational effects on river hydrology beyond those discussed in Section 3.2.2.2 include potential changes to the flood elevation. Typically, federal, state, and local regulations deter development in floodplains, such as the Klickitat County Critical Areas Ordinance and Floodplain Management Ordinance (No. 62981). However, floodplain development typically is allowed if a no net rise in flood elevation standard can be achieved, and if development would not result in flooding of otherwise flood-free areas (Klickitat County Critical Areas Ordinance, No. 0012704). In the case of proposed fish enhancement structures, FEMA Region 10 has a policy that may override the need for a detailed hydraulic analysis. The floodplain encroachment should be as minor as possible. In the case of Lyle Falls, the new fishway channel would effectively create a "hole" below existing grade (approximately 2,200 cubic yards in size) that would transport floodwaters, offsetting the small portion of the fishway that would be above

grade. The net effect of this addition would be near zero. The proposed 960-square-foot concrete equipment building would be upslope from the fishway (about 20 feet higher in elevation) yet still within the FEMA-designated floodplain. The building would be approximately 5 feet above the active flood channel elevation (personal communication, Harbor Engineers, June 2007) but within the 100-year floodplain level. In addition, rock excavated from the new fishway chambers would cover an area of about 30,000 square feet to a depth of approximately 4 feet. The addition of these materials to the floodplain would have a minor effect on the flood elevation and are not expected to result in flooding of previously flood-free areas upstream or downstream of the project site.

### 3.6.3 Mitigation Measures

The following measures have been incorporated and analyzed during project planning to avoid, minimize or offset potential adverse effects to wetlands and floodplains:

- Implement an erosion and sediment control plan (see Section 3.1.3).
- Install temporary protective fencing around the wetland perimeter during construction.
- Limit the profile of instream structures to affect the least surface area within the floodplain.
- Allow unimpeded flow of water through the Klickitat River channel.

## 3.7 Cultural Resources

Cultural resources are nonrenewable evidence of human occupation or activity related to prehistory, history, architecture, archaeology, engineering, and culture. Historic properties, a subset of cultural resources, consist of any district, site, building, structure, artifact, ruin, or object eligible for inclusion on the National Register of Historic Places. Historic properties include "prehistoric" resources that predate European settlement. Another category of property evaluated in this section is Traditional Cultural Properties which are properties identified by an existing community as being important to that community's historic identity and traditional knowledge and culture. Several investigations were conducted to determine the existence of cultural resources in the project area.

### 3.7.1 Affected Environment

The area around Lyle Falls and the existing fish ladder has traditional and contemporary importance to the YN. Adjacent to the site is a historic railroad corridor that has been converted to a public trail. The approximately 0.5-mile long gorge that extends

downstream from the existing fish ladder is the site of a tribal dip net fishery that is one of the key values for which the Klickitat River was designated as Wild and Scenic. This practice is identified by the USFS as one of the outstandingly remarkable values. The project site plays an important role in perpetuating the traditional and cultural practices of the YN.

#### 3.7.1.1 Prehistoric Land Use

The diaries of early explorers and traders traveling through the Columbia River area provide glimpses of pre-contact conditions, although information is quite limited for areas away from major travel routes. Several Columbia River Tribes continue to use the project area, but it is the Klickitat Band of the Yakama Nation that has a direct and ancestral claim to the land where the project is proposed. Ethnographic information specific to the Klickitat Band is limited (White et al. 2006). Prior to 1800, the territory of the Klickitat Band extended west from the Klickitat River, taking in the lower half of the Klickitat River and the entire White Salmon basin. Their largest village site was near the confluence of the Klickitat and Little Klickitat rivers, upstream of Lyle Falls.

The lifestyle of the Columbia River tribes was drastically affected from the earliest contact with Euro-Americans. The result was a major shift in the traditional hunting and gathering pattern (seasonal round) that had once been a part of their daily lives. Prior to the Treaty of 1855, the Klickitat people employed a seasonal round of resource procurement (hunting and gathering). This seasonal round included hunting game, collecting root crops and berries, and seasonally exploiting fish resources of the Columbia and Klickitat rivers (Cleveland and Griffin 1990 as cited in White et al. 2006). The distribution of prehistoric archaeological sites along the Klickitat River and its major tributary streams reflects these seasonal activities (White et al. 2006).

#### 3.7.1.2 Historic Land Use

Euro-American settlement in the Klickitat River vicinity began in the mid-1800s when the Donation Land Act of 1850 allowed citizens of the United States to obtain 320 acres of land from the public domain. Until the Yakima Treaty of 1855, these lands legally belonged to the Klickitat and Wishram people of the area.

The town of Lyle was founded in 1878 and the impetus for the continued growth of Lyle was the construction of the Columbia River and Northern Railroad in 1902, which terminated at the town (Atwell 1977:239 as cited in White et al. 2006). Lyle was also the most important Klickitat County port along the Columbia River. With the advent of the railroad, both imports to and exports from inland areas were shipped through Lyle. This rail corridor is adjacent to the Lyle Falls Project site (now the Klickitat Trail). Exported commodities included grain, cattle, sheep, lumber, fresh and dried fruit, vegetables, and dairy products (White et al. 2006).

#### 3.7.1.3 Ethnographic and Archaeological Investigations

The Lyle Falls site was surveyed for cultural resources in 1971 (by the National Park Service for BPA) and in 1979 (by Robert Kavanaugh), resulting in its designation by the

State Historic Preservation Officer (SHPO) as a Traditional Cultural Property (TCP) [9] (White et al. 2006). Subsequently, limited investigations have been performed in the general project area, mostly in conjunction with Columbia River Gorge National Scenic Area management actions. The Lyle Falls area was reexamined in 2003 by the USFS, resulting in a determination that three sites in the area are eligible for listing in the National Register of Historic Places. These include a TCP, the Columbia River and Northern Railroad, and the Klickitat River Bridge.

### Survey Methods

Project investigators subsequently reviewed published and recorded site information for the general vicinity and the designated project Area of Potential Effect was surveyed by professional archaeologists from the YN (White et al. 2006; White and Meninick 2006). The Area of Potential Effect incorporates all areas directly and indirectly affected by construction. Their work confirmed one traditional cultural property and one historic railroad corridor at the project site. In addition, to comply with Section 106 of the National Historic Preservation Act, pedestrian surveys were conducted that covered 100 percent of the Area of Potential Effect, including proposed equipment staging areas and access roads. Visual inspection of all exposed areas included rodent burrows, cutbank surfaces, and areas of sparse vegetative covering. Because the entire project area lies on a basalt terrace, ground surface visibility was greater than 99 percent. The objective of these efforts was to determine if cultural resources are present and if so, the potential for project actions to affect them. It was noted that the entire area has been subject to continued disturbance since the 1950s by fish ladder construction and operation.

### Traditional Cultural Properties

Lyle Falls has been an important resource procurement site since prehistoric times. Various cultural resources are located at the falls and adjacent areas that include traditional dip net fishing sites, a ceremonial site, and a Native American cemetery. The dip net sites span a ½-mile-long gorge at Lyle Falls and continue to be actively used during salmon and steelhead migration. Despite modifications at the falls from fish ladder construction and operation, these fishing sites retain integrity of location, setting, feeling and association. They are of historic and continued economic importance to the YN. Because of its cultural importance, the Lyle Falls site meets federal criterion A as a traditional cultural property.

The project area also has a traditional cemetery of the original Lyle Falls Native American allotment holder and continues to be used to the present day. Near this site, the YN occasionally conducts its annual First Foods ceremony.

[9] Traditional Cultural Properties are districts, sites, buildings, structures or objects that embody traditional cultural values and are historically and traditionally associated with those values (ACHP 1991). TCPs are properties or locations that have associations with cultural practices or beliefs of a living community and (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

Project investigators also confirmed the presence of historic properties in the Lyle Falls area. The access road to the fishway crosses the Klickitat Trail, a public recreation trail that occupies the corridor of an historic rail bed that extended from Lyle to Goldendale. The line was completed in 1903 to transport wheat, livestock and timber. Known as the Columbia River and Northern Railroad, for a period it provided the only inland connection for goods and services to the riverboats on the Columbia River. The cleared corridor, some trestles and ties are the remaining evidence of this historic feature. This 42-mile-long corridor was abandoned in 1994 by the owner, Burlington Northern, and now is owned by the WSPRC (see Section 3.10).

The Lyle Falls fishway, constructed in the 1950s by the WDF, recently reached the age of being considered historic. Initial fish passage measures were implemented in 1952 when the basalt channel was excavated to form three weirs for fish passage. In 1955, WDF built the original concrete fishway. The 150-foot-long concrete, vertical slot fishway remains intact and unchanged since then, with the exception of the 1960 addition of a 30-inch-diameter siphon pipe added to provide attraction flows (Harbor Engineering 2004).

Because the existing Lyle Falls fish passage structure is over 50 years of age, an evaluation of it was conducted to 1) record/document the facility, 2) research the engineering and construction history for significance, and 3) determine whether the structure is eligible for inclusion in the National Register of Historic Places, Washington Heritage Register, or other local registers (Cutler and Miller 2007). A discussion of this historical evaluation of the falls follows in Section 3.7.2 and also in Section 4.3.

## 3.7.2 Environmental Consequences

The National Historic Preservation Act of 1966 (USC 470 et seq., as amended) requires federal agencies to manage cultural resources under their jurisdiction, or that would be affected by actions they fund. Section 106 of the Act requires federal agencies to take into account the effect of any proposed undertaking on properties listed in, or eligible for listing in the National Register. The potential effects on National Register-eligible properties from implementation of the No Action alterative and Proposed Action alternative are addressed in this section.

### 3.7.2.1 No Action Alternative

Under this alternative, no modifications would be made to the existing fishway or the site access road. Regular maintenance would continue to be performed to retain the functionality of the fish passage structure. There would be no construction-induced effects on cultural resources or National Register-eligible sites. Fish passage would not increase at Lyle Falls and subsistence and commercial harvest opportunities at the falls would be unchanged from current conditions that are described in Section 3.3.1.4.

### 3.7.2.2 Proposed Action Alternative

Two National Register-eligible sites could be affected by the proposed fishway modifications. The Lyle Falls TCP encompasses much of the project area and portions of it would be directly affected by two seasons of construction. The Klickitat Trail would experience limited direct effects although project construction activities would temporarily alter the setting of a segment of this National Register-eligible resource. In addition, the fishway itself has been determined by BPA to be a National Register-eligible historic property.

#### Construction Effects

Proposed work at the fishway would directly affect the TCP site in several ways. The subsistence dip net fishery, an outstandingly remarkable value of the Klickitat Wild and Scenic corridor, would be interrupted at two or three traditional family fishing sites during the four-month construction season. This is an unavoidable disruption due to the proximity of the fishing sites to the downstream end of the ladder where structural modifications would occur. The tribal anglers would be displaced during that period until modifications are completed to the new fish ladder entrance.

Construction is proposed during two summer seasons (see Section 2.2.2.10). As stated, modifications to the downstream ladder entrance would disrupt up to three fishing sites over one construction season. While the specific approach to be taken by the construction contractor is not known, it is expected that work on the downstream ladder entrance would be performed in a single season. During this four-month period, two to three of the scaffold fishing sites could be inaccessible. Access may be impeded by heavy equipment and partial demolition of the existing ladder in an area currently used to reach these traditional fishing sites. One left bank site spans the river at the immediate downstream end of the ladder. Another is on the right bank at the base of the ladder. Deep rock excavation in this area would create a very unsafe condition, necessitating these temporary access restrictions. Work in this area is expected to be complete in four months from late-June to October.

During the second construction season, work would be undertaken at the upstream end of the site, extending the fish transportation channel and building a new fish exit structure. It is not expected that this work would physically displace tribal fishers who concentrate at the downstream end of the ladder.

The presence of construction equipment and personnel may displace campers from the existing parking area and adjacent unoccupied lands for up to eight months spread over a two-year period. Construction also may temporarily displace tribal campers that seasonally occupy the fish ladder parking area and undeveloped areas to the north. These informal and undeveloped camping spots are used by tribal anglers during the fishing season. This area to the north includes the site of the proposed 24 by 40-foot equipment storage building, construction of which would occur in one summer season. It is also the area where excavated rock would be placed.

Installation of buried power lines would disturb two narrow linear corridors within the TCP. As described in Section 2.2.2.7, a new line would be buried from an existing wooden power pole upstream of the project site to the proposed equipment storage building and from there to the fish ladder. Excavation would be observed by a qualified tribal monitor to ensure that, if discovered, any cultural resource material is handled properly.

Located in an area largely isolated from construction activities, a tribal internment area (cemetery site) is not expected to be directly affected by project construction. The boundaries of this cemetery are delineated by fencing and it is on the opposite side of the Klickitat Trail from the construction area, so accidental encroachment would not be expected. Increased traffic on the adjacent project access road may generate dust and noise, moderately degrading the setting while construction activities are ongoing. Precautions are recommended to reduce the potential for vandalism (see Section 3.7.3).

In summary, modifications to the fishway may temporarily affect this Traditional Cultural Property; however, these incremental changes would benefit the fishery resources of the subbasin, which is an important component of the Traditional Cultural Property.

An existing road easement crosses historic railroad and would be the only access route for project construction equipment and personnel. This linear corridor, formerly the Columbia River and Northern Railroad line, has been converted to the Klickitat Trail and is owned by WSPRC. The trail itself would not be used by any motorized vehicles or equipment, and signs would be posted to warn trail users of occasional crossings by construction equipment (see Section 3.9.3). Noise and construction activity, including periodic blasting of rock, would temporarily alter the background setting of the Klickitat Trail corridor, and a limited foreground area would be altered permanently by placement of rock excavated when the ladder is enlarged (see Section 3.9.2.2).

Modifications to the Lyle Falls fishway would have a direct effect on this over 50-year old property. Although the structure maintains integrity of location, design, setting, materials, workmanship, feeling and association, it does not appear to be an individually significant example of fish ladder construction. The fishway is, however, thought to be uniquely associated with settlement or industry in the Klickitat River area and Columbia River Basin, and therefore meets National Register eligibility criterion A. BPA also proposed that the fishway be eligible for listing on the Washington Register; the Washington SHPO concurred with these determinations (see Section 4.3). The SHPO also concurred that the proposed improvements would pose no adverse effect to the fishway and that no further cultural resource evaluation or survey work would be needed.

### Operational Effects

Upon completion of ladder modifications, fishing sites immediately downstream of the ladder would be fully available to traditional users as under current conditions. No access changes or restrictions for tribal anglers are anticipated. Although the functionality of the fishway would improve, it may be expected to result in fewer fish

congregating at the base of the falls as they now do, particularly in the fall when upstream passage has been most impeded. This could reduce the catch rate at the fishing scaffolds nearest the ladder. With currently available information, it is difficult to determine the economic or social extent of this effect or to predict a realistic estimate of reduced fishing success, if at all. Tribal fishing sites downstream of Lyle Falls are not expected to be affected. In the long term however, harvest opportunities will likely improve as more fish likely return to the Klickitat basin and successfully migrate upriver, and spawning success increases (see Section 3.3.2.2, Harvest). Therefore, it is anticipated that the long term benefits of possibly having more fish for subsistence harvest would outweigh the short term effects of suspended fishing immediately at the falls. The long-term operational effect on this outstandingly remarkable value would not physically preclude access to any fishing site.

After construction is complete, informal camping in the parking area and on adjacent lands could resume without the disruptions that construction traffic would bring. Traffic levels on the access road would be similar to existing conditions. Daily inspection of the fish trap in the ladder would be expected to continue. One or two Yakama Nation fisheries biologists' vehicles would be present each day to enumerate and release the upstream migrant fish.

The nearby cemetery would be unaffected by continued operation and expansion of the fish ladder. Similarly, the First Foods ceremony would be unaffected by improved functionality of the ladder.

## 3.7.3 Mitigation Measures

The following mitigation measures have been incorporated and analyzed during project planning to avoid, minimize or offset potential adverse effects on cultural resources:

- A qualified cultural resource monitor would be present during all ground-disturbing activities to 1) ensure that tribal members have access to the area and 2) examine newly disturbed soils, inspecting work sites for potential artifacts.

  Most construction activities would occur within the boundary of the National Register-eligible TCP that continues to be actively used by the Yakama Nation for its treaty reserved rights to fish, hunt and gather. Therefore, implementation of the project should be carefully monitored to protect known cultural properties and on-going cultural activities.

  The presence of a qualified monitor during active construction would serve multiple purposes. It would ensure that access for the tribal fishery is unimpeded to the greatest extent possible, that the boundaries of the nearby tribal cemetery are respected, and that activities don't encroach on the historic Klickitat Trail corridor. Should excavation reveal previously unidentified cultural materials, the monitor would conduct an initial evaluation and initiate appropriate follow-up consultation.

- Construction access would be limited to existing and improved road grades to the greatest extent possible.

  Limiting vehicle access to graded areas reduces the potential for unintended resource damage, and by surfacing the road with rock, dust would be reduced in the area of the tribal cemetery.

- A Native American internment area is adjacent to the project access road. Surfacing this road with crushed rock would measurably reduce dust from construction traffic that otherwise could have a visual impact.

- Extreme caution would be exercised near internment areas and construction workers would be advised to respect this area.

- The historic railroad corridor would not be used for construction or operation access.

  Vehicular use of the Klickitat Trail is specifically forbidden under WSPRC and USFS management regulations.

- Coordination would be undertaken with those that traditionally fish adjacent to the existing ladder. Construction activities that could present potentially dangerous settings for fishing would be identified, and the timing and extent of disruption would be presented to those fishermen.

# 3.8 Air Quality, Noise, Human Health, and Public Safety

## 3.8.1 Affected Environment

### 3.8.1.1 Air Quality

The project is located approximately one mile outside of the boundary of the Columbia River Gorge National Scenic Area (CRGNSA), an area that is unique geographically and meteorologically. Strong seasonal wind patterns occur, with prevailing winds from the west in the summer months and the east in the winter months. During non-windy periods, the Columbia River valley walls and temperature inversions tend to restrict the dispersion of pollutants from sources within or from either end of the CRGNSA. The emission inventory in and around the Scenic Area is complex. There are two major highways, two rail lines, barge traffic, several industrial areas, and urban centers within and at both ends of the Columbia River Gorge, factors that combine to create a unique air shed and air pollution issue.

There is no specific information about air quality in the immediate project area. It is assumed however, that the lower Klickitat River valley has a much lower incidence of air pollution than more heavily developed parts of Washington State. In Washington, the main sources of air pollution are motor vehicles, industry, wood stoves and fireplaces, and outdoor burning. Data from 1999 shows that pollution from motor vehicles contributes approximately 57 percent of the total, while industrial emission, wood stoves, and outdoor burning account for 17, 11, and 5 percent respectively (WDOE 2001).

Klickitat County's economy is based primarily on rural agriculture, grazing, and timber production (Section 3.11.1.1). The limited number of developed industrial facilities in Klickitat County results in a greater proportion of the total pollution occurring from vehicles, wood stoves, and outdoor burning than the State of Washington average. The relatively sparse population would tend to indicate that pollution from these sources would be very low.

The Environmental Protection Agency (EPA) and the Washington Department of Ecology (WDOE) both have responsibility for air quality in Klickitat County. WDOE has adopted the National Ambient Air Quality Standards established by the EPA. The USFS, as the federal agency administering the Columbia River Gorge National Scenic Area provides funding for air quality monitoring at Wishram near the east end of the gorge. Table 3-15 summarizes the air quality standards for the State of Washington.

**Table 3-15 Washington State Ambient Air Quality Standards**

| Pollutant | Measurement Period | Standard |
|---|---|---|
| Total Suspended Particles | Annual Geometric Mean | 60 micrograms/meter3 |
| | 24 Hour Average | 150 micrograms/meter3 |
| Particulate Matter ($PM_{10}$) | Annual Arithmetic Mean | 50 micrograms/meter3 |
| | 24 Hour Average | 150 micrograms/meter3 |
| Particulate Matter ($PM_{2.5}$) | Annual Arithmetic Mean | 15 micrograms/meter3 |
| | 24 Hour Average | 65 micrograms/meter3 |
| Ozone ($O_3$) | 1 Hour Average | 0.12 parts/million |
| Carbon Monoxide (CO) | 1 Hour Average | 35 parts/million |
| | 8 Hour Average | 9 parts/million |
| Sulfur Dioxide ($SO_2$) | 1 Hour Average | 0.4 parts/million |
| | 24 Hour Average | 0.1 parts/million |
| | Annual Average | 0.02 parts/million |
| Nitrogen Dioxide ($NO_2$) | Annual Average | 0.05 parts/million |
| Lead (Pb) | Quarterly Average | 1.5 micrograms/meter3 |

The air quality monitoring station in Washington closest to the project site is at Wishram, Washington approximately 15 miles east of Lyle. On the Oregon side of the Columbia River, the closest monitoring station is at The Dalles, approximately 8 miles east of Lyle. At both locations, particulate matter (PM) parameters are monitored. PM consists of fine particles of smoke, dust, pollen, or other materials that remain suspended in the atmosphere. PM is measured as Total Suspended Particulates, particulates less than

10 microns in diameter (PM10), and particulates less than 2.5 microns in diameter (PM2.5).

Smoke from biomass burning is the largest contributor to PM2.5 at Wishram, with a contribution of 29 percent of the total PM2.5 pollutants, followed by secondary sulfate (28 percent) and nitrate (16 percent). The contribution of sulfate occurs mostly during the summer season, originating from the east end of the gorge. Nitrates are introduced primarily in winter, originating from the west end of the gorge. Smoke and dust are episodic sources with big peaks during forest fires, dust storms, and local land clearing and construction activities, with dust contributing 14 percent of the total pollutants. The contribution from motor vehicles is relatively constant throughout the year and contributes 13 percent of the total pollutants (Southwest Clean Air Agency 2006).

### 3.8.1.2 Noise

Noise is commonly defined as "unwanted sound that disrupts normal activities for humans and wildlife, or diminishes the quality of the human environment." Ambient noise consists of typical sources such as local traffic, wind blowing in trees, neighboring industries, and aircraft. The total noise level (as measured with a sound level meter) is composed of a typical mix of all sources, both distant and nearby, constituting the ambient noise environment at the measurement location (Kelso and Perez 1983).

Noise is measured in decibels as a sound pressure level exerted on the microphone of a sound meter. Sound levels are adjusted (or weighted) by the sound meter for the distance between ear and microphone sensitivity and are reported as A-weighted decibels (dBA). Typical ambient noise levels are shown in Table 3-16.

**Table 3-16 Typical Sound Levels**

| Descriptor | Typical Range (dBA) |
|---|---|
| Very Quiet Rural Area | 25 to 35 |
| Quiet Suburban Residential | 36 to 40 |
| Normal Suburban Residential | 41 to 45 |
| Urban Residential | 46 to 50 |
| Noisy Urban Residential | 51 to 55 |
| Very Noisy Urban Residential | 56 to 60 |

Source: Hessler Associates, Inc. 1994

[1] Daytime residual level exceeded 90 % of the time

Washington Administrative Code 173-60 establishes three types of environmental districts for noise abatement (EDNAs). Class A EDNA applies to areas where human beings reside and sleep (residential areas). Class B EDNA applies to land uses requiring protection against noise interference with speech (commercial areas). Class C EDNA applies to land uses involving economic activities of such nature that higher noise levels normally are to be anticipated (industrial areas). Table 3-17 summarizes the environmental noise limits established by the State of Washington.

**Table 3-17 Washington State Environmental Noise Limits (dBA)**

| | EDNA of Receiving Property | | |
|---|---|---|---|
| EDNA of Noise Source | Class A Day / Night | Class B | Class C |
| Class A | 55 / 45 | 57 | 60 |
| Class B | 57 / 47 | 60 | 65 |
| Class C | 60 / 50 | 65 | 70 |

Noise originating from temporary construction sites is exempt from these regulations, except where the noise affects Class A receptors during night time hours.

No baseline for ambient noise levels has been established for the Lyle Falls project site. Site visits on September 26 and 27, 2006, identified existing noise sources at that time. At the downstream end of the existing ladder, ambient noise is generated by the Klickitat River water flowing over a series of falls and step cascades. It is loud enough to obscure human conversation at a normal voice level, although conversation can be conducted with loud voices. At the upstream end of the project where the new water intake structure would be located, ambient noise levels are lower than the downstream end. Conversations can be conducted in a normal voice level. Ambient noise levels at other locations near the project are lower, with noise sources that include distant vehicular traffic on State Highway 142, occasional traffic on the Fisher Hill Road, and vehicles accessing the project site. Fisheries managers also create noise at the site when using a portable generator to operate the intake structure slide gate. This noise only occurs for two 5-10-minute periods each time the fish trap within the ladder is checked.

### 3.8.1.3 Human Health and Public Safety

A combination of tribal, state, and county agencies provide public health and safety resources for the lower Klickitat River area, including the project site. Most of these resources can be accessed through the Klickitat County Sheriff's office which serves as a communication link between the public and emergency service providers in Klickitat County. The Sheriff's office coordinates 911 calls and dispatch for fire districts, towns and rural areas, and emergency medical teams within the county.

Fire protection is provided by the county through several fire districts, with Fire District No. 4 covering the service area for the town of Lyle and rural areas along the lower Klickitat River. The fire station in Lyle is staffed by 30 volunteers. Fire protection for forest and range lands within the county are provided by Washington State Department of Natural Resources.

Health and medical services are available at several locations within the county including Klickitat Valley Health Services in Goldendale and Skyline Hospital in White Salmon. Additional medical services are also available in nearby cities across the Columbia River at the Mid-Columbia Medical Center in The Dalles and at Providence Hood River Hospital in Hood River. Medical facilities in White Salmon, Hood River, and The Dalles

are less than 15 miles from the project site, while facilities in Goldendale are approximately 30 miles away. Each of these facilities provides emergency services.

Health and safety concerns at Lyle Falls include traditional dip-net fishing practices, absence of a security fence or barricade on the ladder at the falls, and the in-ladder monitoring and enumeration arrangement. Tribal members fish from wooden platforms and rock ledges with dip nets at sites immediately adjacent to the fishway. Although this activity is not associated with the fishway, a portion of the ladder surface is used to access the traditional fishing site of several families. Falls by fishermen engaged in this practice carry extreme loss of life risks so most practitioners use harnesses and ropes as safeguards to reduce the risk of injury or drowning.

The perimeter of the fishway is unfenced and accessible to the public. The 24-inch diameter attraction flow pipeline traverses most of the length of the fishway and serves as a partial barrier from the vertical drop to the river. A portion of the fishway at the falls has no protection.

## 3.8.2 Environmental Consequences

### 3.8.2.1 Air Quality

#### No Action Alternative

Under the No Action alternative, no construction would take place at the fish ladder; therefore, no construction-generated fugitive dust or pollutants would be introduced into the air column. Continued use of the dirt surfaced access road by tribal fishing families, state and tribal biologists and maintenance crews, and others would generate current levels of fugitive dust in the project area.

#### Proposed Action Alternative

##### Construction Effects

Ground disturbing activities under the Proposed Action alternative would occur in an approximately 1.6 acre area, 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. Construction activities may also be a locally common source of exhaust emissions from heavy equipment engines. Emissions from vehicle exhaust may increase the amount of air-borne particulates and other pollutants in the immediate vicinity of the construction activity.

Construction effects on air quality are expected to be short term and would cease when construction is complete. Fugitive dust would be generated during construction as a result of grading, excavation, blasting and construction traffic on unpaved roads. Blasting charges would be set below grade to fracture solid rock for excavation and removal at the upstream and downstream ends of the fishway. Sand, crushed rock or

blasting mats would be placed over area to be fractured to minimize the generation of airborne debris, fugitive dust, and noise. Both Fisher Hill Road and the access road to the Lyle Falls fishway are gravel and native soil surfaced. The use of these roads by construction equipment, delivery trucks, and passenger vehicles is expected to be the greatest source of fugitive dust during the construction period.

Measures that may be used to minimize the production of fugitive dust include minimizing ground disturbance to the extent possible and applying several inches of crushed rock to the Lyle Falls access road. These measures would help keep construction-generated fugitive dust below the legal standards for PM10 and PM2.5 as defined by the State of Washington and minimize the potential for fugitive dust to be carried downstream by winds into the Columbia River Gorge National Scenic Area. Downslope winds are common in the Klickitat River valley when cooler air is forced down the valley during the warming of air on upper valley slopes.

#### Operational Effects

Standard operation of the fish ladder is not expected to produce additional fugitive dust or other particulate matter that would degrade air quality. The only potential source of fugitive dust associated with the fishway would be a result of vehicles accessing the site during dry weather conditions to inspect the ladder and perform general maintenance. The number of vehicle trips would be similar to existing conditions.

### 3.8.2.2 Noise

#### No Action Alternative

Implementation of the No Action alternative would avoid any new noise-generating activities at the Lyle Falls fishway. Noise would continue to be generated at the site by the project operators maintaining the facilities and monitoring the fish trap. Normal ambient background noise would continue to originate from water passing down the falls, traffic on State Highway 142, the Fisher Hill Road, and occasional vehicles accessing the project site.

#### Proposed Action Alternative

##### Construction Effects

The Lyle Falls fishway is in an area characterized as rural undeveloped. Noise is expected to be generated by construction equipment, vehicles, and personnel during the construction of the fish ladder.

Noise originating from temporary construction sites as a result of construction activity is exempt from State Washington noise regulations, except where it affects Class A receptors during night-time hours (WAC 173-60-050). The noise levels from common construction equipment and tools are listed in Table 3-18. These noise levels represent exposure at the operator's ear, except where noted. Due to the rural setting of the site there is not a specific noise limit standard to enforce, although it is not anticipated that

construction noise would exceed the standards identified for residential or commercial receptors (the most restrictive standards).

A continuous level of noise would be generated during daylight working hours at the fish ladder construction site by heavy equipment conducting site clearing and excavation. Noise from power tools and from vehicles delivering construction materials to the site would also generate noise intermittently throughout the construction period, as would human commotion by workers. These noise levels would be consistent with decibel levels identified in Table 3-18. Construction is expected to occur in two seasons, temporarily halting for several months during the winter through spring high flow season.

**Table 3-18 Probable Noise Levels of Common Construction Equipment and Tools**

| Tool | Noise level will probably exceed...decibles[1] | Reference |
|---|---|---|
| Air Compressor | 90 | Nipko and Shields (2003) |
| Backhoe | 85 | Nipko and Shields (2003) |
| Bulldozer | 87 | Nipko and Shields (2003), Dobie (1993), Alfredson and May (1978) |
| Circular Saw | 88 | Seixas and Neitzel (2004), Nipko and Shields (2003), New Zealand DOSH (2002), NIOSH (2006), Kerr et.al. (2002) |
| Concrete Mixer Truck at 50 ft. | 75 | Alfredson and May (1978) |
| Concrete Pump at 50 ft. | 81 | Alfredson and May (1978) |
| Dump truck | 78 | Utley and Miller (1985) |
| Excavator | 80 | Greenspan et.al. (1995), Utley and Miller (1985) |
| Generator at 50 ft. | 72 | Alfredson and May (1978) |
| Nail Gun | 97 | New Zealand DOSH (2002) |
| Portable Welder | 84 | Nipko and Shields (2003) |
| Skilsaw | 104 | Dranitsaris (1982) |
| Welding Equipment | 92 | Seixas and Neitzel (2004) |

Source: Laborer's Health and Safety Fund of North America (www.lhsfna.org)

[1] Noise levels represent exposure at the operator's ear, except where otherwise noted.

There are no Class A (residential areas) or Class B (commercial areas) receptors in the area near the Lyle Falls fish ladder. The nearest receptors during construction would be adjacent to and downstream of the fish ladder. Construction noise would be received by tribal fishermen in the vicinity of the falls. Background noise in this area is currently generated by the flow of water over the falls and through a narrow canyon in the river. The existing background noise is loud enough to block out a normal conversation voice. Noise from construction equipment operating at the downstream end of the fish ladder would exceed the background noise for short durations making it difficult to communicate in a loud voice. Noise from construction equipment (e.g., air compressor and drill, circular saw, excavator, etc.) operating at the upstream end of the site is not expected to be noticed by tribal fishermen at Lyle Falls. Construction noise would be obscured by the falls. Noise generated by the construction is not expected to exceed the

Class B standards for this site, although the noise would be exempt from Washington regulations. Construction activities associated with rock blasting may generate slightly higher noise levels than general construction activities and equipment, specifically introduced by the warning whistles prior to detonation. Blasting would occur on an intermittent short-term basis and would introduce only momentary muffled sounds.

#### Operational Effects

Standard operation of the modified fish ladder is not expected to generate noise that would differ from the existing conditions. Electrical power would be brought to the site to operate tools and the mechanical features (e.g., gates) of the ladder, eliminating the need for a gas generator during maintenance activities. The dominant ambient background noise at the site would continue to be from water cascading over the falls.

### 3.8.2.3 Human Health and Public Safety

#### No Action Alternative

Implementing the No Action alternative would not contribute additional health or safety risks to the public. Under this alternative, no safety or security measures would be implemented to protect the occasional public visitor to the site or biologists maintaining the fishway. Klickitat County emergency services could be expected to be needed at the same level as is currently experienced.

#### Proposed Action Alternative

#### Construction Effects

The project site is most actively used by members of the Yakama Nation, specifically to harvest fish from scaffolds and dip-net sites along Lyle Falls and to periodically conduct ceremonies. For safety reasons, during some construction activities such uses would be precluded. In particular, while modifications are being made to the downstream ladder entrance, three fishing sites would be inaccessible. Short duration site closures may also be necessary when any blasting is occurring. Measures identified in Section 3.8.3 would be implemented to protect the public during blasting.

Public recreation use of the area primarily occurs along the Klickitat Trail, located between 40 to 200 feet from active construction areas. Some kayaking use may be interrupted temporarily by construction adjacent to the river. The only expected public safety constraints are expected when blasting occurs and trail and river passage would be halted for very short periods. Because of the presence of construction equipment, kayakers that use this reach of river would not be able to take out in the vicinity of the ladder during much of the construction phase, nor would they be able to boat the initial drop at Lyle Falls.

All construction entails safety risks. For construction workers, it is expected that the safety risks would be the same as for similar construction activities. The potential for these hazards to result in injuries to workers would be minimized through the selection of

a construction contractor experienced in similar projects, proper supervision and training of construction workers, application of best management practices, and adherence to state and federal safety standards.

As a public health measure, the selected contractor will be expected to provide a portable restroom throughout the duration of construction. If, as assumed, two construction seasons are needed, the restroom will be removed between work periods since it will not be suitably anchored to withstand potential high flows that may inundate the project area.

The selected contractor would be informed that no construction debris would be allowed to enter the river. Because the reach of river below the project is only about seven feet across at its narrowest point, any trapped construction materials could become a life-threatening hazard to kayakers.

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 the Klickitat County Sheriff's central dispatch office via a 911 call. The central dispatch office is qualified to direct the necessary emergency service to the site as appropriate for the situation. Although Klickitat County is a large rural area with few developed communities, police, fire, EMT, and hospital services are available from key communities dispersed throughout the county and across the Columbia River in Oregon, thus minimizing the response time to the project site. Adequate staffing is available from these services to handle emergencies during the construction phase of the proposed project.

### Operational Effects

Generally, operation of the fish ladder would present fewer hazards than during construction. Operational activities include enumerating and tagging fish in the trap, periodically cleaning debris from the trashracks and removing sediment from the ladder chambers. These activities occur in water and therefore carry a drowning risk. Proposed modifications would result in safer fish monitoring conditions for biologists and fewer in-water work requirements. In addition, ladder modifications would not increase water levels or flood flow frequencies and therefore there would be no flow-related effects on human safety.

Because the existing fishway is regularly used by YN fishermen to access traditional fishing sites, access cannot be restricted to the fishway structure. Options to improve public safety at the perimeter of the existing ladder were evaluated. Fence or railings were determined infeasible because they would not withstand heavy debris load strikes during high flows. Therefore, it was concluded that the non-functional auxiliary water supply pipeline should be retained as a safety structure.

Potential emergencies during operation of the fishway may include falls, bodily injury, or drowning. Notification of emergency services personnel would occur through a 911 contact with the Klickitat County Sheriff's central dispatch office. The central dispatch office would direct the appropriate emergency services to the site. The demand

for such services is not expected to increase because of the proposed ladder modifications.

## 3.8.3 Mitigation Measures

The following mitigation measures have been incorporated into project planning to avoid, minimize or offset potential adverse effects of the project on air quality, noise and public safety:

- Dust abatement treatments would be applied to the unpaved roadway accessing the project site. It would be resurfaced with six inches of crushed rock.

- If soils are stockpiled, abatement measures would be applied to prevent the generation of wind-borne dust as discussed in Section 3.1.3.

- Blasting mats, sand or crushed rock would be used to cover excavation sites during blasting activities. These measures would reduce the generation of sound and would contain the dispersion of rock, soil, and fugitive dust.

- 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 throughout construction to warn users of vehicle crossings where the trail and access road intersect. Trail use typically is not heavy enough to merit posting of flaggers.

- Signs would be posted upstream of the project area on the Klickitat River informing kayakers of construction. An outreach plan would be developed in coordination with the USFS to inform this user group of construction activities.

- The contractor would be required to follow OSHA safety regulations for blasting (1926 Subpart U, Blasting and Use of Explosives), which requires displaying signage warning the public about the blasting zone, the use of loud warning signals (i.e., whistle or horn) to indicate the commencement of blasting, and the stationing of flagmen on public routes immediately adjacent to the blast zone during blasting operations to prevent accidental incursion of the public into the blast zone. Public routes adjacent to the construction site that may require flagmen would include the Klickitat Trail and project access road, and the Klickitat River (i.e. boaters). Unrestricted access to these public routes would be restored when it is considered safe.

- Coordination would be undertaken with those that traditionally fish adjacent to the existing ladder. Construction activities that could present potentially

dangerous settings for fishing would be identified, and the timing and extent of disruption would be presented to those fishermen.

- The non-functioning attraction flow pipeline would be retained on the existing ladder segment as a public safety structure. Fencing was considered to replace the hydraulically non-functional structure, but it would not withstand the high debris load typically carried by this river during flood conditions.

- Safety ladders would be installed to access the fish sorting area within the fishway structure. This would provide a safe entry and exit from the fishway for workers collecting and sorting fish or conducting maintenance on the fishway.

# 3.9 Aesthetic Resources

## 3.9.1 Affected Environment

The affected environment for aesthetic resources is an approximately 0.5-mile area around Lyle Falls. The viewshed extends to sites from which the fish passage facilities can be seen and includes viewpoints on State Highway 142 (Figure 1-2) and the Klickitat Trail. It also includes a short reach of the Klickitat River immediately upstream of the existing fishway. River-based views further downstream were not assessed because the turbulent falls reach is used by very few recreationists and is not visible from publicly accessible view points.

The project area is a deep broad valley carved by the Klickitat River that is approximately 0.5 miles wide and about 1,400 feet deep. Dry grasslands and groves of oaks contrast with large dark patches of exposed basalt on the valley floor. Ponderosa pines punctuate the steep undulating hillsides that extend up from the narrow rock canyon occupied by the active river channel. The fishway is the dominant manmade structure in the viewshed (Figure 1-2). A cleared linear corridor occupied by the Klickitat Trail is a more subtle element in the landscape. In the vicinity of Lyle Falls, this trail roughly parallels the river about 250 feet to the north and west. Visible during much of the year are the wooden scaffolds and fishing encampments of the Yakama Nation members who practice traditional dip-net fishing at Lyle Falls (see Section 3.7.1.3).

Visual conditions in the area were inventoried by the USFS when it assumed management of the Lower Klickitat National Wild and Scenic River corridor (USFS 1991). Resource Goal 5 of the USFS Lower Klickitat River Management Plan (USFS 1991) designates 200 feet from the ordinary high water mark of the river as a primary management area. The visual quality objective for this area was characterized as Partial Retention, which equates to Moderate Scenic Integrity under the currently used Scenery Management System (USFS 1995). Such landscapes may appear slightly altered and noticeable deviations are to remain visually subordinate to the character of the landscape being viewed. The Lyle Falls fishway was constructed many years before this designation was applied so the visual criteria established for the corridor did not guide the

original facility designers. Additional discussion of the Wild and Scenic River status can be found in Sections 3.1.1.1, 3.10.1.1, 3.10.1.3, and 4.5.

A field inventory of current fishway site conditions using Scenery Management System criteria found the project site to appear "unacceptably low" because the immediate landscape of the Lyle Falls area has been extremely altered. Deviations from the natural setting dominate and contrast with natural forms, line, texture and pattern of the surrounding area. Areas adjacent to the fishway (excluding the parking area) meet criteria for "moderate" to "low" visual integrity.

When the project site is viewed from the Klickitat Trail, the primary viewpoint (see Section 3.9.1.1), the fishway site meets "moderate" criteria under Scenery Management System because the existing facilities are only slightly visible. When viewed from a State Highway 142 roadside pull-off on a cliff above the project site, the existing fishway visually is characterized as "very low" because the setting appears heavily altered, deviating from the wild and scenic character of the river in ways that do not blend with the natural terrain. The degree of deviation from the landscape character could be considered extremely dominant when viewed from above. When viewed from a kayak in the pool above the falls, views of the fishway are largely screened by riparian vegetation emerging from the small depositional island at the base of the pool. The bright silver color of the auxiliary water pipeline contrasts with the setting and meets a "low" visual standard because it moderately alters the landscape.

In addition to USFS management criteria, Klickitat County's Shoreline Management Program considers scenic values as do its zoning ordinances. Visual conditions must be addressed as a component of development actions proposed within 200 feet of the river.

### 3.9.1.1 Key Observation Points

The project site is visible by members of the public from very few locations. Four key observation points were identified during a September 2006 and June 2007 inventory of baseline conditions, two on the Klickitat Trail, one from a State Highway 142 turn-off, and one from the Klickitat River (Figure 3-6) (Appendix A).

Key Observation Point 1 is a point on the Klickitat Trail parallel with the upstream end of the proposed fish ladder (Figure 3-6). This segment of the trail is elevated about 20 feet above the adjacent grade which slopes gradually and unevenly eastward toward the river.

Water-worn basalt boulders and sculpted bedrock outcrops indicate that much of the visible area is within a seasonally active floodway. A short reach of a pool-riffle complex is visible from Key Observation Point 1 that appears as a shiny ribbon in an otherwise brown summer landscape. Very steep vegetated slopes form a backdrop to the river. In the foreground, the basalt bedrock is interspersed with grasses, forbs, scattered lodgepole pines, and small groves of oak. The existing attraction flow pipeline is visible on the perimeter of this viewshed. It introduces a strong linear form that contrasts with the otherwise natural setting, a contrast enhanced by the shiny white paint.

The visual sensitivity of Key Observation Point 1 is considered high. Some vegetation periodically screens the views, but generally trail walkers would experience this setting for two minutes, bikers for about 45 seconds, and horse-back riders for about a minute.

Key Observation Point 2, also on the Klickitat Trail, is approximately 250 feet due west of the existing fish ladder (Figure 3-6). Views to the east take in the parking and camping area upslope of the fish ladder. The ladder itself is not visible from this location, although this segment of trail passes closest to the structure. Views are of a highly disturbed, visually incoherent setting, with a large cleared area supporting a dirt access road, parking area, dumpster and informal campsites. Neither the river nor ladder is visible from Key Observation Point 2. Stands of oak and pine provide intermittent screening between the trail and these use areas. Seasonally present are tents, trailers and vehicles of the tribal anglers along with stockpiles of wood and other materials.

The visual sensitivity of Key Observation Point 2 is considered high, although views are very short duration. Hikers on the trail would experience this view for less than one minute due to the vegetative screening and the bend in the trail. Bike riders would have an even shorter observation period.

Key Observation Point 3 is a viewpoint from Highway 142 where an unmarked, unimproved turnout has been created at approximately milepost 1.75 (Figure 3-6). Viewers must exit their vehicle and follow an informal trail along the top of a cliff to obtain this bird's-eye view of a broad section of the Klickitat River valley in which the ladder is located. This viewpoint is about 0.3 miles upstream of the ladder and it appears well-used despite the absence of signs or facilities. The entire project area can be seen. Stands of mature oak and pine occupy the floodplain and the western slope of the valley. Extensive outcrops of basalt bedrock and deposits of boulders characterize the floodplain adjacent to the river.

The dominant foreground elements are the river and the fish ladder. The mass, color and line of the ladder strongly contrasts with the setting. The grated decking on the ladder provides some visual texture which, from this viewpoint, helps it to blend with the adjacent basalt. In the mid-ground, the horizontal path of the Klickitat Trail is apparent, although it is partially screened by trail-side vegetation.

Key Observation Point 3 views are not available to travelers unless they exit their vehicle; therefore this is a stationary viewpoint from which the project site can be seen for as long as a viewer wishes to stand. Because this overlook is unmarked, it is likely that only local residents know to stop for this fine perspective. Visual sensitivity of the fish ladder site is considered high, albeit a little known perspective.

Key Observation Point 4 is the point of view from a kayak in the pool approximately 300 feet upstream of the existing fishway exit. A limited number of boaters traveling downstream are reported to seek a safe take-out point just upstream of the existing fish ladder in the vicinity of Key Observation Point 4. Looking west from this viewpoint during summer low flows, boaters would observe a quiet bay with low rocky banks and sparse riparian vegetation. The existing fishway structure is largely screened from view by the riparian vegetation growing from the small island just upstream of the existing fishway exit. A strong visual contrast is introduced by the auxiliary flow pipeline that appears very bright and unnatural.

## 3.9.2 Environmental Consequences

### 3.9.2.1 No Action Alternative

Aesthetic conditions described in the previous section would be unchanged by the No Action alternative. From Key Observation Points 1 and 2, fishway facilities are either not visible or only marginally apparent. The existing fish ladder parking area can be seen from Key Observation Point 2. From Key Observation Point 3, the existing facilities are fully visible and strongly contrast with the setting. Looking west from Key Observation Point 4, boaters would see the gradually sloping rocky bank of a small quiet bay, while to the south, the auxiliary water supply pipeline is evident and dominant.

This area is continually used from April through December by tribal families associated with numerous dip net fishing sites. Human presence is evident from each Key Observation Point. No measures are proposed as part of ongoing operations to reduce the visual contrast of the existing facilities and visual/aesthetic conditions are expected to remain as they are. The USFS Visual Quality Objective for this site (see Section 3.9.2.2) of “moderate scenic integrity” would not be achieved under the No Action alternative.

### 3.9.2.2 Proposed Action Alternative

Under the visual resource inventory framework applied by the USFS (the Scenery Management System), management goals are identified that describe acceptable levels of modification associated with land use activities in a given area. These standards, or Visual Quality Objectives, range from “preservation” to “maximum modification”. The Lower Klickitat River Wild and Scenic River Management Plan EIS (USFS 1991) identifies this river corridor as “moderate scenic integrity” under the Scenery Management System. Generally, this designation is applied to landscapes whose character appears only slightly altered, a definition appropriate to the Klickitat River corridor in general, but not entirely consistent with the large fish ladder currently located at this site. USFS guidelines state that noticeable deviations from this standard are to

remain visually subordinate to the landscape character. The USFS management plan provides general visual guidance, although it does explicitly state that:

> "Improvements to the existing fish passage facility may be consistent with the intent of the Act to the extent that these enhance or reduce the potential for negative impacts to river resources."

Potential effects on aesthetic resources include temporary visual changes during construction and permanent changes resulting from construction and operation of the fishway and maintenance building. Figure 3-7 is an artist's rendition of how the proposed facilities might appear. Visual considerations were an integral part of the design of the new fishway components. Measures incorporated into project design include:

- Placing the proposed fish transportation channel largely below grade.
- Using colored concrete on above-ground portions to blend with local rock.
- Using a deep natural pool for the fishway exit and water supply intake to reduce the scale of the new component.
- Integrating existing facilities into the modified fishway to limit new construction.
- Using an existing access road for construction and using the structure itself as a service vehicle route to eliminate the need for permanent new roads.
- Siting facilities to minimize removal of mature vegetation.

The most visually sensitive viewers are recreationists using the Klickitat Trail and Yakama tribal members fishing adjacent to the ladder. Although few in number, travelers who pull off and walk to the viewpoint from State Highway 142 would observe the entire project site. Kayakers would find their take-out point to be modified.

### Construction Effects

Construction activities would occur over two consecutive summer seasons and would be conducted only during daylight hours. Construction equipment, material stockpiles and workers would be visible from key viewpoints during the work phase. Rock drilling and excavation, occasional below-grade blasting, and truck traffic would generate noise in an otherwise quiet rural setting, temporarily reducing this aesthetic component.

Construction would be quite apparent from Key Observation Point 1. There is little vegetative screening between the Klickitat Trail, the new ladder exit, the spoil disposal site, extended fishway, and the storage/maintenance building (Appendix A: page A-4). Excavated rock would be placed on a 0.16-acre area adjacent to the trail, strongly contrasting with the existing water-sculpted basalt. Although geologically the materials would be the same, the angular nature of the deposited material would resemble quarried rock rather than river-washed rock. A grove of oaks and dense shrubby plants would partially screen views of the proposed 24- by 40-foot equipment storage building (Section 2.2.2.6).

At Key Observation Point 2, ladder construction would occur about 250 feet from the Klickitat Trail. Trail users may observe changes to the existing access road from dirt to a rock surface, and open areas under trees may be used for material stockpiling. The vehicles of construction workers would be added to those of the tribal anglers, and occasional truck traffic may be visible and audible from Key Observation Point 2. During some periods it is likely that tents of tribal members would need to be relocated because of construction materials and activities (Appendix A: pages A-8 and A-9).

The entire construction process could be observed from Key Observation Point 3 (Appendix A: page A-13). All construction activities, personnel, and material hauling and placement would be apparent to those seeking out this viewpoint from the unmarked State Highway 142 pull-off. While viewers at this site may expect to observe a quiet rural setting, they will be at a sufficient distance that the sounds and sense of activity would be diminished.

Construction of the extended transportation channel would be most apparent from Key Observation Point 4, where work on the low horizontal fish transportation channel and fishway exit structure would be evident in the immediate foreground. This activity would occur over one summer season, during which time boaters would need to disembark upstream of this work site. Heavy equipment and workers would be highly evident from this Key Observation Point. Construction activities at the downstream ladder entrance would be less apparent from Key Observation Point 4.

### Operational Effects

From Key Observation Point 1, the permanent spoil disposal site would be 40 feet from the trail and about 250 feet from the new fishway exit. While the excavated rock would be of the same origin as that deposited by the river, it would be a very dominant foreground element because of its texture. The jagged quarry-rock appearance would contrast with the boulders sculpted by the river. This would be mitigated by shaping the spoil pile and placing soil or sand in the crevasses to facilitate establishment of grasses and forbs that are common in the adjacent boulder fields (see Section 3.4.3, Revegetation Plan).

The new fishway exit and ladder segment largely would be below grade, so from Key Observation Point 1 its presence would not be apparent. The degree of visual contrast from the current setting would be weak. The greatest change in the Key Observation Point 1 viewshed would be the addition of the equipment storage building as shown on Figure 3-7. It would be the only visible structure from this trail perspective, introducing a contrasting element to the foreground.

The 24-foot by 40-foot building would be dark colored split face concrete with a non-reflective dark colored metal roof (see Section 2.2.2.6). A stand of oaks partially screens this site from Key Observation Point 1 and fully screens it to southbound Klickitat Trail travelers. This new structure would visually contrast with the undeveloped setting.

In summary, from Key Observation Point 1, the new spoil pile initially would not achieve USFS Moderate Scenic Integrity standards, but as vegetation becomes reestablished, this feature would become visually subordinate in the setting. The proposed equipment building adds a new element to this lightly developed setting and may not achieve the Moderate Scenic Integrity standard. It is expected that this standard could be achieved if additional native shrubs and trees can be established between north end of the building and the Klickitat Trail.

Visual modifications evident from Key Observation Point 2 are expected to be temporary, with the exception of the rock surface added to the access road and parking area. Neither the river nor the modified ladder would be visible from this point, so there would be no changes in visual contrast due to the fishway. The contrast introduced by the road texture would be rated as visually weak. This project element would be consistent with Moderate Scenic Integrity standards.

All fishway facility modifications and the new storage building would be visible from Key Observation Point 3. Facility expansion would extend the horizontal line of the ladder within the otherwise undeveloped setting. Although the extended fishway channel would largely be below grade, its concrete form and grated decking would contrast with the curvilinear character of the river's edge. Viewers are unlikely to detect reduced flows in the bypass reach because of the viewing distance from this Key Observation Point and the highly confined nature of the bypass reach channel which concentrates the river flow. The proposed 960-square-foot equipment storage building would be sited in an area partially screened from Key Observation Point 3 by tall pines. As newly planted screening vegetation matures, the small building would become much less apparent from Key Observation Point 3. The visual contrast of these new components may be less than those of the existing ladder, but in combination, the project would not achieve the USFS Moderate Scenic Integrity standards.

From Key Observation Point 4, the only visible project elements would be the new fish transportation channel and fish exit structure. Boaters would be aware of the new transportation channel, although throughout over 90 percent of its length, the channel would be largely below grade. During summer low flows, its concrete sidewall would extend above the river bank a maximum of one to two feet in some locations and would not protrude at all in other segments. During high flows, it would be fully inundated, as occurs at the current fishway. Boaters would be aware that the area has been modified. Where the concrete sidewalls protrude, the linear form largely would be screened by a row of basalt boulders anchored along the transportation channel to fend off woody debris. When rafted together and secured in place with concrete, the boulders should withstand the force of the river and provide both structural protection and visual mitigation. Because the boulders would be obtained from transportation channel excavation, coloration should be natural, particularly after weathering in the stream over time. The new fishway exit structure also would be largely below grade, although it would be quite apparent from Key Observation Point 4. Most side walls and grated decking would be at grade, but the 25-foot-wide fishway exit and water supply intake would protrude from the deep river pool about 4.5 feet during summer flows. Figure 2-3 shows an elevational view of the fishway exit from the perspective of a boater; the

portion above the shaded line is what would be visible above the water under typical summer flow conditions. Boaters who are familiar with the project area may be aware that the water level is somewhat reduced in comparison to conditions prior to ladder expansion. The pool where most boaters exit the river to portage the most dangerous falls segment would be somewhat smaller under low flow conditions. The reduced flows may not be detectable in the short falls reach because its highly confined nature would remain very turbulent. Skilled kayackers who ran Lyle Falls prior to the proposed project likely would note the changes in hydraulics through this less than 200-foot-long falls segment, but this is unlikely to be perceived as a visual degradation. In summary, Key Observation Point 4 would not achieve USFS "moderate scenic integrity" standards.

## 3.9.3 Mitigation Measures

The following mitigation measures have been incorporated into project planning and analysis to avoid, minimize or offset potential adverse aesthetic impacts:

- Specify that the new equipment storage building would be brown with a dark, non-reflective roof to reduce the visual contrast.
- Use a color additive in the concrete placed on the surface of the new fish transportation channel and fishway exit/water supply intake to reduce visual contrast with the adjacent native rock.
- Paint the existing auxiliary water supply pipeline a dark color to match the adjacent concrete.
- Implement a vegetation protection plan to reduce potential construction damage to vegetation (see Section 3.4.3).
- Develop a landscape management plan to reduce the visual contrast of the equipment storage building from the Klickitat Trail (Key Observation Point 1) and the State Highway 142 overlook (Key Observation Point 4).
- Direct motion-sensor activated exterior lighting for the new building downward to achieve security objectives.
- Place sand or soil in crevasses of the excavated rock at the spoil disposal site adjacent to the Klickitat Trail to facilitate revegetation using within-watershed sources of seeds.

With these measures in place, the USFS Visual Quality Objectives are expected to be achieved from Key Observation Points 1 and 2. These standards would not be achieved from Key Observation Point 3, and during summer low flows, would not be achieved from Key Observation Point 4.

# 3.10 Land Use, Transportation, and Recreation

## 3.10.1 Affected Environment

### 3.10.1.1 Land Use and Ownership

The project site is within unincorporated Klickitat County at RM 2.2 of the Klickitat River. The general area is rural in character, with no residences or businesses in the nearby vicinity. The most common use of the area is subsistence fishing, and recreational hiking, boating and fishing. Klickitat County has authority for land use and construction permitting for all non-federal ownership within the county, including the project site.

The land occupied by the existing fishway is owned by the WDFW (Figure 3-8). The area on the northwest side of the Klickitat River extending up to the Klickitat Trail is owned by WDFW, while the area on the southeast side of the river opposite the fishway, is owned by a private entity. Figure 3-8 does not accurately reflect the correct parcel ownership boundary at the fishway due to the different map accuracy standards that are used by each source of mapping data; however, it does represent the data available from the Klickitat County Assessor's office.

As stated in Section 1.1, the existing fishway is owned by WDFW but has been operated by the YN since August 2006. The area immediately north (upstream) of the existing fish ladder, where the new fish transportation channel and water intake structure are proposed, is currently undeveloped and consists mainly of bare rock with some areas containing soils supporting native grass and herbaceous vegetation. The area immediately south (downstream) of the existing fish ladder is a traditional fishing area of the YN. This area is mostly bare solid rock with small amounts of soil supporting native grass and herbaceous vegetation. Wooden fishing platforms and a hand-operated cable car extend over and across the river at Lyle Falls.

Access to the project site is via an unimproved private road from the Fisher Hill Road (a county road). The private road is a tribal allotment to which WDFW holds an easement for access to the fish ladder (easement recorded on July 30, 1996 under Auditor's File No. 254588). The easement was extended by an Agreement between the YN and WDFW effective August 15, 2006, under which the YN agreed to maintain the road and gate. Before entering WDFW property, this road crosses the Klickitat Trail, which is owned by the WSPRC.

WDFW owns a 507-acre parcel that includes Lyle Falls fishway and lands to the north and west, and manages it under the Draft Klickitat Wildlife Area Management Plan (WDFW 2006b). The overall goals for WDFW's Klickitat Wildlife Area are to preserve and enhance habitat and species diversity for fish and wildlife resources, maintain healthy populations of game and nongame species, protect and restore native plant communities, and provide opportunities for public appreciation of wildlife (WDFW 2006b). The Lyle Falls site is within the WDFW's Fisher Hill Wildlife Area Unit, for which no specific land or resource management objectives are defined.

The lower 10.8 miles of the Klickitat River are designated as a National Wild and Scenic River (see Section 3.9.1), classified as a Recreation River. The Proposed Action is within this corridor that is managed by the USFS to ensure that the outstanding resources of the lower Klickitat River are protected and maintained (see Recreation below). Lyle Falls is approximately one mile north of the boundary of the USFS-managed Columbia River Gorge National Scenic Area.

The Klickitat River has a flood zone mapped by the Federal Emergency Management Agency (FEMA) (Figure 3-5). The fishway, constructed in the actual river channel, is within the 100-year flood zone boundary defined by FEMA.

The area around the Lyle Falls project site is zoned as Open Space by Klickitat County. The purpose of this zone is to retain or conserve the open character of the land, to safeguard the health, safety, and welfare of the residents by limiting development in areas where police, fire, and safety protection is not possible without excessive costs to the community. Conservation uses, such as a fishway, are permitted outright within this zone.

### 3.10.1.2 Transportation

General transportation patterns in the lower Klickitat River valley are typical of the lightly populated agricultural communities in central and eastern Washington. The volume of traffic is greater near larger communities along the Columbia River Gorge compared to more rural locations within the Klickitat River Valley. Truck traffic near the project site has a seasonal pattern of use, increasing during the spring through fall when construction, log hauling, and agricultural harvesting is occurring. This traffic pattern also coincides with increased passenger car volume during the summer months related to tourism in the Columbia River Gorge.

Roads in the project area include Washington State Highway 14 that parallels the north side of the Columbia River at the mouth of the Klickitat River valley, State Highway 142 that parallels the Klickitat River, and the Fisher Hill Road that accesses upland areas north of the Klickitat River.

State Highway 14, a two-lane undivided paved road, is the primary east-west route connecting communities along the north bank of the Columbia River. This road would be used by project operators, construction personnel, and material suppliers accessing the project site during construction and project operation. It is a two-lane rural-principal arterial with a posted speed limit outside of established communities of 60 miles per hour (WSDOT 2005a). Average daily traffic volumes reported on State Highway 14 near its junction with State Highway 142 at Lyle was 3,800 vehicles (WSDOT 2005b). Truck traffic accounted for 27 percent of the total use of 1,900 vehicles on a segment of State Highway 14 measured at a point approximately 25 miles east of the town of Lyle.

State Highway 142 is a two-lane, undivided, paved road running northeast that provides access along the Klickitat River between the towns of Lyle and Goldendale. This road would be used by project operators, construction personnel, and material suppliers

accessing the project site during construction and project operation. It is designated a rural-collector road, consists of two 11-foot lanes with 1-foot paved shoulders on each side, and has a speed limit of 45 miles per hour (WSDOT 2005a). Average daily traffic volumes reported on State Highway 142 near Lyle in 2005 were 880 vehicles (WSDOT 2005b). There is no data available on the percent of truck traffic within this total volume.

Fisher Hill Road is a gravel-surfaced county road extending from the Klickitat River to upland areas north of the river. Classified by the county as a minor collector road, it is 16- to 18-feet wide with ditching on the uphill side. There is no posted speed limit, although a warning sign at the southern end near State Highway 142 states that it is a primitive road with no warning signs. The posted clearance of this road under the railroad grade bridge adjacent to the Klickitat River is 12 feet 4 inches. This low clearance limits the size of the trucks that can travel on the Fisher Hill Road. The southern 0.2 mile of the Fisher Hill Road is used seasonally by recreational anglers and YN members to reach fishing sites along the Klickitat River. It provides the only vehicular access to the project site.

A 0.2-mile-long private road linking the project site to Fisher Hill Road is owned by a YN member and an easement for this road is provided to WDFW and the YN for operating and maintaining the fish ladder. This road is approximately 10- to 12-feet wide, with no ditching and limited turn-outs. The dirt surface is interspersed with patches of gravel. This road crosses WSPRC land at the Klickitat Trail, then enters WDFW property near the fish ladder. This road is heavily used during seasonal fishing periods by YN members and by WDFW and YN biologists operating the fish ladder.

### 3.10.1.3 Recreation

The Lyle Falls fishway is within a designated “Recreation” River in the National Wild and Scenic River program (PL90-542) (see Section 4.5). Recreational boating occurs upstream of Lyle Falls, but because of the degree of difficulty of the falls section, only around 35-40 experienced kayakers a year boat this reach (personal communication, USFS, July 2007). Recreation is more prevalent along the Klickitat Trail, a rail-to-trail conversion that parallels the Klickitat River and passes within 250 feet of the fishway. This trail is the primary recreation opportunity within a 0.5-mile radius of the project.

The lower Klickitat River was designated a Recreation river as part of the same legislation that established the Columbia River Gorge National Scenic Area. Both designated areas are managed by the USFS. Five outstandingly remarkable characteristics were identified for the Klickitat: hydrology, anadromous fish, resident fish, Native American dip-net fishing sites, and the geology of the lower river gorge (see also Sections 3.1.1, 3.2.1, 3.3.1, and 3.7.1). The boundary of this designation extends approximately 0.25 mile from each bank. It is noted that the Lyle Falls Fishway was constructed many years before this management designation.

The USFS defines and manages the lower Klickitat River corridor as a “roaded natural” area under the Recreation Opportunity Spectrum framework. In roaded natural areas,

visitors can expect opportunities for both for solitude and to encounter others in a setting that is natural but where human presence is evident. Rustic facilities may be provided. Consistent with this, the Lyle Falls fishway is accessible by a rough road, includes an unsurfaced parking area that could accommodate about 15 cars, yet is in a setting that feels isolated. The State Highway 142 corridor closely parallels the river but is far upslope and vehicle sights and sounds don't penetrate the adjacent vegetation. Two undeveloped highway turn-offs provide overviews of the Lyle Falls area and the fishway.

Although reaches of the Klickitat River upstream of the project area are popular with both kayakers and rafters, Lyle Falls is run only by highly experienced kayakers. A one-mile segment of the river known as Lyle Gorge is rated Class V-VI by whitewater boaters (Bennett 1991). Lyle Falls itself is rated Class VI (generally considered unrunnable by most standards, involving substantial hazard to life). The reach at the base of the fish ladder is described as possessing "overwhelming currents" and at points so narrow that inflatable rafts have become wedged between the vertical cliffs (Bennett 1991). About 35-40 boaters a year are reported to portage the first drop, and run the rest of the gorge reach, and a few kayakers run the entire reach each year. Downstream of the gorge, fishing is an important recreational activity as is boating in the calmer lower one mile of the river.

The USFS does not encourage kayaking in the lower Klickitat gorge due to potential conflicts with tribal fishing. Traditional tribal fishing methods are practiced from a point just upstream of the fish ladder, downstream to the Fisher Hill Bridge. Wooden platforms provide precarious bases for the YN families that fish with dip-nets affixed to long poles. The tribal fishery is open from the second week of April through the end of December, from mid-day Tuesday through midnight Saturday (personal communication, B. Sharp, YN Fisheries, October 25, 2006).

A number of goals are identified in the USFS management plan for the Lower Klickitat River (USFS 1991), although most have not been implemented (personal communication, V. Kelly, USFS Planner, September 8, 2006). Resource Management Goal 11 was to provide public access and facilities, including an objective to work with WSDOT to improve a roadside pull-out at RM 3.5 to provide an unobtrusive location to view the dip-net anglers. Resource Management Goal 14 was to provide for health and safety of recreational visitors and resource users (dip-net anglers). Suggested measures were to prohibit motorized boating above RM 1 on the Klickitat River and to develop a search and rescue plan for the river. FS order CRGNSA-09-03 prohibits motorized boating between RM 1.0 and Wheeler Canyon at RM 0.8.

The WSPRC owns the Klickitat Trail, a 31-mile former railroad right-of-way that extends from Lyle at the mouth of the Klickitat River upstream to the community of Warwick. This trail parallels the river in the vicinity of the Lyle Falls fishway and therefore is within the lower Klickitat River National Wild and Scenic River corridor. The USFS manages and operates a 13.5-mile segment of the trail in partnership with the WSPRC. As a result of a partnering agreement between these two agencies, the USFS prepared an environmental assessment in 2003 to evaluate trail management and improvement options (USFS 2003a). The decision document (USFS 2003b) defines trail

improvements that the USFS would spearhead. In the vicinity of the fish ladder, the only proposed improvement is to compact the 6-foot-wide trail surface. In addition, the Klickitat Trail Conservancy, a local volunteer group, was established to preserve and promote public use the trail which they view as a multi-faceted asset to Klickitat County. Klickitat Trail Conservancy conducts periodic trail maintenance events as well as organized hiking and biking excursions on the trail.

The Klickitat Trail Conservancy reports that the trail is used year round, peaking in the spring and fall (personal communication, B. Robinson, KTC Vice President, November 4, 2006). Summer heat reduces use, but proposed trail upgrades from the mouth of the river to the Fisher Hill Bridge may bring more summer visitors to the area from the Columbia River Gorge. Because published trail use data is unavailable, the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (IAC 2002) was examined, as were published projections of expected recreation use statewide (IAC 2003). Statewide use projections for hiking, biking and horseback riding, the allowed uses of the Klickitat Trail, were examined (Table 3-19). Other uses of the area include fishing, photography, and cross country skiing in winter. Participation as a percent of the population from 1979 to 1999 increased dramatically, except for equestrian activities, which remained stable. It can be surmised from this data that use of the Klickitat Trail could be expected to continue or increase as the population grows. The USFS reports that outfitted kayak school use has increased significantly in the last 5 years, growing from no reported use in 2000 to over 250 users in 2006 (personal communication, V. Kelly, USFS, May 4, 2007). In this same period, the USFS reports that outfitted boat fishing declined slightly, dropping from 250 participants in 2000 to about 225 in 2006.

**Table 3-19 Participation in Outdoor Recreation Activities by Washington Residents**

| Year | Walking / Hiking | Bicycling | Horseback Riding |
|---|---|---|---|
| 1979[1] | 17 % | 8 % | 3 % |
| 1989[2] | 75 % | 50 %[3] | |
| 1999[1] | 53 % | 20 % | 3 % |

[1] Data collected in 1979 and 1999 displays the percent of the population participating.
[2] Data collected in 1989 depicts participation by the number of households in the state.
[3] Data collected in 1989 combines bicycling and equestrian activities as Non-motorized Riding.
Source: IAC 2003

## 3.10.2 Environmental Consequences

### 3.10.2.1 Land Use

#### No Action Alternative

Current land uses at Lyle Falls would continue under the No Action alternative. Traditional fishing, non-motorized trail recreation and fish ladder operation would resemble present uses.

### Proposed Action Alternative

#### Construction Effects

As described in Chapter 2, the fishway would be modified, extending beyond the footprint of the existing structure into an area that currently is undeveloped and sparsely covered with native grasses, shrubs, and trees. Approximately 1.6 acres would be disturbed by the expansion of the fish transportation channel, water supply inlet/fishway exit, spoil disposal site, equipment storage building and temporary access roads. The area of developed land use would thus increase at this site.

The proposed modifications would be consistent with Klickitat County zoning ordinances, which classify the site as Open Space and uses such as the fishway are compatible with that designation. Most construction activity would occur within the boundaries of Klickitat County's Shoreline Management Program (SMP). The Klickitat River is a shoreline of statewide significance, and under the Shoreline Use Element of the SMP, the county would evaluate consistency of the expanded fishway with their goal of balancing shoreline uses and minimizing adverse effects on the environment. Because this reach of the Klickitat River is also a designated National Wild and Scenic River, the USFS will contribute to the County's shoreline consistency determination, as well as write the Section 7a analysis of consistency with the National Wild and Scenic Rivers Act.

#### Operational Effects

The Lyle Falls fish ladder is on rural undeveloped land owned by WDFW. The WDFW published a draft management plan for land they own in the Klickitat River subbasin (Ellenburg and Dobler 2006); however, no land management recommendations are included for parcels in the vicinity of Lyle Falls. Because the site is currently in use as a fishway, the proposed expansion would not represent a change in land use.

Modifications to the fish ladder would occur within the 100-year flood zone defined by FEMA (Section 3.6.1.2). The ladder would be designed and engineered to allow seasonal high flows to pass over the structure without restricting the connection between the river and the floodplain. Placement of approximately 4,000 cubic yards of excavated rock in the location shown on Figure 2-1 would be outside the high flow channel but within the 100 year flood zone, and would not impede flows or cause inundation of adjacent areas. Similarly, the maintenance building would be within the 100-year flood zone but outside of the active high flow channel.

## 3.10.2.2 Transportation

### No Action Alternative

Implementation of the No Action alternative would not increase traffic on roads adjacent to the project site. Vehicle traffic would continue to be generated on State Highway 142 and Fisher Hill Road by the general public and on the private road accessing the fishway by tribal fishers and project personnel.

## Proposed Action Alternative

### Construction Effects

The transportation routes used to reach the project site would experience changes in the level of use during construction. These changes would occur on a daily basis during the construction period extending over two successive summer to early fall periods. Construction would coincide with the low seasonal flows in the Klickitat River.

Activities that would affect the transportation system include the intermittent transport of construction materials and equipment to the project site, transport of debris, waste materials, and equipment from the project site, and the daily travel of construction workers. It is estimated that up to 10 workers would be present at any given time. Construction materials delivered to the site would include rock and gravel for construction pads and access road improvements, wood for concrete forms, metal for concrete reinforcing and solid structures, and concrete. The source and quantity of these materials is not precisely known at this time, although it is anticipated that most materials would originate from suppliers along the Columbia River. Some materials may originate from Goldendale or other communities north of the project site. The nearest concrete batch plant is located in Bingen approximately 10 miles west of Lyle.

Waste material produced on the site would include rock and soil from excavated areas, and wood and metal debris from construction forms and supports. Excavated rock would be permanently deposited in a location immediately adjacent to the construction site (Figure 2-2). Measures would be taken to prevent any construction materials from entering the river, becoming a potential hazard to kayakers. Wood and metal waste would be transported off-site to an approved disposal site.

Construction activities intermittently would increase truck traffic on State Highways 14 and 142, the Fisher Hill Road, and the private road accessing the construction site over a two-year period. Based on available data for State Highway 14 (WSDOT 2005b), assuming a maximum of 5 deliveries to the project site on a typical day and daily travel by up to 10 construction workers, this would result in 30 additional trips or a 6 percent increase in daily truck traffic (523 total trucks) on State Highway 14.

The contribution of 30 additional trips to the existing daily use of State Highway 142 (approximately 880 vehicles) would represent a 3.5 percent increase in traffic. No use data is available for Fisher Hill Road, but it is thought to be light, so the addition of construction-associated traffic would be a major increase. Truck use of the Fisher Hill Road is limited by the low clearance trestle at the junction with State Highway 142. Any increase in traffic would be noticeable to local users, particularly recreational anglers that park in the vicinity of Fisher Hill Bridge.

Traffic on the private unimproved access road leading to the project site is primarily passenger cars and light trucks going to the YN fishing sites and the fish ladder. Heavy equipment is rare on this road, generally occurring once a year when equipment is brought in to dredge gravel deposits at the water supply entrance of the ladder (see Section 3.2.2.1). Additional truck traffic would be most noticeable to tribal

members at the fishing sites by the falls, and may be noticeable to users of the Klickitat Trail. To accommodate increased use of this road, crushed rock would be placed to stabilize the base and surface, potentially adding a turn-out to allow vehicles to pass in opposite directions, clearing vegetation to improve sight lines, and installing safety signage on the Klickitat Trail.

#### Operational Effects

Fish ladder operations would generate traffic at levels similar to current conditions. State and tribal fisheries biologists would periodically inspect the trap portion of the ladder and perform general maintenance. This may occur on a daily basis when fish are actively moving upriver or on a weekly basis at other times of the year. Their vehicles would continue to drive on the ladder surface to transport monitoring equipment directly to the work area. The amount of traffic generated during operation of the fishway is expected to be similar to existing conditions and would consist of passenger car and light truck traffic.

### 3.10.2.3 Recreation

#### No Action Alternative

The recreational setting in the project vicinity would be unaffected under the No Action alternative. Current uses are expected to continue, likely increasing over time. Popularity of the Klickitat Trail could be expected to grow in conjunction with visitation to the Columbia River Gorge and boating upstream of the project reach also may increase.

#### Proposed Action Alternative

Undertaking the proposed fishway modifications would not preclude any current recreation uses either during construction or upon completion; however, temporary disruption over two summer seasons would alter the recreation setting.

#### Construction Effects

As stated in Section 2.2.2.10, ladder modifications are proposed to extend over two summer seasons. An existing access road that crosses the Klickitat Trail would be used by all construction workers, equipment, and materials delivery (see Section 3.10.1.1). Warning signs to caution trail users about cross traffic would be posted on the east and west sides of the trail near the crossing throughout each construction season as well as at the nearby trail access point. During brief periods of peak construction activity, a flagger may be present to caution trail users about truck movements. Crossings are expected to range from 12 to 50 per day, depending on the work activity. Safety personnel would be posted on the trail when charges are set off to fracture rock (see Section 2.2.2.10), with public access potentially halted for periods lasting less than 30 minutes. Although blasting would not be conducted near the trail, this precaution would be taken to ensure that visitors or pets do not stray into the area. Because trail use is light, these effects are not expected to disrupt significant numbers of users.

Construction activities would be visible from the trail for about 0.5 mile north of the existing ladder, although these views would be partially screened by trailside vegetation (Section 3.9.2.2). The undeveloped setting along the National Wild and Scenic River corridor would be compromised by the presence of heavy equipment and personnel, altering the experience of boaters for a short period.

River-based recreation at the site of the new fish transportation channel and exit structure would be affected for parts of two summer seasons. The area where boaters take out to portage a portion or all of Lyle Falls would be affected by construction. While use of the shoreline would not be precluded, certain segments would be inaccessible during construction.

#### Operational Effects

The effects of operating the modified fishway on recreational opportunities in the project area would be modestly altered. The only identifiable effect would be to kayakers who would disembark adjacent to the new fish transportation channel. They may have to walk an additional 200 feet farther than they currently do to portage around all or a portion of Lyle Falls. Periodic inspection, maintenance, and fish trap monitoring activities would be unchanged from current practices, with no effect on recreation uses.

## 3.10.3 Mitigation Measures

The following mitigation measures have been incorporated and analyzed during project planning to avoid, minimize or offset potential adverse effects on land use, transportation, and recreation:

- Add crushed rock to the Lyle Falls access road to provide a more stable surface for existing users and construction vehicles.
- Construct a turn-out along the access road to improve safety for existing road users and to reduce conflicts with construction vehicles.
- Clear vegetation along access road to improve sight lines and allow safe passage of vehicles in opposite directions.
- Install safety signage at the intersection of the Klickitat Trail and the access road to reduce conflicts between trail users and construction traffic.
- Flaggers would be used at the intersection of the Klickitat Trail and the access road on days when blasting would occur. Warnings also would be posted on the river bank upstream of the work area cautioning boaters of construction. Outreach to boaters would occur before construction begins. A flagger would be positioned upstream prior to execution of blasting.

# 3.11 Socioeconomics

## 3.11.1 Affected Environment

### 3.11.1.1 General Population, Income, and Employment Characteristics

To evaluate the affected socioeconomic environment, the primary project area is defined as local communities in south-central Washington within Klickitat, Skamania, and Yakima counties; and to a limited extent, selected communities in north-central Oregon. The largest population centers are in the Yakima Valley, located northwest of the project area. The largest urban communities, Vancouver and Portland, are about 100 miles to the west. Table 3-20 includes recent population estimates for the project area communities.

The Native American population in Klickitat and Yakima counties was estimated to be about 11,670 in 2004. Enrolled members of the Yakama Nation tribal membership is estimated to be about 8,870 (Table 3-20).

Also located south of the project area across the Columbia River, are the communities of The Dalles and Hood River, Oregon, which may provide some services or materials for project construction. These communities have been, and are, experiencing growth related to the housing and small commercial sectors.

In the project area counties, economic activity and primary industries are diverse, including agriculture and food processing, forest products, transportation and warehousing, recreation and tourism, health care, and the service-sector industries (BEA 2005). Per capita income within the project area counties tends to be moderately lower that in Washington's more urban counties, where higher earnings industries and activities are located.

**Table 3-20 General Population, Income, and Employment Components for the Affected Area, Local Communities**

| County/City Tribal/ Reservation | 2005 Est. Population | Est. 2004 Native American Population | Est. 2005 Per Capita Income | Est. 2005 Employ. (All Jobs) | Est. 2004 Construction Employment |
|---|---|---|---|---|---|
| Klickitat County | 19,500 | 736 | $24,809 | 6,769 | 413 |
| Bingen | 655 | ------ | ------ | | ------ |
| Goldendale | 3,650 | ------ | ------ | | ------ |
| White Salmon | 2,235 | ------ | ------ | ------ | ------ |
| Skamania County | 10,300 | 262 | $24,371 | 2,267 | 103 |
| Stevenson | 1,250 | ------ | ------ | ------ | ------ |
| Yakima County | 229,300 | 10,679 | $25,125 | 103,029 | 3,653 |
| Toppenish | 9,000 | ------ | ------ | ------ | ------ |
| Yakima | 79,480 | ------ | ------ | ------ | ------ |
| Wapato | 4,535 | ------ | ------ | ------ | ------ |

| | | | | | |
|---|---|---|---|---|---|
| Yakama Nation Tribal Membership | 8,870 | ------ | ------ | ------ | ------ |
| Oregon | | | | | |
| The Dalles, OR | 11,894 | ------ | ------ | ------ | ------ |
| Hood River, OR | 6,480 | ------ | ------ | ------ | ------ |

Source: Office of Financial Management, 2005; WA State Data Book, 2005; and BEA Local Area Regional Income, 2005.

Along the Columbia River corridor, the recreation industry continues to grow, which includes sport salmon and steelhead fishing. Within the general project area, most larger-scale employment and commercial activities reside in Yakima County.

Economic activity on the Yakama Nation Reservation (within Klickitat and Yakima counties) is broad in nature. The YN and tribal members operate several financial enterprises, including timber products, Columbia River fisheries, farming units, gaming facilities, tourist and recreation sites, and several other types of small commercial enterprises on and near the Reservation. The YN also maintains and provides for its members significant health, education, and human services needs (Yakama Nation Economic Development 2006).

Members of the YN fish for commercial purposes as well as for ceremonial and subsistence needs. The tribal fisheries occur within the Zone 6 region, extending from Bonneville Dam pool through the John Day Dam pool. In 2006, YN tribal members and their counterpart tribes within the inter-tribal fisheries, caught about 24,300 spring and summer Chinook and about 47,000 fall Chinook (initial catch estimate) in Zone 6.

## 3.11.2 Environmental Consequences

### 3.11.2.1 No Action Alternative

Economic conditions would be similar to the existing conditions described in Section 3.11.1. No new construction would be undertaken, although regular maintenance and repairs would be expected to continue at levels similar to the present. Employment associated with the fishway would include YN fisheries staff with continued involvement by WDFW biologists. Employment levels would be consistent with current operational levels.

### 3.11.2.2 Proposed Action Alternative

The direct and secondary effects of project-related construction and continued operation of the fishway would be insignificant in terms of the regional population. The construction phase would not measurably affect the local or regional population, nor would the service needs of the population be changed by project operations.

#### Construction Effects

Though positive in nature, the economic impacts associated with fishway modifications are expected to be relatively small, and thus not significant to the local and state

economies. Total construction costs (including labor, materials, and equipment) are estimated to be about $2.5 - $3.0 million and would extend over two 4-month periods. This equates to about $1.0 million or less for infrastructure and capital costs, about $1.0 million or less for equipment rentals and custom work, and about $1.0 million or less for skilled and unskilled labor.

Short-term full-time construction employment would increase by approximately ten to twelve workers on site. Using the Washington State economic input-output model (I/O Model) (Office of Financial Management, Washington State 2004), about 22 to 26 direct and secondary positions would be supported by the project construction phase.

Relative to the total value of all statewide goods and services potentially affected by the project construction, the Washington State I/O model indicates about a $7.0 to $8.0 million overall change (total statewide impact). With the expenditures adjusted for total income impacts, the estimated increase to direct, secondary, and induced labor income throughout the state would be about $2.4 to $2.8 million (based on Office of Financial Management, Washington State I/O Model analyses by Pacific Northwest Project). A percent of this could be expected in the nearby small communities such as Lyle that may offer services to construction workers.

The construction phase would be expected to include opportunities for tribal construction contractors and laborers. The Yakama Nation maintains a Tribal Employment Rights Office (TERO) that provides contact lists for tribal-member owned construction and construction-related companies. The TERO also facilitates the employment of skilled and unskilled tribal laborers for construction projects. Thus tribal construction management and labor is expected to be available for project work (personal communication, T. Arquette, YN TERO staff, January 2007 and other discussions with Tribal agency staff, 2006-2007).

The overall project area has witnessed growing commercial development during the last decade, and several local and regional construction companies may be available to bid on the project, both tribal and non-tribal in ownership. Construction firms from larger urban areas that are experienced in this type of work could be expected to bid for construction contracts.

### Operational Effects

As stated earlier, the Lyle Falls fishway has been owned and maintained by WDFW since the early 1950s. The YN and WDFW have collaborated to monitor fish passage at Lyle Falls for many years. As of August 2006, fishway operation and maintenance responsibilities were formally transferred to the YN in an agreement signed by WDFW and the YN. Therefore, employment of maintenance personnel shifted between these organizations.

Ladder maintenance requirements and associated staffing needs may be reduced upon completion of the proposed modifications. Biological monitoring would be similar to or

greater than current levels if use is made of the facility for basin fisheries data collection. Associated employment could increase slightly.

### 3.11.3 Environmental Justice Considerations

Executive Order 12898 to the Council on Environmental Quality provides that federal agencies make environmental justice a part of their missions 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; and 3) offers mitigation measures to reduce unwarranted impacts on minority or low income communities.

The YN proposed that BPA adopt the Lyle Falls Fish Passage Project as part of the agency's extensive effort to implement its share of the Columbia River Basin Fish and Wildlife Program and mitigate fish and wildlife affected by the basin's federal hydropower projects. The fish runs are important to the cultural and economic livelihood of the YN. The effects of the project on other aspects of environmental justice are summarized below:

- Population: Construction and operation of the fishway would have no population-level effect on minority or low income groups.

- Income and Employment: Tribal agencies, like TERO, are in place to identify tribally-owned construction firms and labor resources that may be qualified for project construction.

- Housing: Fishway modification would have no long-term effect on local housing.

- Local Services: During fishway construction, local businesses may experience short-term beneficial effects due to the demand for materials and some services.

- Subsistence Fisheries: A short-term (4-month) negative effect on fishing opportunities at Lyle Falls may occur at 2 to 3 fishing sites during ladder construction. Long-term benefits may be realized if improved fish passage increases fish productivity in the subbasin.

### 3.11.4 Mitigation Measures

Given the limited socioeconomic effects associated with project construction, no mitigation is proposed.

## 3.12 Cumulative Effects

According to the Council on Environmental Quality's regulations for implementing NEPA (40CFR§1508.7), an action may cause cumulative impacts on the environment if

its effects overlap in space or time with the effects of other past, present, or reasonably foreseeable future actions, regardless of the agency, company, or person undertaking the action. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative effects are the incremental impacts upon a resource that result from the interaction of two or more individual actions. There are two types of cumulative effects that could occur on this project as described in this document: 1) the incremental effect of two different resource actions occurring within a proposed alternative, and 2) the incremental effect resulting from a project action and a non-project action. Each type of cumulative effect must consider past, present, and reasonably foreseeable future actions (temporal component), and actions that may be separated by distance (spatial component) if there is the potential for incremental effects.

The spatial scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of: 1) the Lyle Falls Project's effects on the resources; and 2) the contributing effects from other activities within the Klickitat River watershed or the surrounding socioeconomic area. Because a Proposed Action may affect some resources differently, the spatial scope of analysis for each of the resources may vary. The temporal scope of analysis for cumulative effects includes past, present, and future actions and their effects on each resource. The assessment of future actions is limited to actions that are reasonably foreseeable.

Two or more project actions that result in a cumulative effect are addressed as a direct or indirect project effect, and are described for each alternative in the Environmental Consequences sections. These cumulative effects are not described further in this section.

Cumulative effects can also occur when the effects of project related actions interact with non-project actions occurring in the same geographic area. The non-project effects may occur at differing temporal scopes than the project action, such as persisting effects from past actions, or effects that may result from reasonably foreseeable future actions. Non-project actions can include other federal, state, local government or private industry activities, or management and policy decisions relating to social or resource management. Such cumulative effects are summarized in the following sections.

Non-project actions assumed to contribute cumulatively to the effects of the modification to the Lyle Falls Fishway are listed below. These policies, projects and actions are likely to interact with resources and project actions evaluated in this EIS to create a cumulative effect upon a resource.

- Management Plan for the Klickitat National Wild and Scenic River
- Klickitat River Subbasin Plan
- Klickitat Subbasin Recovery Plan for the Mid-Columbia River Steelhead ESU

- Klickitat Lead Entity Regional Salmon Recovery Strategy
- Policies and practices to restore ESA-listed species by NMFS and USFWS
- Commercial, recreational, and tribal fish harvest
- Recreational use in the Klickitat River watershed.

The following subsections briefly describe these policies, projects, and actions. The interaction of these non-project actions with the alternatives evaluated for the Lyle Falls Fishway modifications project is presented in below.

## 3.12.1 Geology and Soils

No cumulative effects on geologic or soil resources have been identified.

## 3.12.2 Water Resources (Hydrology, Water Rights, Water Quality)

The Proposed Action would have no cumulative effect on overall river hydrology upstream or downstream of the fish ladder site as the project is a non-consumptive use of the Klickitat River. From a water quality standpoint, the Proposed Action would incrementally reduce turbidity and reduce disruption of bedload transport by eliminating the need to periodically excavate gravel and sediment deposited in the Klickitat River at the fishway exit.

The Klickitat watershed has been affected by timber harvest, agriculture, habitat restoration projects, salmon recovery projects, some residential and commercial development, and watershed management activities. Some of these activities have had significant effects on hydrology and water quality. Although implementation of the Proposed Action would not be expected to contribute appreciably to non-compliance with water quality standards, by eliminating periodic sediment removal (of 6 to 15 cubic yards of material) and reducing associated turbidity, it may contribute incrementally to water quality improvement when added to past and future projects.

## 3.12.3 Fisheries

In addition to improving fish passage at Lyle Falls, the proposed action also would contribute incrementally toward achieving the goals of several basin management plans targeting both the conservation and harvest of salmonids utilizing the Klickitat River and its tributaries. Production and conservation objectives of the Klickitat Subbasin Plan (YN et al. 2004) and the Klickitat Supplemental Plan (YN 2004b) include improving distribution of spawning fish throughout the basin, and monitoring population levels and composition.

Improved passage also would contribute cumulatively toward the objectives of the Klickitat Lead Entity Regional Salmon Recovery Strategy (see Section 4.6.9.5) to return native salmonids to sustainable and harvestable levels. Monitoring capabilities would be expanded in the modified fishway. In addition to being safer for biologists and improving day-to-day fisheries management, the modifications would cumulatively increase the ability of the YN and WDFW to manage the ESA-listed population of Middle Columbia River steelhead as stipulated in the Klickitat Subbasin Recovery Plan (NMFS 2006a) and potentially to allow broodstock collection. On-going YN mitigation efforts for spring Chinook, fall Chinook, coho and steelhead trout (see Section 3.3.1.1.) would improve adult passage, contributing to increased production which, in turn, would contribute cumulatively to the number of harvestable fish—including listed steelhead and depressed spring Chinook.

The watershed above Castile Falls contains suitable spawning habitat for Chinook salmon, steelhead and bull trout. Improving passage at Lyle Falls would allow more fish to take advantage of this newly-accessible habitat. If these fish colonize this habitat, it will result in an increase in nutrients associated with decomposing carcasses, which as shown in Section 3.3.2.2, would benefit the entire aquatic community by increasing primary productivity.

## 3.12.4 Vegetation and Wildlife

Oregon white oak habitat is considered a priority habitat in Washington (Larsen and Morgan 1998). Its distribution in Washington is limited and its abundance is declining as a result of fire suppression and conversion to agricultural use, cattle grazing, and urban development (Larsen and Morgan 1998). Currently, Klickitat and Yakima counties support approximately 70,000 acres of ponderosa pine/Oregon white oak habitat (Chappell 2005). The loss of ten oak trees as a result of construction at the Lyle Falls fish ladder would represent a very small incremental contribution to the cumulative loss of oaks in the Klickitat subbasin. Planting oaks as part of the site revegetation plan (Section 3.4.3.2) would mitigate this loss, and would be consistent with WDFW's management recommendations (Larsen and Morgan 1998).

## 3.12.5 Threatened and Endangered Species

Cumulative effects for listed bull trout and MCR steelhead are described in Section 3.12.3.

## 3.12.6 Wetlands and Floodplains

The Proposed Action would have no cumulative effect on wetlands because the only wetland at the project site would not be affected. The proposed fishway modifications would negligibly contribute to continued development within the 100-year floodplain in this region. Implementation of the Proposed Action would result in a very minor increase of natural floodplain functions. Modifications to the Lyle Falls fishway would result in a minor increase in the ability of the river to moderate the magnitude and duration of flood

flows by adding water-carrying structures to areas that are currently solid rock. The 960-square-foot maintenance building would be within the floodplain, 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.

## 3.12.7 Cultural Resources

Modifications to the fishway under the Proposed Action alternative would contribute incrementally to changes in the project area setting. No other actions or changes have been identified that would cumulatively affect the National Register-eligible Traditional Cultural Property at this site.

## 3.12.8 Air Quality, Noise, Human Health and Public Safety

Construction of the proposed fishway and supporting structures are expected to have a minor effect on air quality, noise, human health and public safety. Operation of the proposed fishway is not expected to affect these same resources. There are no other projects known to be proposed near Lyle Falls in the near future that would have an effect on air quality, noise, human health and public safety. Therefore, implementation of the fishway improvements would have a minor, short-term contribution to cumulative effect on these resources.

## 3.12.9 Aesthetic Resources

Expansion of the fishway and construction of the storage building would additively contribute to human development, cumulatively affecting visual resources in the lower Klickitat River subbasin.

## 3.12.10 Land Use, Transportation and Recreation

Recreation pursuits in the vicinity of the fishway include non-motorized activities on the Klickitat Trail, kayaking, and fishing upstream and downstream of the falls. Project construction and fishway operation would not contribute cumulatively to these recreation activities.

The proposed fishway improvements would not represent a change to land uses in the vicinity, although adding a storage building would be a minor land use change as there are no other such structures along this reach of the Klickitat River. No other structures are known to be proposed in this reach by other developers in the foreseeable future. Due to the federally designated recreation status of this portion of the Klickitat River, future development within the corridor must be compatible with the USFS management plan and the Wild and Scenic Rivers Act. Therefore the Proposed Action is not expected to have a cumulative effect on land use along the river.

Improvements proposed to the fishway would result in a minor and short-term increase in traffic on roads near Lyle Falls during the construction period, with the greatest effect occurring closest to the project site. No other large or long-term construction projects are known to be planned in the area; therefore, there would be no cumulative effect to traffic quantity and patterns as a result of this project, at the time of this writing.

### 3.12.11 Socioeconomics

When the socioeconomic effects of the Proposed Action 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 affected communities in the Columbia Basin. These projects have already been budgeted by BPA; therefore, no additional rate impacts would result from funding this proposed project or the fish and wildlife program at currently projected levels.

## 3.13 Unavoidable Adverse Effects

Unavoidable adverse effects are those effects that would occur upon implementation of the Proposed Action, including any mitigation measures that are implemented with the Proposed Action. Unavoidable adverse effects would not be mitigated and would occur with implementation of the Proposed Action.

### 3.13.1 Geology and Soils

No unavoidable adverse effects to either geologic or soil resources would be associated with the Proposed Action.

### 3.13.2 Water Resources (Water Quality, Hydrology, Water Rights)

Increased flow through the fish ladder would reduce the amount of water within the 475-foot-long bypass reach by up to about 26.7 percent during lowest flow conditions. This effect would be unavoidable, as a primary goal of the Proposed Action is to increase the volume of diverted water to enhance the ability of the ladder to attract fish. No adverse effects to overall river water quality, channel morphology, hydrology, large wood or sediment passage, or water rights have been identified with the proposed flow reduction in the bypass reach.

### 3.13.3 Fisheries

Any unavoidable adverse effects to fisheries that may occur during construction would be minor and temporary. These effects include temporarily dewatering a small amount of aquatic habitat during construction of the new fishway exit structure; and the need to handle fish that may be isolated during installation of the cofferdam or during ladder dewatering.

The fitness of fish reaching the upper Klickitat subbasin potentially could be adversely affected to a minor degree. As fish passage becomes easier, selection for more athletic, larger and/or more bioenergetically "efficient" fish would be relaxed, with a potential minor effect on the fitness of a population that has an arduous spawning run.

The productivity of native stocks of spring Chinook and steelhead may also be slightly depressed because of competition with or predation by the progeny of non-native fall Chinook and coho. The magnitude of any such impact would depend entirely on the reproductive success of fall Chinook and coho. Prospects for natural production of these species are low because of very high fine sediment levels in spawning gravels and because of a severe lack of complex, low-gradient rearing habitat required by juvenile coho (as well as high sediment loading below the confluence with Big Muddy Creek).

## 3.13.4 Vegetation and Wildlife

No unavoidable adverse effects on vegetation or wildlife were identified, other than temporary noise disturbance during two construction seasons and temporary dispersal of wildlife. Construction of the fishway would require removal of 4 ponderosa pine trees and 10 Oregon white oak trees that may currently provide cover or forage for wildlife, particularly passerine birds; however, pine and oak trees would be planted as part of the revegetation plan following construction to mitigate for the loss of this habitat. Construction would cause temporary disturbance during two summers, causing some wildlife species to relocate to avoid the project area.

## 3.13.5 Threatened and Endangered Species

Modification and operation of the fish ladder would have limited adverse effects to federally listed plants or animals. The unavoidable effects on listed bull trout and Mid-Columbia River steelhead would be the same as identified in Section 3.13.3.

## 3.13.6 Wetlands and Floodplains

No unavoidable adverse effects to wetlands have been identified under the Proposed Action alternative. Fish ladder modifications would increase the volume of built structures within the floodplain. Because water would flow through the structures, there would be a negligible unavoidable effect on overall flood flow elevation. The small concrete block maintenance building, proposed at Elevation 170, is about 20 feet higher than the active river channel, yet potentially it could be within the wetted channel during an extreme high flow event. The surrounding trees and the selected construction material are expected to prevent significant structural damage from occurring.

## 3.13.7 Cultural Resources

Construction at the downstream end of the fish ladder may preclude tribal access to up to three traditional fishing scaffold sites for a period of about three to four months in one of the two construction seasons. Construction must occur during the summer to early fall

low flow season, which coincides with the presence of migrating fall Chinook in the Lyle Falls area.

### 3.13.8 Air Quality, Noise, Human Health and Public Safety

During construction, short-term air quality emissions, increases in noise, and worker safety risks could be expected from equipment and machinery use in the project area. These are unavoidable but short-term effects are typically associated with construction projects.

### 3.13.9 Aesthetics

Expanding the fishway and constructing a permanent storage building under the Proposed Action would increase the built environment, proportionally reducing the natural setting. USFS Visual Quality Objectives are not achieved by the present facility, an effect that would be increased by fishway expansion. The sensitivity level from two affected viewpoints has been assessed, but the number of potential visitors who would be affected is unknown, but thought to be low. So although this effect, even with mitigation, is unavoidable, a limited number of viewers would be affected.

### 3.13.10 Land Use, Transportation and Recreation

Implementing the Proposed Action would not result in unavoidable adverse effects to recreation facilities or uses. Construction of the storage building would result in a minor unavoidable adverse effect to land use as this would be the only above ground building within this reach of the National Wild and Scenic river corridor. Short-term and temporary increases in traffic on the existing roads would occur during the construction period. These increased traffic levels would be greatest for roads that are closest to the project site.

### 3.13.11 Socioeconomics

Up to three traditional fishing sites would be inaccessible during one construction season, adversely affecting those tribal families that fish these sites for subsistence or commercial purposes. This temporary interruption constitutes cumulative change from the social and economic perspectives, but it is uncertain to what degree this effect would have due to the short term, temporary duration of this inaccessibility.

## 3.14 Relationship of Short-term Uses and Long-term Productivity

Short term uses introduced by construction of this project would include the demand for construction labor and equipment over an approximately eight-month, noncontiguous

period of time, and some limited effects on natural resources in the immediate vicinity of the construction activities. Long term benefits would include compliance with federal fish passage guidelines; the ability to improve collection biological (fisheries) information, improved management of fishery resources in the Klickitat subbasin; and improved fishway functionality would greatly enhance the productivity of salmonid populations in the subbasin.

## 3.15 Irreversible and Irretrievable Commitment of Resources

Development and operation of the proposed project would require irreversible and irretrievable commitments of resources such as rock, gravel and petroleum products. Gravel and rock would be used for roads, foundations, and as a component of concrete. Although some of these materials could be retrieved if the ladder is decommissioned in the future, it is unlikely that they would be returned to their place of origin. Petroleum products would be consumed by construction equipment and would be used during the operation of the fish ladder. Federal funding used to develop this project would be considered an irretrievable socioeconomic resource because it could not be allocated to another purpose. The effect of the irreversible and irretrievable commitments of resources is expected to be negligible in all cases.

## 3.16 Intentional Destructive Acts

In its December 1, 2006 memorandum, the Department of Energy (DOE) issued interim guidance titled “Need to Consider Intentional Destructive Acts in NEPA Documents”. This interim guidance was developed by the Office of NEPA Policy and Compliance and requires that all environmental impact statements and environmental assessments prepared for proposed DOE actions, address the potential environmental consequences of intentional destructive acts such as sabotage, terrorism, vandalism, and theft. Where applicable, partial guidance is also offered in “Recommendations for Analyzing Accidents under NEPA”, that was also prepared by the Office of NEPA Policy and Compliance in July 2002.

For fish, watershed, and wildlife mitigation projects that BPA implements, there have been only a minor number of incidences where vandalism and theft were reported. These have been isolated and relatively minor and have not affected integrity of the respective projects. While the likelihood for such intentional destructive acts to occur at the Lyle Falls Fishway is difficult to predict, it is highly unlikely that such acts would occur. Intentional acts could include deliberate fire, explosions, missile or other impact force that are not accidental, although they could be random. Comments received during the scoping process revealed no levels of opposition to the proposed modification/upgrade of the Lyle Falls fishway. Generally, the community, including the YN, support the potential for increasing fish passage through the ladder and there is no reason to believe that such destructive acts would occur. Intentional destructive act are generally intended

to portray a message that is generally farther reaching than an action at an isolated fish ladder. None of these intentional acts have occurred at the project site nor would they send a common sense message.

With the exception of the proposed equipment building, the YN prefers the facility not to include security fencing, surveillance camera equipment or other such security measures, largely because the project area is frequently visited and occupied by tribal members for subsistence and ceremonial purposes. In the unlikely instance of sabotage, terrorism, vandalism or theft acts directly focused on the Lyle Falls Fishway, there is no indication this would have any national or regional significance, and likely could be quickly isolated.

# 3.17 Summary of Environmental Consequences

Table 3-21 summarizes the beneficial and adverse affects associated with implementation of the No Action and the Proposed Action alternatives. Mitigating measures identified in the respective sections would apply to the proposed action alternative.

**Table 3-21 Summary of Environmental Consequences of Alternatives**

| Environmental Resource | No Action Alternative | Proposed Action |
|---|---|---|
| 3.1 Geology and Soils | Deposited sediment would continue to be dredged from the fishway exit. | Up to 1.6 acres of basalt and soils disturbed (excavated) during construction to build the modified fishway. |
| 3.2 Water Resources | From 4.5% (at low flow) to 2.9% (at high flows) of river flow would continue to be diverted through the ladder, affecting a 200-foot-long reach of the Klickitat River. | From 26.7% (at low flow) to 8.6% (at high flow) of river flow would be diverted through the ladder, affecting a 475-foot-long reach of the Klickitat River. |
| | Turbidity would increase during periodic instream dredging of fishway exit and bedload stored in the river channel would be disrupted. | Construction of the modified ladder would temporarily dewater a 1,500-sq.ft. area of river. A cofferdam would reduce potential water quality effects from work in this area. Sediment detention tanks would filter water from construction areas prior to release back to the Klickitat River. New fishway exit location would reduce or eliminate need to remove accumulated bedload from river. |
| | | No long-term effects on water quality from ladder operation. |
| 3.3 Fisheries | Upstream migration of some fish (fall Chinook, coho salmon, Pacific lamprey) would continue to be impaired, particularly during high and low flow conditions. | Upstream migration of fish, primarily fall Chinook and coho, and possibly lamprey, would/could be improved. |
| | Poor passage conditions would continue to depress reproductive success of some salmon and steelhead due to delays in migration and fallback. | Improved passage conditions and escapement of fall Chinook and coho could increase competition between spring Chinook and steelhead, and between coho and fall Chinook. However, due to different spawning habitat requirements and different spawn timing, these competitive effects are expected to be minimal. |
| | Nutrient enrichment from salmon carcasses would be unchanged. This basin is nutrient and prey-limited, factors contributing to low productivity. | Enabling more salmonids to reach the upper Klickitat River would increase primary productivity and nutrients available to aquatic organisms. |
| | Population monitoring of fish from | Basin fisheries management would benefit |

| Environmental Resource | No Action Alternative | Proposed Action |
|---|---|---|
| | this site would continue to be difficult due to condition and functionality of existing facilities. Fish stress and mortality from handling would continue at current levels. | from improved monitoring capabilities. Monitoring stress and mortality to fish would be reduced with PIT-tag and video monitoring capabilities that would greatly reduce fish handling. |
| | Fish harvest opportunities would continue at approximately current levels. | Overall Klickitat subbasin harvest opportunities, including commercial, subsistence, recreational and ceremonial, would increase as escapement and resultant productivity increase. There is potential for some slight decrease in harvest at the immediate fishway site. |
| | Lamprey would continue to avoid the fish ladder as an upstream passage route. | The modified fishway would be designed to be favorable for lamprey passage; i.e., rounded corners/edges. |
| 3.4 Vegetation and Wildlife | Vegetation around the margins of the ladder, parking area, and informal camping sites would continue to be disturbed at approximately the same levels as the present. The entire project site experiences frequent minor human disturbance, such as by subsistence fishers, their families, biologists checking fish data. | Construction would displace up to 1.6 acres of grasses, forbs, scattered shrubs and several pine and oak trees. About 0.65 acres would be revegetated. Ongoing disturbance would be similar to current levels. |
| | Ladder operations and active tribal fishing would continue to contribute some level of disturbance to wildlife that might be present. | Noise during two summer construction seasons may reduce use by some animals. Construction would seek to avoid critical osprey nesting and hatchery periods (April 1 – June 30). Disturbance during ladder operations would be similar to current conditions. |
| 3.5 T&E Species | Upstream passage and associated population levels for mid-Columbia River steelhead and bull trout would be unchanged from current conditions. There are no other ESA-listed species that would be affected. | Improved passage conditions would benefit steelhead populations and potentially could aid migratory bull trout. There are no other ESA-listed species that would be affected. |
| 3.6 and Floodplains | The 1,350-sq.ft. wetland within a project area high flow channel would be undisturbed. | The 1,350-sq.ft. wetland would not be affected by project construction or operations because it is in an isolated location without hydraulic connection to the fishway. |
| | Floodplain conditions would be | The modified fishway would be within the |

| Environmental Resource | No Action Alternative | Proposed Action |
|---|---|---|
| | unaffected. | active 100-year flood elevation; however, water would flow through the structure with a negligible addition of mass to the floodway. |
| | Equipment storage container is seasonally moved out of the active floodway to a location still within the FEMA-designated flood zone. | The permanent equipment storage and workshop building and material deposited from site excavation would be outside of the active floodway, but within the FEMA-designated flood zone. There would be no measurable restriction in high flow passage. |
| 3.7 Cultural Resources | Uses associated with a National Register-eligible TCP would continue as they currently do. | Construction would occur within a National Register-eligible TCP, temporarily displacing certain traditional activities, such as subsistence fishing at up to 3 dip net sites adjacent to the existing fish ladder entrance. |
| | Any effects on cultural resource would continue as they are currently. | The SHPO agreed with BPA in that the proposed project would have no effects on listed cultural resources. |
| | Access road users crossing the National Register- eligible railway corridor (now a Rail-to Trail conversion) would be limited primarily to YN tribal members who fish in the area and YN and biologists managing the fish ladder. | Construction vehicles and workers using a developed access road would cross a National Register-eligible railway corridor. |
| 3.8 Air, Noise, Heath and Safety | Air quality, noise levels, and public health and safety would be unchanged from current conditions. | Dust and emissions would be introduced by machinery, equipment, vehicles, and other commotion during the construction periods. Fugitive dust on the access road would be reduced by a new gravel surface. |
| | | Machinery and equipment would generate noise during the construction periods. Measures would be taken to protect the public during construction and blasting, including warning signs on the river above the ladder exit and on the Klickitat Trail. Workers would be posted on the trail and river during blasting to provide warnings. |
| | Biologists would continue to collect fisheries data from within a ladder chamber. | Remote monitoring measures would replace much of what now must be done from inside the ladder. Biological fisheries data still would be collected, although the new chamber would be designed for safer and more convenient human access. |

| Environmental Resource | No Action Alternative | Proposed Action |
|---|---|---|
| 3.9 Aesthetics | The USFSVQO of "Moderate" scenic integrity would continue to be an unachievable standard from a few viewpoints. From other key viewpoints, such as the Klickitat Trail, the fishway would not be visible and the standard would be maintained. Although the ladder is visible from very few locations, from these perspectives it appears to meet a "low" to "unacceptably low" standard due to the extremely altered setting. | The modified fishway also would be visible from very few locations. Similar to existing conditions, from these locations, it would not achieve the VQO of "Moderate" scenic integrity. From other key viewpoints, such as the Klickitat Trail, the fishway would not be visible and the VQO standard would be maintained. Trail users would however, be aware of the deposition of a large quantity of basalt, a visual effect that would lessen over time as vegetation takes hold. Structural changes would be most apparent to boaters and tribal fishers. |
| 3.10 Land Use, Transportation, Recreation | Land use would be consistent with current conditions. | Fishway modifications would be an expansion of a current use and would conform to existing land use regulations. |
| | Vehicle use in the area would continue at current levels. | Temporary increases in vehicle traffic would occur during the two-season construction period. Upon completion, traffic levels are expected to return to current conditions. |
| | Recreational use of the Klickitat Trail is expected to increase and boating above the project site is reported to be growing. The reach upstream of the ladder is reported to be a portage point for kayaks. | Recreation use would largely be unaffected by this project. During construction, very brief interruptions would be experienced along the Klickitat Trail due to access road use and periodic blasting charges. Kayak take-out would have to occur away from active construction areas in the vicinity of the new fish exit structure, an approximately 8 week effect. Boating take-out could resume upon completion of this component. The few kayakers that might run the Lyle Falls reach would be precluded from doing so during modifications to the downstream ladder entrance, also for approximately 8 weeks. |
| 3.11 Socioeconomics | Employment levels associated with operation and maintenance of the fishway and biological monitoring/sampling would continue at levels similar to current conditions. | Project construction would generate about 10 to 12 temporary construction jobs over two summer seasons. In addition, secondary employment associated with construction would contribute to between 22 and 26 jobs. |

# Chapter 4 Consultation, Review and Permit Requirements

Various federal, state, and local environmental laws and administrative requirements relative to this project must be satisfied prior to initiating 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 a Proposed Action on the environment prior to funding, approving, or implementing the action. This EIS has been compiled to meet NEPA requirements, and has invited all concerned parties to consider and disclose the potential environmental consequences of and mitigation for the Proposed Action.

BPA conducted formal scoping meetings and informal outreach efforts with interested and potentially affected parties (see Section 1.5.1). The identified key issues were used to guide the environmental analysis. Copies of this Draft EIS have been sent to relevant agencies, organizations, and interested parties for review and comment (Chapter 6). After a formal public comment period on the Draft EIS, responses to comments and additions, corrections, or clarifications to the analysis will be incorporated into a Final EIS. The Final EIS will be used by BPA decision-makers to determine if they will proceed with approving and funding the Lyle Falls Fish Passage Project. BPA will document its final decision in a record of decision after the Final EIS is complete. Additionally, the cooperating agencies will use the Final EIS to support their decision-making and administrative actions as explained in Section 1.4.

## 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 to ensure that their actions do not jeopardize endangered or threatened species or their critical habitats.

Sources of information for the potential occurrence of sensitive species in the project area include NMFS, USFWS, and the Washington Natural Heritage Database. Each was contacted during preparation of the Draft EIS for lists of threatened, endangered, sensitive, or candidate species. Potentially affected species and their habitat are

discussed and analyzed in Sections 3.3 through 3.5. Based on this information, a Biological Assessment is being prepared for consultation with the USFWS and NMFS in accordance with ESA Section 7. The Final EIS will summarize the outcome of these consultation efforts with the 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 non-game species and their habitats.

A portion of the flow of the Klickitat River would be used to facilitate upstream passage of spring and fall Chinook salmon, coho salmon, steelhead trout, Pacific lamprey, rainbow trout and limited numbers of fluvial bull trout under the Proposed Action. This use is expected to increase the abundance and distribution of these species in the upper Klickitat watershed. The Proposed Action is consistent with the intent of these acts, and BPA will comply with them through this NEPA process.

## 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 (EFH).

The Lyle Falls Fish Passage Project is located within Essential Fish Habitat for Chinook and coho salmon. BPA addresses Essential Fish Habitat as part of the Biological Assessment (see Section 4.2.1). 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.

The project would not be constructed on or near known waterfowl or shorebird concentration areas, migratory routes or any other area acquired as a reservation for migratory birds. Osprey, known to occur in the project area and protected under this act, may be temporarily displaced by construction activities, but long-term effects are not expected. Conservation measures are provided in Section 3.4.2. The project would not result in the take of a migratory bird.

### 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 Chapter 3 reveals the closest known bald eagle site to be 1.5 miles from the Lyle Falls fishway site and 0.2 mile outside the communal roost buffer zone. A golden eagle nest is located approximately one mile from the fishway site. 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 lifecycle. 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

The National Historic Preservation Act (NHPA) of 1966 as amended (16 USC 470) requires federal agencies 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 be undertaken with the State Historic Preservation Office (SHPO) regarding the inventory and evaluation of properties potentially eligible for National Register nomination and to determine whether the undertaking would adversely affect them.

In accordance with Section 106 of the NHPA, consultation was initiated with the SHPO on December 19, 2006 and with the following tribes known to have historically occupied or used the Lyle Falls area: Confederated Tribe and Bands of the Yakama Nation, Confederate Tribes of the Warm Springs Reservation of Oregon, Nez Perce Tribe, and Confederated Tribes of the Umatilla Indian Reservation.

In a December 21, 2006 letter, the SHPO concurred with BPA's proposed area of potential effect and determination to conduct cultural resource surveys. The Tribes did not comment. Through contract by BPA, the Yakama Nation's cultural resources program conducted a literature search and on-the-ground cultural survey of the area of potential effect. The purpose of the survey was to identify and record the presence of any archaeological or historic properties within the area of potential effect. Recommendations made by the Yakama Nation in their reports will be implemented as

part of this project. This included an evaluation of the historic context of the Lyle Falls area as a traditional cultural property. In addition, an evaluation of the Lyle Falls fishway was also conducted to identify its potential eligibility to the National Register (Section 3.7). As a result, the following reports were prepared: Cultural Resources Inventory of the Lyle Falls Fish Passage Enhancement Project (dated February 22, 2007), Traditional Cultural Property Report of the Lyle Falls Fish Passage Project (undated), and the Lyle Falls Fish Passage Upgrade Project – Historic Structure Evaluation Report (dated April 10, 2007). The first two surveys were conducted for BPA by the Yakama Nation and the third survey was conducted by Historical Research Associates.

In its May 29, 2007 letter to the SHPO and the affected tribes, BPA determined that the proposed improvements would pose no adverse effects to the existing fishway and that the fish passage facility was eligible to the National Register under Criterion A because the structure is associated with events that have made a significant contribution to the broad patterns of our history. BPA also proposed that the existing fishway be evaluated for eligibility to the Washington Heritage Register and recommended that no further cultural resource evaluations or survey work was needed. In its September 12, 2007 response letter, the SHPO concurred with BPA, stating that the project would have no adverse effect on National Register eligible or listed historic and cultural resources. The SHPO also stated that if additional information on the project becomes available or if any archaeological resources are uncovered during construction, then work should cease and contact made with the appropriate Native American tribes and SHPO. No responses were received from the tribes. This concluded the consultation process.

## 4.4 Floodplain/Wetlands Assessment

Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands, require Federal agencies to evaluate the potential effects of actions on floodplains and wetlands. If either would be affected or altered by project facilities, the U.S. Department of Energy regulations require its agencies to prepare a Floodplain and/or Wetland Assessment. The following discussion constitutes this assessment for the Lyle Falls Passage Project. Section 3.6 also addresses the effects of the proposed project on the floodplain of the Klickitat River and on wetlands. A statement of findings with respect to floodplains will be included in the final EIS, as also required by the Department of Energy regulations.

A narrow corridor along the Klickitat River, including the project site, is designated as a floodplain by FEMA. The project site was inspected in September 2006 to determine the presence of hydrophytic vegetation and other key wetland indicators. One wetland area was identified: a high flow channel that may be inundated for brief periods during peak flow events (Figure 3-5). This 1,350-square-foot area is thought to be inundated approximately every other year when high flows pass through this remnant channel. As described in Section 3.6.1.1, this seasonally flooded area is a Palustrine emergent marsh that is a Category III wetland (Hruby 2004). Wetlands of this category provide minimal wetland ecological functions.

Construction activities would not be conducted in any wetland areas. The small wetland in the area (Figure 3-5) is approximately 60 feet from the proposed work area and would not be affected by construction or operation of the fishway (see Section 3.6.2.2). The 1,350-square-foot wetland is within a narrow high flow channel that is topographically isolated from the proposed work areas. It is within a narrow draw that readily could be protected from accidental encroachment by installing temporary fencing while construction activities are ongoing.

Expansion of the existing fish ladder would occur within the floodplain of the Klickitat River. Although the modified fish ladder would occupy a larger surface area than the present ladder, the new components would be excavated into bedrock and upon completion, would be primarily underground. Because the new structure would be below grade and because it would transport water, this modification is not expected to impair the flow of the Klickitat River. Construction of the 960-square-foot storage building (Section 2.2.2.6) and placement of 4,000 cubic yards of rock (Section 2.2.2.10) over a 30,000-square-foot area would occur within the 100-year floodplain but outside of the active floodway. Therefore, these modifications also are expected to have little effect on the total high flow capacity.

The fish ladder is a water dependent use and therefore, it is not possible to locate it outside of the FEMA-designated floodplain. The existing wetland would not be affected by construction so no protective modifications are proposed.

Steps taken to avoid or minimize adverse effects on the project area floodplain include: (1) limiting the profile of instream structures to affect the least amount of surface area and (2) allowing the unimpeded flow of water through the Klickitat River. By limiting the surface area of structures, floodplain function and capacity are not hindered. The modified ladder would not obstruct river flow and no weirs or barriers would be added. In addition, Best Management Practices would be incorporated into the final design and construction protocols to minimize the short-term adverse effects of instream or near-stream construction on the river channel (see Sections 3.6.2.2 and 3.6.3). Cofferdams used to isolate the new fishway exit structure during construction would be placed during the lowest flow period and removed prior to likely high flow occurrences; therefore, the channel is not expected to be constricted when floodway capacity is needed.

## 4.5 Wild and Scenic Rivers

Under the National Wild and Scenic Rivers Act (PL 90-542, as amended; 16 USC 1271-1287) the lower 10.8 miles of the Klickitat River are designated as a Recreational river segment and are to be managed to by the USFS. Rivers are selected for this designation because they possess outstandingly remarkable values and because they are in free-flowing condition. The lower Klickitat River was included in this federal system because it possesses five characteristics determined to be outstandingly remarkable: hydrology, anadromous fish, resident fish, Native American dip-net fishing sites, and the geology of the lower river gorge. Enhancement and preservation of

outstandingly remarkable values is accomplished by the USFS under a management plan adopted as part of its Final EIS for the Lower Klickitat River (USFS 1991).

Under Section 7 of the National Wild and Scenic Rivers Act, the USFS must evaluate the effects of any "water resources project" and make a determination regarding the effects of the project on the values for which the river was designated. A water resources project is defined as any project within the ordinary high water mark of a designated river.

The standard for a Section 7 determination for water resources projects within the corridor of a designated river is, "Does the project have direct and adverse effects on the values for which the river was designated (free flow, water quality, and outstandingly remarkable values)?" Under the National Wild and Scenic Rivers Act, no federal agency can fund or assist a project that has direct and adverse effects on the values for which a river has been designated.

Effects of the Proposed Action on these values are disclosed and analyzed in Sections 3.1, 3.2, 3.3 and 3.7. This information will be used by the USFS as the basis of its determination under Section 7 of the Wild and Scenic Rivers Act. Section 13 of the Act stipulates that existing rights of access and use of waters by the state remains within the state's jurisdiction.

## 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 a document 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 understand how a proposal will affect the environment and it can be used to reduce likely effects or deny a proposal when adverse effects are identified. This EIS may be adopted by one or more of the state agencies involved in approving or permitting this project to fulfill its SEPA requirement.

### 4.6.2 State, Area-wide, and Local Plans and Approval

Various federal, state, tribal, and Klickitat County permits and approvals would be required prior to initiating ground disturbance (Table 4-1). No project components would

be located on federal land. The fishway is a water-dependent use that would require permits and authorizations for in-water work. Design elements are being incorporated to assure consistency with the appropriate authorizations.

**Table 4-1 Permits and Other Approvals Expected to be Required for the Lyle Falls Fish Passage Project**

| Type of Permit or Approval | Permitting Agency | Estimated Permit Approval Timeline |
|---|---|---|
| Water Rights (Groundwater and surface water) | WDOE | 1 year |
| Corps Sections 404/10 | U.S. Army Corps of Engineers | 6 months – 1 year |
| Endangered Species Act | NMFS | 135 days |
| | USFWS | 135 days |
| Wild and Scenic Rivers Act | USFS | 1 month |
| Water Quality Certification (Section 401) | WDOE | 90 days |
| NPDES Stormwater General Permit for Construction | WDOE | 45 days (not required until construction begins) |
| Hydraulic Project Approval | WDFW | 3 – 6 months |
| Flood Control Zone Permit | Klickitat County | 120 days |
| Shoreline Substantial Development Permit | Klickitat County | 120 days |
| Critical/Sensitive Areas Ordinance Compliance | Klickitat County | 60 days |
| Land Use/Building Permits | Klickitat County | 120 days |

Instream construction requires a Hydraulic Project Approval (HPA) from WDFW. The HPA would specify when in-water work could occur, and it would include measures that must be implemented to protect the river channel and water quality during construction. In addition, a Shoreline Substantial Development Permit may be required from Klickitat County (under authority delegated by the Washington Department of Ecology) for work conducted within 200 feet of the waterway. This permit would stipulate conditions for near-water construction activities. Klickitat County may also require an approval prior to allowing construction within a designated floodway in order to assure that appropriate design measures are included.

## 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 continued 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 was obtained under its provisions. The U.S. Army Corps of Engineers 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 EPA to the states, including the issuance of wastewater discharge permits and stormwater permits for construction.

#### Section 401

Section 401 of the 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. A National Pollutant Discharge Elimination System (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 to prepare and implement a Storm Water 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 U.S. Army Corps of Engineers 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 Farmland Protection Policy Act

The Farmland Protection Policy Act (7 U.S.C. 4201 et seq.) directs federal agencies to identify and quantify adverse effects of federal programs on farmlands. The purpose of this act is to minimize the number of programs that unnecessarily contribute to the conversion of agricultural land to non-agricultural purposes. Modifications to the Lyle Falls fish ladder would have no effect on farmlands and this act therefore would not apply to this project.

## 4.6.5 Noise Control Act

The Noise Control Act of 1972 (42 U.S.C. 490 et seq.) promotes management of resources to maintain noise levels below that which is harmful to human health. 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 construction or operation noise in excess of state, federal, and tribal standards is expected from this project. Noise was analyzed in Section 3.8.2.2.

## 4.6.6 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 the Washington Department of Ecology. The Proposed Action would not violate current clean air standards, as described in Section 3.8.2.1.

## 4.6.7 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.) authorized the EPA to prescribe conditions for use of pesticides. It is not expected that such products would be used during modifications to, or operation of the Lyle Falls Fish Passage Project; therefore, this act does not apply to this project.

## 4.6.8 Executive Order on Environmental Justice

Presidential Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) directs federal agencies to consider the effects of their programs, policies and activities on minority and low-income populations. BPA examined the potential for modifications of the Lyle Falls Fishway to affect low-income communities and minority populations in Section 3.11.3.

## 4.6.9 Consistency and Coordination with Regional Aquatic Resource Planning

### 4.6.9.1 Klickitat Subbasin Recovery Plan for the Mid-Columbia River Steelhead ESU

This draft NMFS document (2006b) describes a recovery plan for mid-Columbia River steelhead in the Klickitat subbasin. Its purpose is to identify actions needed to restore the Klickitat population (including both winter- and summer-run components) to the point where the steelhead are self-sustaining and no longer need protection of the ESA.

This recovery plan also states that a retrofitted Lyle Falls facility would enable a high proportion of returning fish to be physically examined at a location in the lower watershed. The proposed video monitoring and PIT tag detection systems at Lyle Falls would enable escapement monitoring, provide run-timing information, and improve enumeration of natural- and hatchery-origin recruits returning to the subbasin. These tools could also determine the presence/absence of a fluvial bull trout population. The collection facility would provide data that bears on the scientific justification for particular supplementation activities proposed for the subbasin. Specifically, the facility would support monitoring and evaluation strategies in the Klickitat Anadromous Fishery Master Plan (YN 2004a) (see Section 4.6.9.3).

The recovery plan notes that steelhead passage at Lyle Falls, while possible, is nevertheless difficult under certain flow conditions, and that planned repairs, modifications, and retrofits to the existing fishway would increase fish passage into the Klickitat subbasin. The document also states that an improved broodstock collection facility is essential if natural production of the Klickitat steelhead population is to be increased by means of hatchery production in the future.

### 4.6.9.2 Klickitat River Subbasin Plan

Numerous efforts are underway to coordinate and prioritize conservation and recovery activities in Columbia River subbasins. In the Klickitat subbasin, these activities include the BPA-funded Klickitat Subbasin Plan (YN et al. 2004). The Klickitat Subbasin Plan identified both "focal species" and "species of concern". Analysis was most intensive for focal species. Focal species and species of concern were chosen as a function of: 1) status under the Endangered Species Act; 2) ecological significance; 3) cultural significance; and 4) *US v. Oregon* guidance. The Klickitat technical committee identified focal species and species of concern in terms of these four factors and the amount and quality of information available. Focal species are spring Chinook, rainbow/steelhead and bull trout. Species of concern include Pacific lamprey, cutthroat trout and coho salmon. Because of a lack of information and/or a lack of ecological significance, the Plan focused almost exclusively on spring Chinook, rainbow/steelhead, bull trout and lamprey.

The Klickitat Subbasin Plan outlines a number of objectives for the management of spring Chinook, steelhead trout, bull trout and Pacific lamprey. These objectives specifically address the health of natural populations (including improved access to high quality spawning and rearing habitat), artificial propagation, and harvest. The overall intent of the Klickitat Subbasin Plan is to improve the diversity and sustainability of these species in the subbasin, and generally to promote "healthy, self-sustaining populations of indigenous fish and wildlife that support harvest and other purposes" (YN et al. 2004).

A Supplemental Plan (YN 2004b) presents artificial production and supplementation goals for spring Chinook, steelhead, coho and fall Chinook. The objectives for each species potentially related to the proposed action at Lyle Falls are summarized below.

**Spring Chinook**

- Increase returns, harvest and natural escapement.
- Improve fitness
- Monitor and evaluate survival, life history and habitat use.
- Monitor genetic changes in the population.

**Steelhead**

- Rebuild populations throughout the subbasin.
- Monitor and evaluate ecological interactions.

**Coho**

- Reduce efforts to establish a natural run of coho in the subbasin.
- Improve survival of out-of-basin smolts reared in a new lower Klickitat acclimation pond.
- Monitor natural spawning.

**Fall Chinook**

- Maintain production for harvest augmentation.
- Distribute spawning throughout the lower subbasin.

A "primary tier" finding of the subbasin plan was that the natural production of all migratory fish species (especially late returning species) was limited by difficult passage conditions at Lyle Falls, and that the fishway should be retrofitted to improve passage and to facilitate monitoring of the abundance and survival rates of Klickitat fish populations. Improved passage conditions, leading to increased basin productivity, may increase the number of harvestable fish. Improving passage for coho may be inconsistent with the Supplemental Plan (YN 2004b) objective to reduce establishment of a natural coho population in the subbasin.

### 4.6.9.3 Klickitat Subbasin Anadromous Fishery Master Plan

The Yakama Nation developed a Master Plan for facilities to help restore the abundance and distribution of wild anadromous fish stocks in the Klickitat subbasin (YN 2004a). This plan, currently undergoing revision, also describes programs to artificially propagate certain stocks for treaty and recreational harvest opportunities to mitigate for fisheries impacts from numerous sources, including federal Columbia River dams. Improved passage at Lyle Falls would contribute meeting to wild fish stock objectives that are part of the Master Plan. The salmon and steelhead propagation activities identified in the Master Plan depend upon improved data collection and broodstock collection capabilities in the subbasin. The Lyle Falls fishway is critical for both purposes. Specifically, the facility would support monitoring and evaluation strategies that can be undertaken prior to implementation of integrated hatchery program activities, including the following:

- **Strategy SC3d**. Use radio telemetry, mark-recapture, and/or run reconstruction to determine passage and entrainment rates at Lyle and Castile falls and to track natural spawners to their spawning grounds.

- **Strategy SC5a**. Collect DNA samples and morphometric data from fish passing through the Lyle Falls and Castile Falls traps. Use findings from Yakima and other Columbia Basin studies in conjunction with information from these samples to target genetic studies in the Klickitat subbasin. Convene meetings of tribal and state geneticists as necessary to further develop sampling rates, protocols and evaluation measures.

- **Strategy SC6b**. Update and maintain all Klickitat-related databases with historical and current harvest data.

- **Strategy SC6c**. Use run reconstruction methods developed for Yakima subbasin spring Chinook to reconstruct Klickitat run and harvest to the Columbia River mouth.

Fishway modifications described in Chapter 2 of this Draft EIS would contribute to biologist's ability to monitor and evaluate survival and abundance of hatchery and natural fish.

#### 4.6.9.4 Limiting Habitat Factors Analysis WRIA 30 (Klickitat Subbasin)

The Klickitat Habitat Limiting Factors Analysis (Klickitat LFA) was mandated by the Revised Code of Washington (RCW) 75.46 (Salmon Recovery), and was intended to "identify the limiting factors for salmonids" in the Klickitat subbasin. Limiting factors are defined as "conditions that limit the ability of habitat to fully sustain populations of salmon." It was intended that the findings of this analysis be used by a locally-based habitat selection committee to prioritize appropriate projects for funding under the state salmon recovery program.

The Klickitat LFA identified four major categories of limiting factors in the subbasin: access, floodplain/wetlands/riparian issues, sediment, and water quality/quantity. Difficult passage at Lyle Falls was one of the five key factors listed under the Access category. The analyses and observations of the Klickitat LFA thus represent a justification and rationale for the fishway modifications proposed at Lyle Falls.

#### 4.6.9.5 Klickitat Lead Entity Regional Salmon Recovery Strategy

The Klickitat Lead Entity has developed a set of goals and implementation priorities for salmonid restoration and habitat improvement in the Klickitat subbasin. Specific improvement projects would be funded by the Salmon Recovery Funding Board. The Lead Entity will measure success by the number of man-made limiting factors that are mitigated and by the return of healthy native salmonids to harvestable and sustainable levels. One of the key limiting factors identified in this strategy is difficult fish passage at Lyle Falls. Therefore, implementation of the proposed fishway improvements would be consistent with the objectives of the Lead Entity Strategy.

# Chapter 5 References

The documents cited in this chapter are references that support the analysis presented in this EIS.

Bennett, Jeff. 1991. A Guide to the Whitewater Rivers of Washington. Swiftwater Publishing Co. Portland, Oregon.

Blakesley, J. 2004. Habitat associations. Chapter 5 *in* Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutierrez, J.M. Marzluff and L. Sztukowski. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute, Portland, OR.

Bonneville Power Administration (BPA). 2003. Fish and Wildlife Implementation Plan Final EIS (DOE/EIS-0312). Portland, Oregon. Issued April 2003.

Brenkman, S.J., and Corbett, S.C. 2005. Extent of anadromy in bull trout and implications for conservation of a threatened species. North Am. J.Fish. Manag. 25(3):1073-1081.

Brown, R.S. and D.R. Geist. 2002. Determination of Swimming Speeds and Energetic Demands of Upriver Migrating Fall Chinook Salmon (*Oncorhynchus tshawytscha*) in the Klickitat River. Prepared for the Bonneville Power Administration. Contract DE-AC06-76RLO 1830. Pacific Northwest National Laboratory, Richland, WA.

BRT (West Coast Salmon Biological Review Team). 2003. Updated status of federally listed DPSs of west coast salmon and steelhead. U. S. Department of Commerce, National Marine Fisheries Service, Northwest Fisheries Science Center and Southwest Fisheries Science Center (July 2003).

Bureau of Economic Analysis (BEA). 2005. Local area personal income by major source and earnings by industry, and full-time and part-time employment. http://www.bea.gov/bea/regional/reis/action/cfm.

Cederholm, C.J., D.H. Johnson, R.E. Bilby, L.G. Dominguez, A.M. Garrett, W.H. Graber, E.L. Greda, M.D. Kunze, B.G. Marcot, J.F. Palmisano, R.W. Plotnikoff, W.G. Pearcy, C.A. Simenstad, and P.C. Trotter. 2000. Pacific Salmon and Wildlife-Ecological Contexts, Relationships, and Implications for Management. Special Edition Technical Report prepared for D.H. Johnson and T.A. O'Neil (Managing Directors), Wildlife-Habitat Relationships in Oregon and Washington. Washington Department of Fish and Wildlife, Olympia, WA.

Chappell, C.B., R.C. Crawford, C. Barrett, J. Kagan, D.H. Johnson, M. O'Mealy, G.A. Green, H.L. Ferguson, W. D. Edge, E.L. Greda and T.A. O'Neil. 2001. Wildlife

habitats: descriptions, status, trends, and system dynamics. Chapter 2 *in* Wildlife-Habitat Relationships in Oregon and Washington. D.H. Johnson and T.A. O'Neil, Managing Directors. Oregon State University Press, Corvallis, OR.

Cusimano, B. 1993. Horseheaven/Klickitat Water Quality Management Area. WDOE publication number 93-e08.

Cutler, Leigh and Heather Lee Miller. 2007. Lyle Falls Fish Passage Upgrade Project; Historic Structure Evaluation Report (Project 1988-120-35). Submitted to BPA by Historical Research Associates, Inc. Seattle, WA April 2007.

Ellenburg, M. and F. Dobler. 2006. Draft Klickitat Wildlife Area Management Plan. Washington Department of Fish and Wildlife.

Fertig, W., R. Black, and P. Wolken. 2005. Rangewide status review of Ute ladies'-tresses (*Spiranthes diluvialis*). Prepared for the U.S. Fish and Wildlife Service and Central Utah Water Conservancy District. September 30, 2005. www.r6.fws.gov/species/plants/uteladiestress/SPDI_Status%review_Fertig2005.pdf. Accessed September 22, 2006.

FHWA. 2006. FHWA Highway Construction Noise Handbook. John A. Volpe National Transportation System Center. Cambridge, MA. August 2006. Report Number FHWA-HEP-06-015.

Fraley, J.J. and B.B. Shepard. 1989. Life history, ecology and population status of migratory bull trout (*Salvelinus confluentus*) in the Flathead Lake river system, Montana. Northwest Science 63(4): 133-143.

Franklin, J.F. and C.T. Dyrness. 1988. Natural Vegetation of Oregon and Washington. Oregon State University Press. Corvallis, OR.

Gamon, J. 2007. Washington's Biodiversity: Status and Threats. Washington Biodiversity Council. Olympia, WA. January 2007.

Goetz, F.A., E. Jeanes, and E. Beamer. 2004. Bull trout in the nearshore, preliminary draft. U.S. Army Corps of Engineers, Seattle District. June 2004. http://www.nws.usace.army.mil/publicmenu/DOCUMENTS/Prelim_Bull_Trout_Report.pdf

Gray, S. 2006. Determine the Origin, Movements, and Relative Abundance of Bull Trout in Bonneville Reservoir, 2005-2006 Annual Report. Project No. 200306500, BPA Report DOE/BP-00022537-1.

Gray, S.W. 2005. Determine the Origin, Movements, and Relative Abundance of Bull Trout in Bonneville Reservoir, 2004-2005 Annual Report. Project No. 200306500, BPA Report DOE/BP-00016701-1.

Hatchery Scientific Review Group (HSRG). 2004. Hatchery Reform: Principles and Recommendations of the HSRG. Long Live the Kings, 1305 4th Avenue, Seattle, WA, 98101. Available from www.hatcheryreform.org.

Harbor Engineering Company. 2004. Klickitat River Proposed Fishway Improvements at Lyle Falls, Hydraulic Conditions Report. Prepared for the Yakama Nation, Toppenish, WA. January 2004.

Hemmingsen, A.R., S.L. Gunckel, and P.J. Howell. 2001. Bull trout life history, genetics, habitat needs, and limiting factors in central and northeast Oregon. 1999 Annual Report. Prepared for U.S. Department of Energy, Bonneville Power Administration. Project Number 199405400. Oregon Department of Fish and Wildlife, Portland OR.

Hruby, T. 2004. Washington State Wetland Rating System for Eastern Washington – Revised. Washington State Department of Ecology Publication # 04-06-15.

Idler, D.R and W.A. Clements. 1959. The Energy Expenditures of Fraser River Sockeye Salmon during Spawning Migration to Chilko and Stuart Lakes. International Pacific Salmon Fisheries Commission, New Westminster, B.C., Canada.

Independent Scientific Review Panel (ISRP). 2005. Review of the Yakama Nation's Response to the ISRP's Step 1 Review of the Klickitat Subbasin Anadromous Fishery Master Plan. ISRP. Portland, OR. November 1, 2005. http://www.nwppc.org.library/isrp/isrp2005-7.htm

Interagency Committee on Outdoor Recreation (IAC). 2002. An Assessment of Outdoor Recreation in Washington State: A State Comprehensive Outdoor Recreation Planning (SCORP) Document 2002-2007. Olympia, WA. October 2002.

Interagency Committee on Outdoor Recreation. 2003. Estimates of Future Participation in Outdoor Recreation in Washington State. Olympia, WA. March 2003.

Kauffman, J.B., M. Mahrt, L.A. Mahrt and W.D. Edge. 2001. Wildlife of riparian habitats. Chapter 14 *in* Wildlife-Habitat Relationships in Oregon and Washington. D.H. Johnson and T.A. O'Neil, Managing Directors. Oregon State University Press, Corvallis, OR.

Kelso, D. and A. Perez. 1983. Noise control terms made somewhat easier. Noise Pollution Clearinghouse website, www.nonoise.org/library/diction/soundict.htm. Accessed October 9, 2006.

Klickitat County Noxious Weed Control Board. 2006. Klickitat County weed list. www.klickitatcounty.org/WeedControl. Accessed September 14, 2006.

Larsen, E.M. and J.T. Morgan. 1998. Management recommendations for Washington's priority habitats: Oregon white oak woodlands. Washington Department of Fish and Wildlife, Olympia, WA.

Linders, M.J. and D.W. Stinson. 2006. Draft Washington state recovery plan for the western gray squirrel. Washington Department of Fish and Wildlife, Olympia, WA. May 2006.

Modin, J. 1998. Whirling disease in California: a review of its history, distribution, and impacts, 1965-1997. Aquat. J. Anim. Health 10: 132-142.

Myers, J., C. Busack, D. Rawding, and A. Marshall. 2003. Historical population structure of Willamette and Lower Columbia River Basin Pacific salmonids. WLC-TRT Report. NMFS Northwest Fisheries Science Center, Seattle Washington.

National Marine Fisheries Service (NMFS). 2006a. Draft Anadromous Salmonid Passage Facility Guidelines and Criteria. NMFS Northwest Region, Portland, OR.

National Marine Fisheries Service. 2006b. Draft Klickitat Subbasin Recovery Plan for the Mid-Columbia River Steelhead ESU. NMFS. December 2006.

Natural Resource Conservation Service. 2006. Information retrieved from the NRCS web site http://websoilsurvey.nrcs.usda.gov/app/.

Office of Financial Management. 2005. "Washington State Input-Out Model, Washington State Input-Output Multipliers, 1997." OFM, Olympia, Washington. (The Pacific Northwest Project maintains a working spreadsheet model of the State I/O model for project impact analyses.)

PacRim Geotechnical Inc. 1997. Geotechnical Report, Klickitat Fishway Improvements, Klickitat County, Washington. Report prepared for Summit Technology December 22, 1997.

Pacific Biodiversity Institute (PBI). Undated. Endangered Species Information Network. Gray Wolf. www.pacificbio.org/ESNI/MapImages/graywolf.jpg. Accessed December 20, 2006.

Pearsons, Todd, Gabriel Temple, Anthony Fritts, Christopher Johnson, Timothy Webster. 2006. Ecological Interactions between Non-target Taxa of Concern and Hatchery Supplemented Salmon; Yakima/Klickitat Fisheries Project Monitoring and Evaluation, 2005-2006 Annual Report, Project No. 199506325. BPA Report DOE/BP-00022370-1.

Poole, A.F., R.O. Bierregaard and M.S. Martell. 2002. Osprey (*Pandion haliaetus*). *In* The Birds of North America, No. 683. A. Poole and F. Gill, eds. The Birds of North America, Inc. Philadelphia, PA.

Pratt, K.L. 1992. A review of bull trout life history *in* Proceedings of the Gearhart Mountain Workshop, Corvallis, Oregon: Oregon Chapter of the American Fisheries Society. P.J. Howell, D.V. Buchanan, and J.M. Maule, editors.

Rodrick, E. and R. Milner. 1991. Management recommendations for Washington's priority habitats and species. E. Rodrick and R. Milner, technical editors. Washington Department of Wildlife. Wildlife Management, Fish Management, and Habitat Management Divisions. Olympia, WA. May 1991.

Schmetterling, D.A. and M.H. Long. 1999. Montana anglers' inability to identify bull trout and other salmonids. Fisheries 24:24-27.

Seixas, Noah and Rick Neitzel. 2004. Final report on noise and use of hearing protection in construction, September 2004. Department of Environmental and Occupational. Health Sciences, University. of Washington. Retrieved October 13, 2006, from http://staff.washington.edu/rneitzel/Noise_HPD.pdf

Schreck, C. B. 1996. Immunomodulation:endogenous factors. Pages 311-337 *in* G. Iwama and T. Nakanishi, editors. The fish immune system: organism, pathogen, and environment. Academic Press, San Diego, CA.

Southwest Clean Air Agency. 2006. Causes of Haze in the Gorge: Final Report. Prepared by Desert Research Institute. July 31, 2006.

Starcevich, S., T. Hartill, and S. Jacobs. 2006. Hood River Bull Trout Abundance, Migration and Connectivity. Work summary. Native Fish Investigations Project, Oregon Department of Fish and Wildlife, Corvallis, Oregon. December 18, 2006.

Stinson, D.W. 2001. Washington state recovery plan for the lynx. Washington Department of Fish and Wildlife, Wildlife Management Program. Olympia, WA. June 2001.

Stinson, D.W., J.W. Watson and K.R. McAllister. 2001. Washington state status report for the bald eagle. Washington Department of Fish and Wildlife. Olympia, WA.

Thiesfeld, S.L., A.M. Stuart, D.E. Ratliff, and B.D. Lampman. 1996. Migration patterns of adult bull trout in the Metolius River and Lake Billy Chinook, Oregon. Information Report 96-1. Oregon Department of Fish and Wildlife, Portland.

Thiesfeld, S.L., R.H. McPeak, B.S. McNamara, and I. Honanie. 2001. Bull Trout Population Assessment in the White Salmon and Klickitat rivers, Columbia River Gorge, Washington. . BPA Contract #00004474-00001. Prepared for U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon.

U.S. Army Corps of Engineers. 1987. Corps of Engineers wetlands delineation manual. Technical Report Y-87-1. Corps of Engineers, Waterways Experiment Station, Vicksburg, MS.

U.S. Coast Guard. Undated. Navigability determinations for waters in the Thirteenth Coast Guard District. http://uscg.mil/D13/exhibit11_K1.pdf.

U.S. Fish and Wildlife Service (USFWS). 1986. Pacific bald eagle recovery plan. U.S. Fish and Wildlife Service. Portland, OR.

U.S. Fish and Wildlife Service. 2002a. Chapter 20, Lower Columbia Recovery Unit, Washington. *In*: U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.

U.S. Fish and Wildlife Service. 2002b. Chapter 6, Hood River Recovery Unit, Oregon. *In*: U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.

U.S. Fish and Wildlife Service. 2006. 12-Month Finding on a Petition to Establish the Northern Rocky Mountain Gray Wolf Population as a Distinct Population Segment and to remove it from the list of endangered and threatened species. August, 2006.

U.S. Fish and Wildlife Service. 2007. National bald eagle management guidelines. U.S. Fish and Wildlife Service. May 2007. www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf. Accessed June 27, 2007.

U.S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, Montana Fish, Wildlife & Parks, Idaho Fish and Game, and USDA Wildlife Services. 2006. Rocky Mountain Wolf Recovery 2005 Annual Report. C.A. Sime and E.E. Bangs, eds. USFWS, Ecological Services, 585 Shepard Way, Helena, Montana. 59601. http://westerngraywolf.fws.gov/annualreports.htm.

USDA Forest Service (USFS). 1991. Lower Klickitat River Wild and Scenic River Management Plan - Final Environmental Impact Statement. USFS Columbia River Gorge National Scenic Area, Hood River, OR. November, 1991.

USDA Forest Service. 1995. Landscape Aesthetics: A Handbook for Scenery Management. Agriculture Handbook Number 701. December, 1995.

USDA Forest Service. 2003a. Environmental Assessment for the Klickitat Rails-to-Trails. Prepared by USFS Columbia River Gorge National Scenic Area. Hood River, Oregon. August 2003.

USDA Forest Service. 2003b. Decision Notice: Finding of No Significant Impact and Preliminary Consistency Determination for the Klickitat Rails-to Trails Environmental Assessment. Prepared by USFS Columbia River Gorge National Scenic Area. Hood River, Oregon. December 19, 2003.

Walsh, T.J., M.A Korosec, W.M. Phillips, R.L. Logan, and H.W. Schasse. 1987. Geologic map of Washington – Southwest quadrant. Washington Division of Geology and Earth Resources Geologic Map GM-34.

Washington Department of Ecology (WDOE). 1997. Washington state wetlands identification and delineation manual. Publication 96-94. Washington State Department of Ecology. Olympia, WA.

Washington Department of Ecology. 2001. Airlines. WDOE Air Quality Program Newsletter, May 2001.

Washington Department of Fish and Wildlife (WDFW). 2000. Fish Passage Guidelines for Washington State (Draft). Olympia, WA. April 25, 2000.

Washington Department of Fish and Wildlife. 2002. Washington state salmon and steelhead stock inventory. Washington Department of Fish and Wildlife, Olympia Washington. http://wdfw.wa.gov/fish/sasi/

Washington Department of Fish and Wildlife. 2004. Klickitat River Summer Steelhead Hatchery Genetic Management Plan (draft). WDFW, Olympia, WA. August 16, 2004.

Washington Department of Fish and Wildlife. 2006a. Priority habitats and species list. Washington Department of Fish and Wildlife, Olympia, WA. http://wdfw.wa.gov/hab/phslist.htm. Accessed December 14, 2006.

Washington Department of Fish and Wildlife. 2006b. Draft Klickitat Area Wildlife Management Plan. Washington Department of Fish and Wildlife, Olympia, WA.

Washington Department of Fish and Wildlife. 2006c. Wolves in Washington - Fact Sheet. Washington Department of Fish and Wildlife, Olympia, WA. January 2006. http://wdfw.wa.gov/factshts/wolves_fact_jan06.htm. Accessed January 29, 2007.

Washington Department of Natural Resources. 2005. List of known occurrences of rare plants in Washington: Klickitat County. Washington Natural Heritage Program Information System. www.dnr.wa.gov/refdesk/lists/plantsxco/klickitiat.html. Accessed August 2005.

Washington State Conservation Commission (WSCC). 1999. Salmonid Habitat Limiting Factors, Final Report. WRIA 30; Klickitat Watershed.

Washington State Data Book. 2005. http://www.city-data/city/washington.html, accessed December 2006-January 2007.

Washington Department of Transportation (WSDOT). 2005a. 2005 State Highway Log, Planning Report 2005 B, SR 2 to SR 971. Olympia, WA.

Washington Department of Transportation. 2005b. 2005 Annual Traffic Report. Olympia, WA.

Washington Department of Transportation. 2007. Advanced Training Manual: Biological Assessment Preparation for Transportation Projects. www.wsdot.gov/Environment/Biology/BA/default.htm#BAManual. February 2007.

Watershed Professionals Network (WPN) and Aspect Consulting, Inc. 2005. Appendix A, WRIA 30 Level I Watershed Assessment. Produced for Klickitat County Planning Department, Goldendale, WA.

White, William S., and Jo Anna Meninick. 2006. Traditional Cultural Property report of the Lyle Falls Fish Passage Project. Prepared for BPA by the Yakama Nation Cultural Resources Program. Toppenish, WA. February 22, 2007.

White, William S., Shane Scott, and Gregg Kiona. 2006. Cultural Resources Inventory of the Lyle Falls Fish Passage Enhancement Project. Prepared for BPA by the Yakama Nation Cultural Resources Program. Toppenish, WA. September 13, 2006.

Whitesel, T.A., J. Brostrom, T. Cummings, J. Delavergne, W. Fredenberg, H. Schaller, P. Wilson, and G. Zydlewski. 2004. Bull Trout Recovery Planning: A review of the science associated with population structure and size. Science Team Report # 2004-01, U.S. Fish and Wildlife Service, Regional Office, Portland, Oregon.

Wydoski, R.S. and R.R. Whitney. 2003. Inland Fishes of Washington. Second Edition Revised and Expanded. University of Washington Press, Seattle, WA.

Yakama Nation, Klickitat County and Washington Department of Fish and Wildlife. 2004. Klickitat Subbasin Plan. Prepared for the Northwest Power Planning and Conservation Council. Jeff Spencer and Heather Simmons-Rigdon, coordinators. May 28, 2004.

Yakama Nation. 2004a. Klickitat Basin Anadromous Fishery Master Plan. Prepared for the Northwest Power Planning and Conservation Council.

Yakama Nation. 2004b. Klickitat Subbasin Supplement. Prepared for the Northwest Power and Conservation Council. Principal preparers: Jeff Spencer, Heather Simmons-Gigdon, Bill Sharp, Will Conley and Joe Zendt. November 24, 2004.

Yakama Nation. 2006. Yakama/Klickitat Fisheries Project- Klickitat Monitoring and Evaluation, 2005 Annual Report. Project No. 199506335, Contract No. 22506. Prepared by the Yakama Nation for BPA, Portland, Oregon.

Yakama Nation. *In press*. Revised Klickitat Basin Anadromous Fishery Master Plan. Being prepared by the Yakama Nation for the Northwest Power Planning and Conservation Council.

Yakama Nation Economic Development. 2006. Website link at http://www.critfc.org accessed December 2006-January 2007.

# Chapter 6 Acronyms, Abbreviations and Glossary

This chapter is divided into two parts. The first provides a list of abbreviations used throughout this EIS (Acronyms, Abbreviations), and the second provides definitions of technical and scientific terms (Glossary). The Glossary includes common terms that may have specific meaning in the context of the EIS analysis.

## 6.1 Acronyms and Abbreviations

| | |
|---|---|
| BA | Biological Assessment |
| BPA | Bonneville Power Administration |
| BRT | Biological Review Team |
| C | centigrade |
| cfs | cubic feet per second |
| CMU | Concrete masonry unit |
| CRFMP | Columbia River Fish Management Plan |
| CRGNSA | Columbia River Gorge National Scenic Area |
| dBA | A-weighted decibels |
| DPS | Distinct Population Segment |
| EDNA | Environmental districts for noise abatement |
| EIS | Environmental Impact Statement |
| EL | elevation |
| EMT | emergency medical technician |
| EPA | Environmental Protection Agency |
| ESA | Endangered Species Act |
| ESU | Evolutionarily Significant Unit |
| FEMA | Federal Emergency Management Agency |
| FIRFA | Federal Insecticide, Fungicide and Rodenticide Act |
| FPPA | Farmland Protection Policy Act |
| fps | feet per second |
| HPA | Hydraulic Project Approval |
| IAC | Interagency Committee on Outdoor Recreation |
| I/O Model | Input/Output Model |
| mg/l | milligrams per liter |
| KOP | key observation point |
| KTC | Klickitat Trails Conservancy |
| MCR | Middle Columbia River |
| NAAQS | National Ambient Air Quality Standards |

| | |
|---|---|
| NEPA | National Environmental Policy Act |
| NMFS | National Marine Fisheries Service |
| NOI | Notice of Intent |
| NPCC or Council | Northwest Power and Conservation Council |
| NPDES | National Pollution Discharge Elimination System |
| NRCS | Natural Resource Conservation Service |
| NTU | Nephelometric Turbidity Units |
| ORV | Outstandingly Remarkable Value |
| PCE | Primary Constituent Element |
| PIT | Passive Integrated Transponder |
| PHS | Priority Habitat Species |
| PL | Public Law |
| PM | particulate matter |
| RCRA | Resource Conservation and Recovery Act |
| RM | River mile |
| ROS | Recreation Opportunity Spectrum |
| SASSI | Salmon and Steelhead Stock Inventory |
| SCORP | Statewide Comprehensive Outdoor Recreation Plan |
| SEPA | State Environmental Policy Act |
| SHPO | State Historic Preservation Office |
| SMS | Scenery Management System |
| SR | State Route |
| TES | Threatened, endangered, or sensitive species |
| TSCA | Toxic Substances Control Act |
| TSP | Total suspended particulates |
| WAC | Washington Administrative Codes |
| WDF | Washington Department of Fisheries |
| WDFW | Washington Department of Fish and Wildlife |
| WDOE | Washington Department of Ecology |
| WSDOT | Washington State Department of Transportation |
| WSPRC | Washington State Parks and Recreation Commission |
| USACE | United States Army Corps of Engineers |
| USC | United States Code |
| USDA | U.S. Department of Agriculture |
| USFS | U.S. Forest Service |
| USFWS | U.S. Fish and Wildlife Service |
| YKFP | Yakima-Klickitat Fisheries Program |
| YN | Confederated Tribes and Bands of the Yakama Nation |

## 6.2 Glossary

| | |
|---|---|
| Adfluvial | possessing a life history trait of migrating between lakes or rivers and streams. |
| Anadromous | fish that hatch and rear in freshwater, migrate to the ocean (salt water) to grow and mature, and migrate back to fresh water to spawn and reproduce. |
| Attraction Water | water released at the downstream opening of a fish ladder that is sufficient in volume so that fish select the ladder opening as their upstream migratory route. |
| Broodstock | adult fish used to propagate the subsequent generation of hatchery fish. |
| Ceremonial or Subsistence harvest | harvests of fish by Native Americans for ceremonies and to support traditional lifestyles. |
| Cofferdam | temporary enclosure placed around an instream work area to create a dry construction zone. |
| Columbia River Commission | the coordinating body of the Yakama, Nez Inter-Tribal Fish Perce, Umatilla and Warm Springs Indian tribes; these tribes all signed the 1855 treaties that reserved their rights to Columbia River salmon and steelhead, certain wildlife and other resources. |
| Core area | the area of habitat essential in the breeding, nesting and rearing of young, up to the point of dispersal of the young. |
| Critical habitat | under the Endangered Species Act, critical habitat is defined as (1) the specific areas within the geographic area occupied by a federally listed species in which are found physical and biological features essential to the conservation of the species, and that may require special management considerations or protections; and (2) specific areas outside the geographic area occupied by a listed species, when it is determined that such areas are essential for the conservation of the species. |
| Cubic feet per second | a unit used to measure water flow; one cubic foot per second is equal to 201,525 gallons per minute. |
| Dip-net fishery | a traditional tribal fishery for salmon and steelhead where fish are captured using long-handled dip nets, usually at waterfalls or other obstructions, which congregate the fish and make them more available for harvest. |

| | |
|---|---|
| Domestication selection | the progressive culling of heritable traits that confer fitness in the wild in favor of those heritable traits that confer fitness in the hatchery. |
| Escapement | the portion of a fish population that survives to reach its natal spawning grounds. |
| Evolutionarily Significant Unit | a definition of "species" used by NMFS in administering the Endangered Species Act; an Evolutionarily Significant Unit is a population (or groups of populations) that (1) is reproductively isolated from other conspecific population units, and (2) represents an important component in the evolutionary legacy of the species. |
| Fallback | fish that successfully pass Lyle Falls but due to strong currents and/or a lack of energy, are swept back downstream over the falls. |
| Fishway | a device made up of a series of stepped pools, similar to a staircase, that enables adult fish to migrate up the river past dams. |
| Fitness | fitness is indexed by the mean number of spawning adults in the second wild generation per spawner (number of adult grand-children per spawner). |
| Floodplain (100-year) | area adjacent to a stream that is on average inundated once a century. |
| Hydrograph | a graph showing the stage, flow, velocity, or other water-related properties in relation to time. |
| Mitigation | measures taken to reduce adverse effects on the environment. |
| Native stock | an indigenous stock of fish that has not been substantially affected by genetic interactions with non-native stocks or by other factors, and is still present in all or part of its original range. |
| Natural fish | a fish that is produced by parents spawning in a stream or lake bed, as opposed to a controlled environment such as a hatchery. |
| Obligate species | a plant or animal that occurs only in a narrowly defined habitat such as tree cavity, rock cave, or wet meadow. |
| Outstandingly Remarkable Value | under the National Wild and Scenic Rivers Act, these are attributes of a river reach that are determined to be worthy of special protection for future generations. |

| | |
|---|---|
| PIT tags | Passive Integrated Transponder tags are used to identify individual salmon for monitoring and research purposes; this miniaturized tag consists of an integrated microchip that is programmed to include specific fish information; the tag is inserted into the body cavity of the fish and decoded at selected monitoring sites. |
| Redd | a nest of fish eggs covered with gravel. |
| Resident species | species of fish that spend their entire lives in freshwater. |
| Riparian | adjacent to or living on river banks. |
| Riprap | broken rock used to stabilize river banks from flows and wave action. |
| Self sustaining population | a population of salmonids that exists in sufficient numbers to maintain its levels through time without supplementation with hatchery fish. |
| Smolt | juvenile anadromous salmon that have completed their freshwater rearing phase and are preparing to migrate to saltwater. |
| Tailwater | the water surface immediately downstream from the fish ladder outlet. |
| Tules | a race of Columbia River fall Chinook salmon; Tules enter the river at an advanced stage of maturation and spawn shortly thereafter; they spawn almost exclusively in the lower Columbia River and its tributaries from early October to early November. |
| Traditional Cultural Properties | Properties associated with cultural practices or beliefs that are rooted in the community's history and are important in maintaining the continued cultural identity in the community. |
| Upriver Brights | a race of Columbia River fall Chinook salmon; Upriver Brights enter the river at an earlier stage of maturation and still retain their bright, silvery marine coloration; they spawn from mid-October to mid-November, primarily in the middle Columbia, lower Snake and associated tributaries. |
| *US v. Oregon* | a federal court case decided in 1969 and amended in 1975 that confirmed the right of four tribes to take up to 50% of the harvestable surplus of fish in the Columbia River. |

| | |
|---|---|
| Wetland | an area that is regularly saturated by surface water or groundwater and is characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions (e.g., swamps, bogs, fens, marshes, and estuaries). |
| Work Window | period authorized by the Washington Department of Fish and Wildlife when instream construction may be performed with the least impact upon aquatic life. |

# Chapter 7 List of Preparers

Based on the Council of Environmental Quality Regulations for Implementing NEPA, the names of the persons primarily responsible for preparing this EIS are listed, including their qualifications and discipline of expertise. This interdisciplinary team represents an integrated use of natural, social, and cultural sciences. A list of individuals who have also contributed in the review and development of this draft document, is also provided.

**Preparers**

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| Boyce, Jeff<br>Meridian Environmental | Lead: Land Use, Transportation, Air, Noise | 16 years interdisciplinary planning and analysis<br>M.S. Forestry |
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| Corsini, Amy<br>Meridian Environmental | Document Production | 7 years environmental document production<br>M.B.A. Public Administration<br>B.S. Business Admin., Project Management |
| Cutler, Leigh<br>Historical Research Associates | Research Historian | 3 years historical research<br>M.A. Public History<br>B.A. History |
| Dube', Kathy<br>Watershed GeoDynamics | Geology and Soils | 22 years evaluating geomorphology and riverine processes<br>M.S. Geological Sciences<br>B.S. Environmental Sciences |
| Hutchins, John<br>Harbor Engineering | Engineering Lead | 36 years civil-structural engineering, fisheries and marine design<br>P.E. Civil Engineering |
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| Olsen, Darryll<br>Pacific Northwest Project, Inc. | Socioeconomics | 26 years regional resource economics/planning<br>Ph.D. Applied Energy Studies<br>M.A. Quantitative Analysis, History<br>B.A. History, Philosophy |
| Shappart, Jason<br>Meridian Environmental | Water Quality and Quantity, Aquatic Threatened and Endangered Species | 11 years evaluating aquatic resources<br>B.S. Fisheries |

| | | |
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| Cannell, Kevin<br>BPA | Archaeologist |
| Carroll, Trish<br>USFS | Regional Water Quality and Water Use Program Lead<br>FS/EPA Liason |
| Cobell, Gerald<br>BPA | Tribal Account Executive |
| Fiedler, Chuti<br>USFS | CRGNSA Fish and Wildlife Biologist |
| Gray, Steve<br>WDFW | Fisheries Biologist |
| Keller, Carl<br>BPA | Project Environmental Lead |
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| Kreiter, Mark<br>USFS | CRGNSA Hydrologist |
| Ross, Diana<br>USFS | CRGNSA Planner, Landscape Architect |
| Sater, Sue<br>USFS | Regional Wilderness and Wild and Scenic River Coordinator |
| Sharp, Bill<br>YN | Fisheries Research Scientist |
| Smith, Patricia<br>BPA | Project Manager, YKFP Fish and Wildlife Management |
| Uebel, Jeff<br>USFS | Regional Program Fishery Assistant |
| Weintraub, Nancy<br>BPA | Team Lead for Fish and Wildlife |
| Whalen, Michelle<br>BPA | Public Affairs Specialist |

# Chapter 8 List of Agencies, Organizations, and Persons To Whom Copies of the 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

U.S. Environmental Protection Agency

U.S. Department of Agriculture, Gifford Pinchot National Forest

U.S. Department of Commerce, National Marine Fisheries Service

U.S. Department of Defense, U.S. Army Corps of Engineers

U.S. Department of the Interior, Bureau of Indian Affairs

U.S. Department of the Interior, Fish and Wildlife Service

## Tribes or Tribal Groups

Columbia River Intertribal Fish Commission

Confederated Tribes and Bands of the Yakama Nation

Confederated Tribes of the Umatilla Indian Reservation

Confederated Tribes of the Warm Springs Reservation of Oregon

Nez Perce Tribe

# Regional Associations

Columbia Basin Fish and Wildlife Authority

Columbia River Gorge Commission

Northwest Power and Conservation Council

# Washington State Agencies

Department of Natural Resources

Department of Ecology

Department of Fish and Wildlife

Department of Parks and Recreation Commission

# Public Officials

## Federal Congressional

Honorable Doc Hastings, Representative

Honorable Maria Cantwell, Senator

Honorable Patty Murray, Senator

## State Of Washington

Honorable Christine Gregoire, Governor

Honorable Bruce Chandler, Representative

Honorable Daniel Newhouse, Representative

Honorable Jim Honeyford, Senator

Office of the Attorney General

## Local Governments

Klickitat County

## Businesses

Hancock Forest Products

SDS Lumber Company

## Libraries

Central Washington University Library

City of Ellensburg Public Library

City of Vancouver Public Library

City of Walla Walla Public Library

Goldendale Community Library

Portland State University Library

State of Washington Library

Tumwater Timberland Library

White Salmon Valley Community Library

## Interest Groups

American Rivers

Association of Northwest Steelheaders

Central Cascade Alliance

Klickitat Trail Conservancy

Northwest Sport Fishing Industry Association

Oregon Trout

Salmon For All

Save Our Wild Salmon

White Salmon Steelheaders Association

# Individuals

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Ford, Roger

Frey, Spencer

Fritsch, Thomas

Guenther,Gayla

Jackson, Johyn

Kayser, Neil

Kiona, James

Kiona, Ralph

Montero, Lanny

P. Jr., Christopher

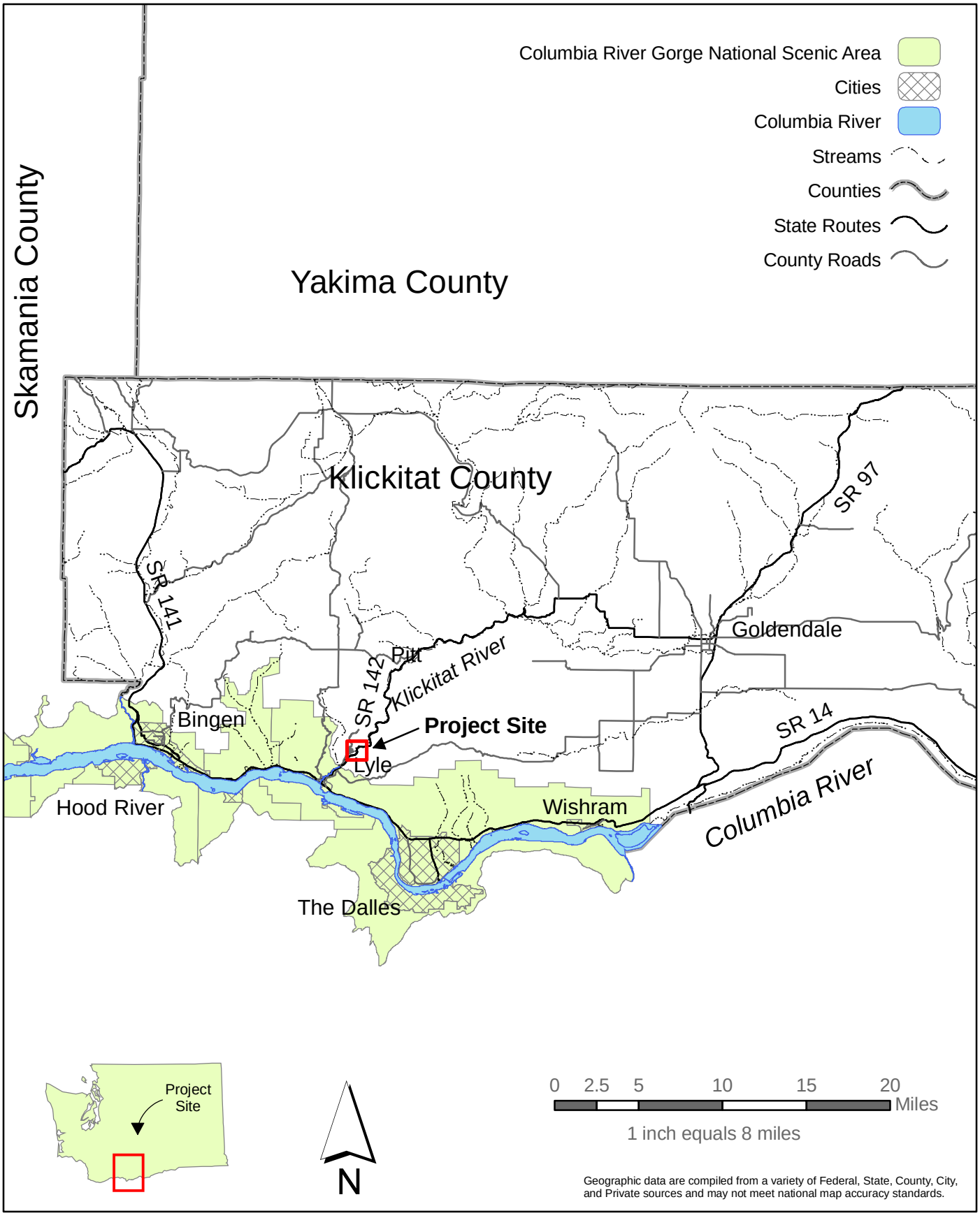
Peitow, Jim

Penney, Sherry

Sundeen, Donald

Zoller, Lori

# Chapter 9 Index




Bonneville Power Administration

LYLE FALLS FISHWAY PROJECT
Draft Environmental Impact Statement

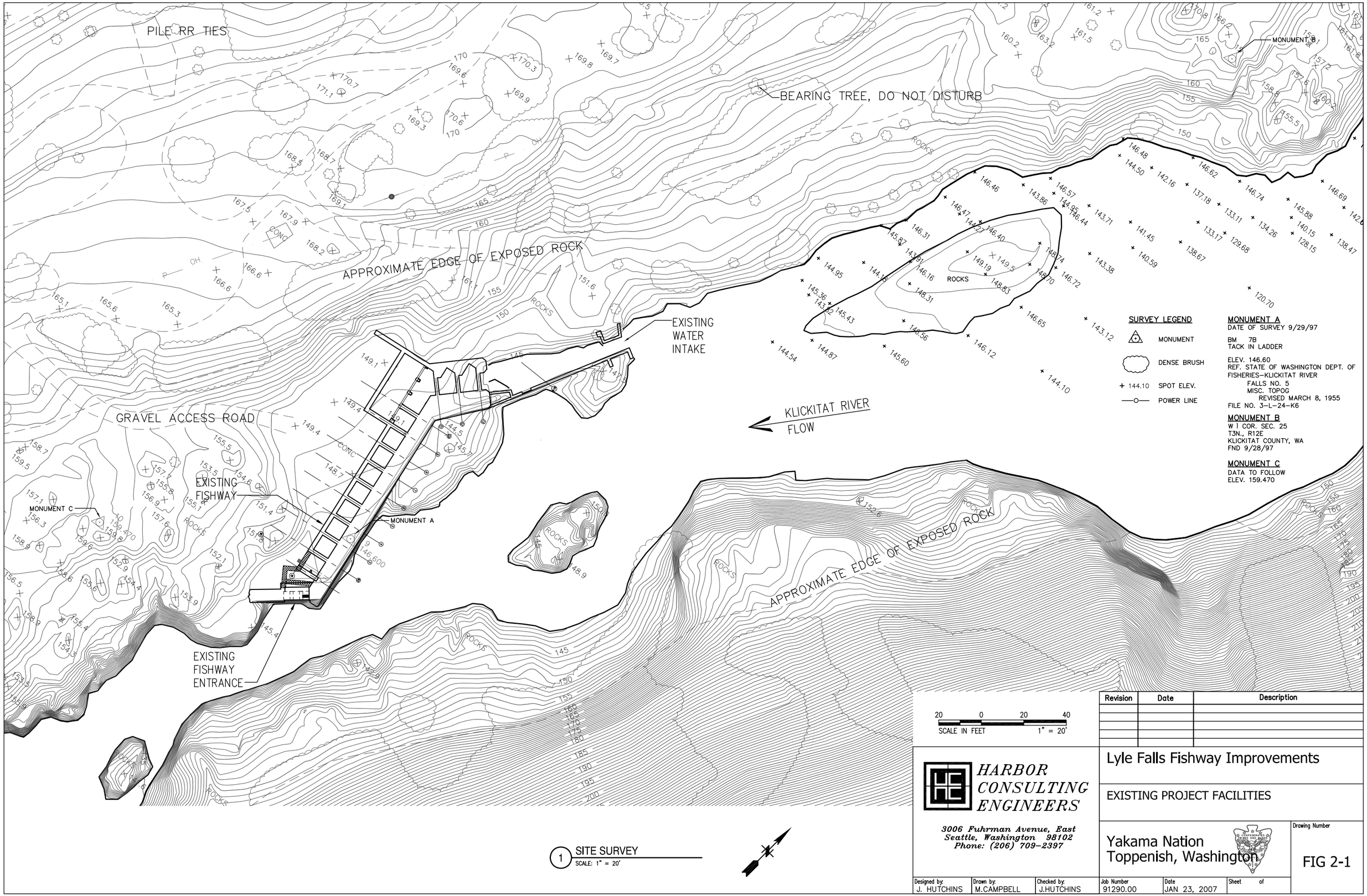
Figure 1 - 1
Project Vicinity

**Figure 1-2 Photo of the Lyle Falls Fishway Setting**

**Figure 1-3 Existing Lyle Falls Fishway and Attraction Flow Pipe**

**Figure 1-2 Photo of the Lyle Falls Fishway Setting**

**Figure 1-3 Existing Lyle Falls Fishway and Attraction Flow Pipe**




1 SITE SURVEY
SCALE: 1" = 20'

20 0 20 40
SCALE IN FEET 1" = 20'

| Revision | Date | Description |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |


HARBOR CONSULTING ENGINEERS
3006 Fuhrman Avenue, East
Seattle, Washington 98102
Phone: (206) 709–2397

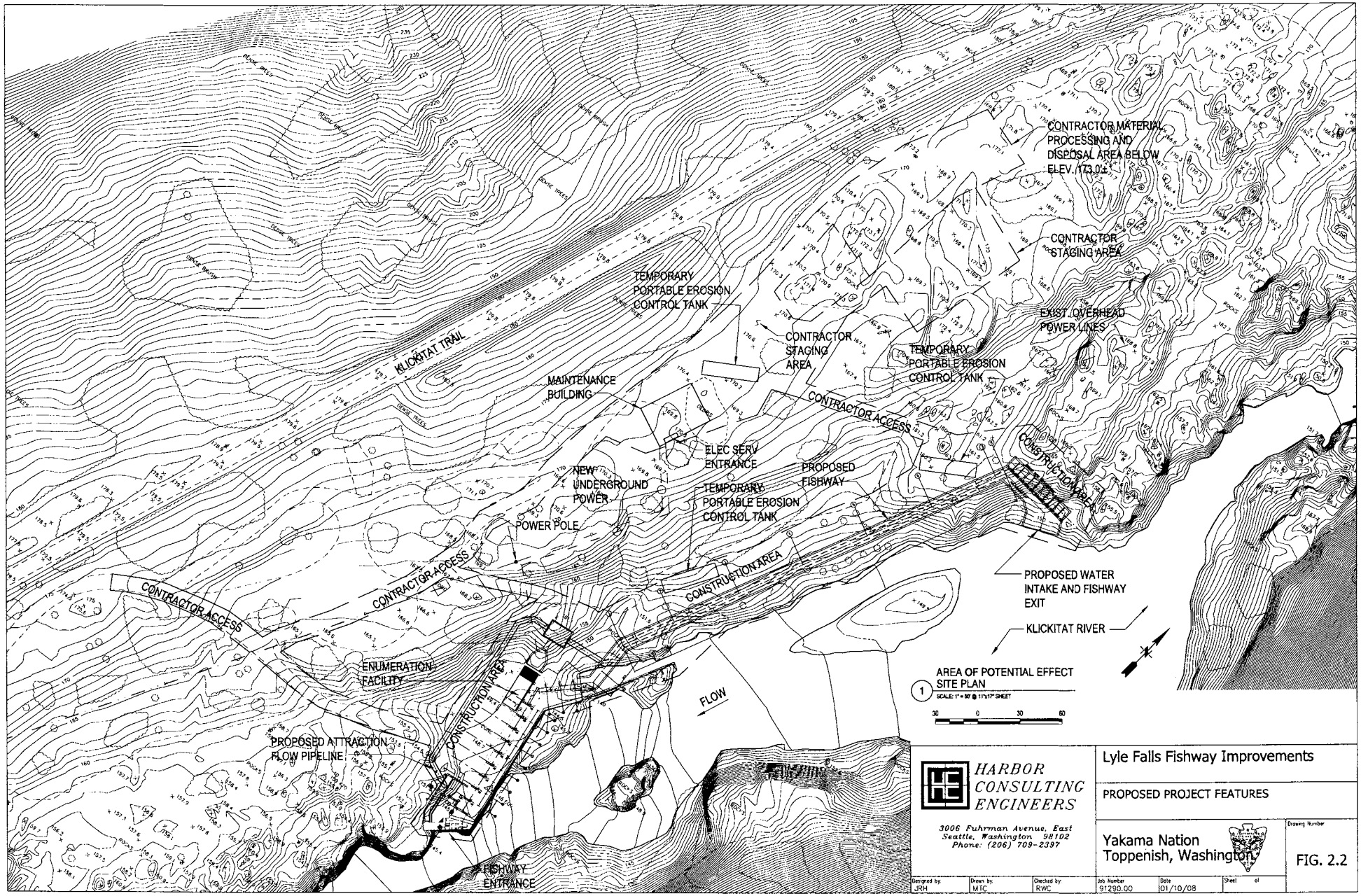

# Lyle Falls Fishway Improvements

EXISTING PROJECT FACILITIES

Yakama Nation
Toppenish, Washington

Drawing Number
FIG 2-1

| Designed by: | Drawn by: | Checked by: | Job Number | Date | Sheet of |
|---|---|---|---|---|---|
| J. HUTCHINS | M.CAMPBELL | J.HUTCHINS | 91290.00 | JAN 23, 2007 | |

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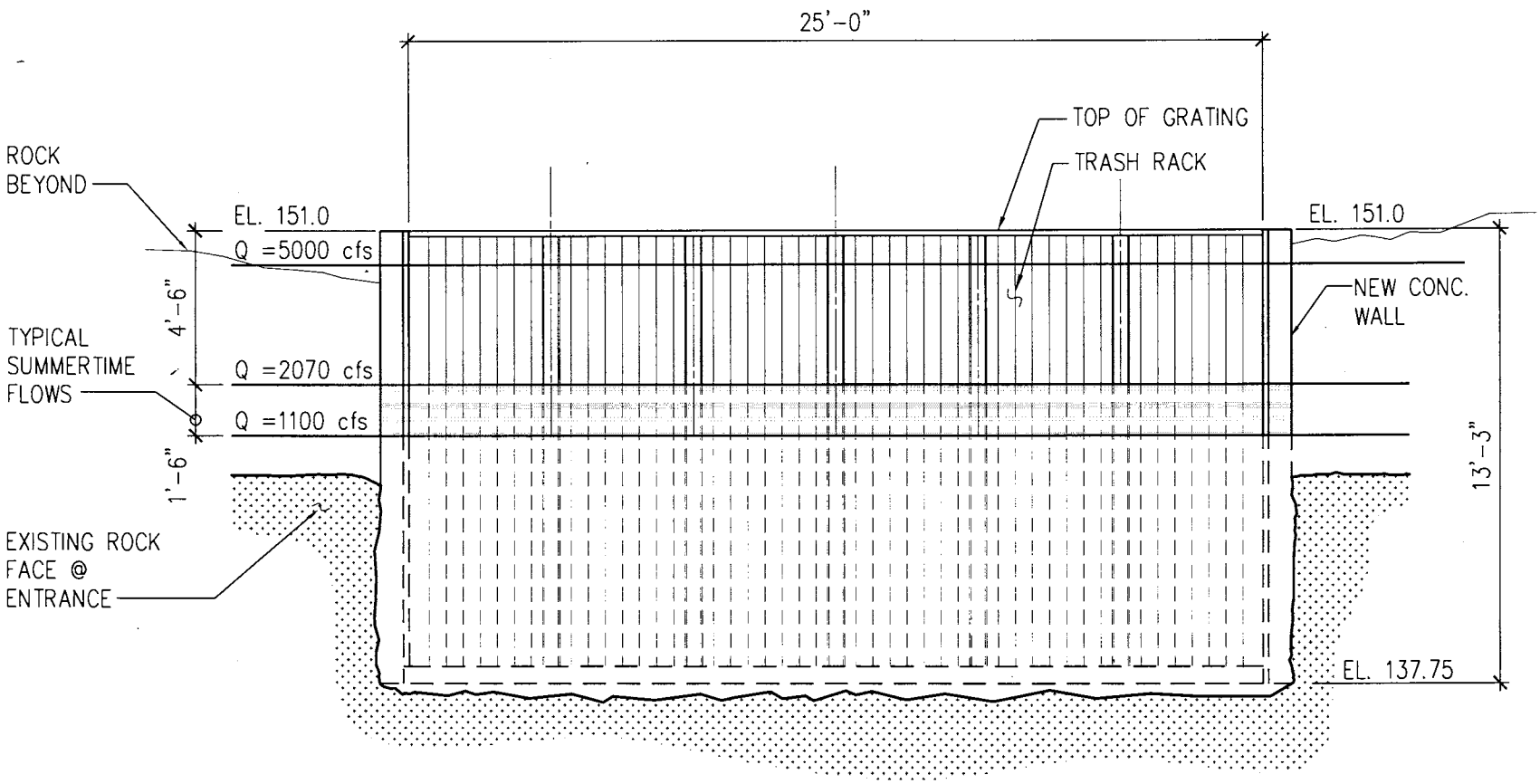
Lyle Falls Fishway Improvements

PROPOSED PROJECT FEATURES

Yakama Nation
Toppenish, Washington

Drawing Number
FIG. 2.2

| Designed by | Drawn by | Checked by | Job Number | Date | Sheet |
|---|---|---|---|---|---|
| JRH | MTC | RWC | 91290.00 | 01/10/08 | of |




FISHWAY EXIT VIEWED FROM RIVER

NOT TO SCALE

| Revision | Date | Description |
|---|---|---|
| | | |

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Seattle, Washington 98102
Phone: (206) 709-2397

Lyle Falls Fishway Improvements

INTAKE STRUCTURE ELEVATION

Yakama Nation
Toppenish, Washington

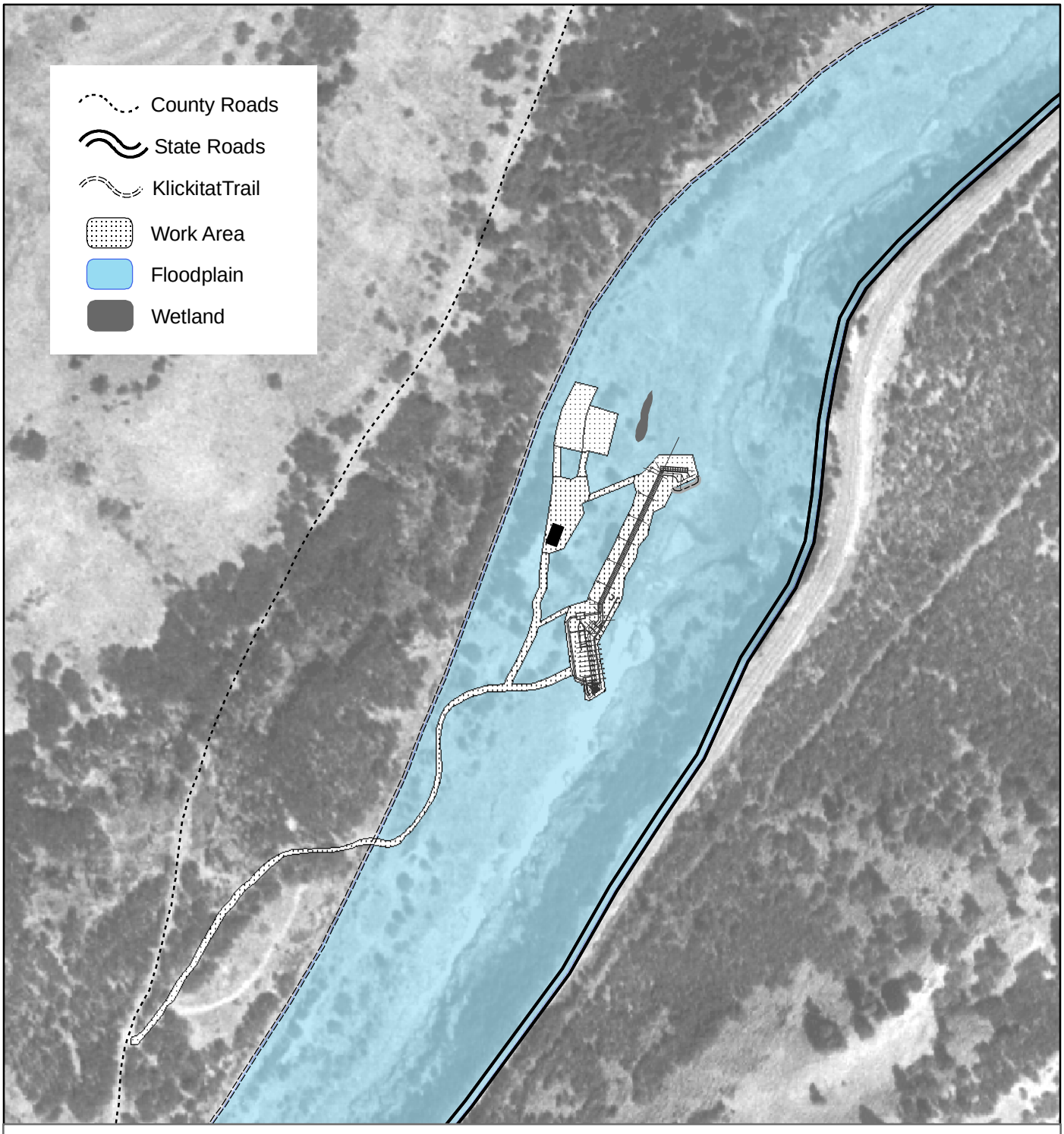
Drawing Number: FIG. 2-3

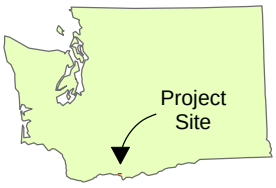
| Designed by | Drawn by | Checked by | Job Number | Date | Sheet of |
|---|---|---|---|---|---|
| J. HUTCHINS | | J. HUTCHINS | | JUNE 27, 2007 | |


Bonneville Power Administration

LYLE FALLS FISHWAY PROJECT
Draft Environmental Impact Statement

Figure 3 - 1
Project Area Soils





0 95 190 380 570 760 Feet

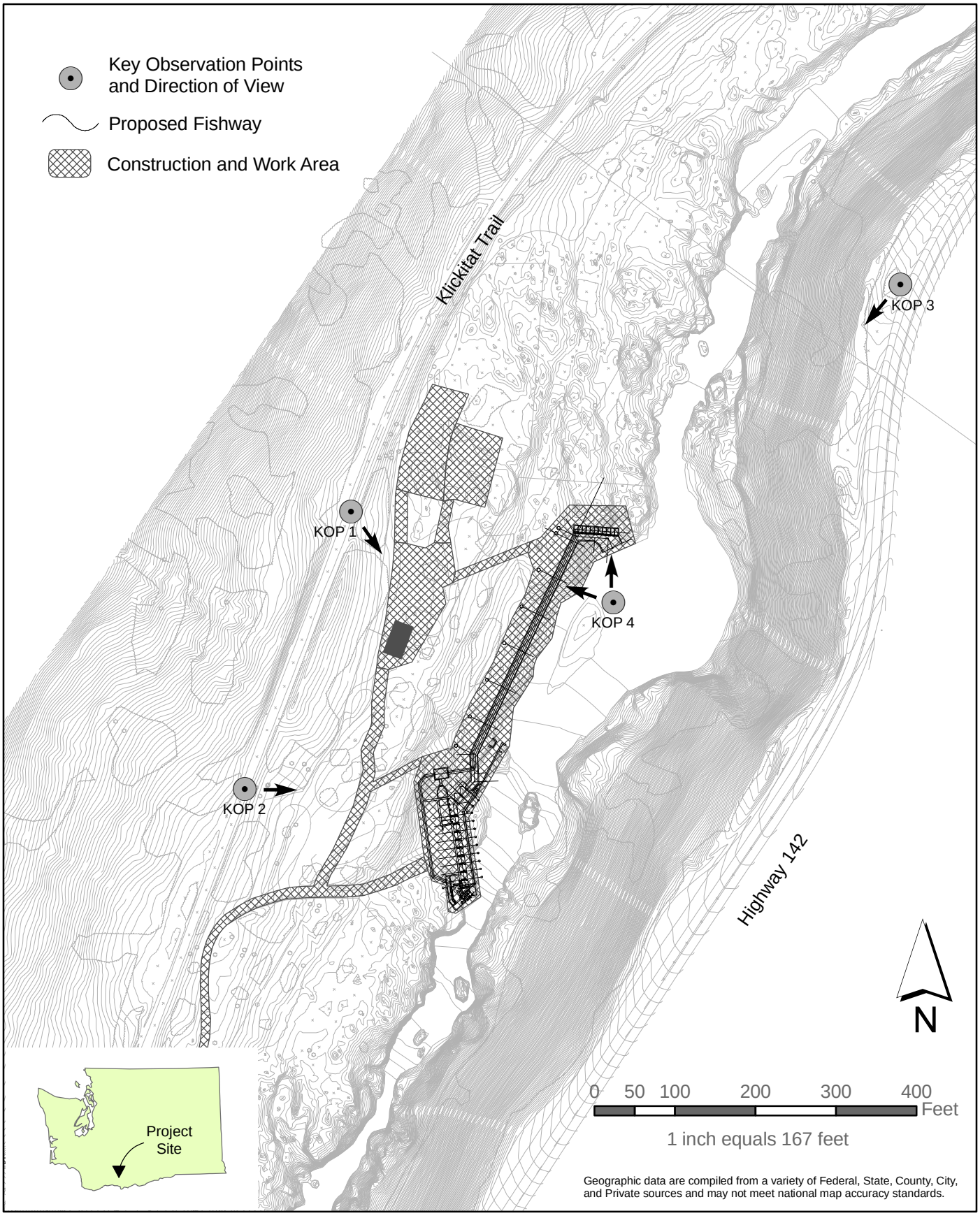
1 inch equals 300 feet

Geographic data are compiled from a variety of Federal, State, County, City, and Private sources and may not meet national map accuracy standards.

Bonneville Power Administration

LYLE FALLS FISHWAY PROJECT
Draft Environmental Impact Statement

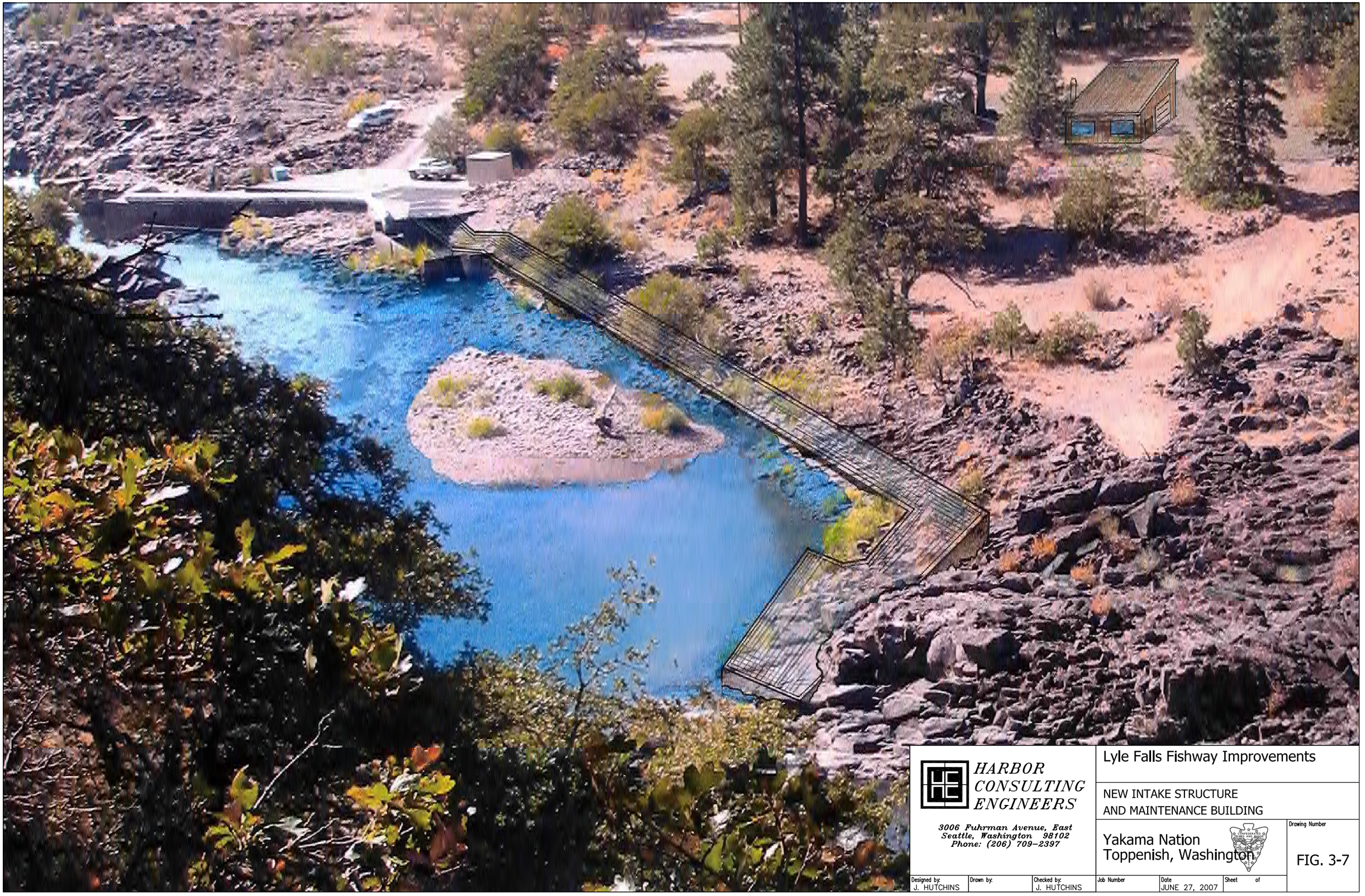
Figure 3 - 5
Wetlands and
FEMA Floodplain Boundary




Bonneville Power Administration

LYLE FALLS FISHWAY PROJECT
Draft Environmental Impact Statement

Figure 3 - 6
Key Observation Points



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*Phone: (206) 709-2397*

# Lyle Falls Fishway Improvements

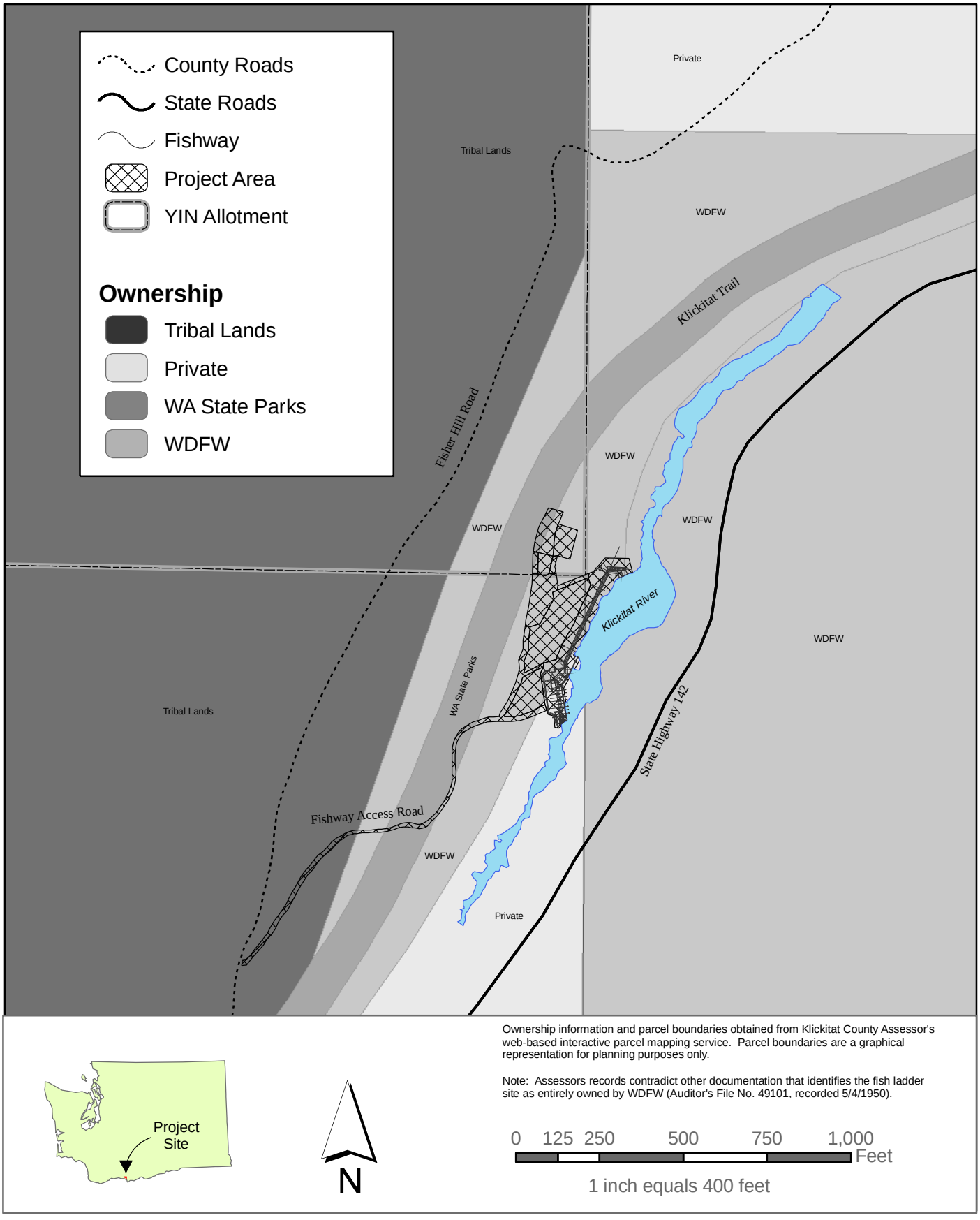
NEW INTAKE STRUCTURE
AND MAINTENANCE BUILDING

Yakama Nation
Toppenish, Washington

Drawing Number

FIG. 3-7

| Designed by: | Drawn by: | Checked by: | Job Number | Date | Sheet of |
|---|---|---|---|---|---|
| J. HUTCHINS | | J. HUTCHINS | | JUNE 27, 2007 | |

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LYLE FALLS FISHWAY PROJECT
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Figure 3 - 8
Land Ownership

# Appendix A

*Key Observation Points*

# *Visual Resource Inventory Field Form: KOP 1*

| **Lyle Falls Fish Passage Facility** | |
|---|---|
| **Photo Point** | **(1) Klickitat Trail, parallel with upstream end of ladder** |
| **Date/Time** | 9/27/06, 10 AM. |
| **Weather** | Clear, sunny |
| **Photo Direction** | East |
| **SMS Class** | Moderate Scenic Integrity (same as VQO of Partial Retention) |
| **KOP Location** | Klickitat Trail. This segment of the trail is elevated about 20 feet above the base grade, and the grade then slopes gently and unevenly down toward the river. |

**Characteristic Landscape Description**

| | **Land/Water** | **Vegetation** | **Structures** |
|---|---|---|---|
| **Form** | Most of area is floodplain, basalt boulders worn and deposited by river. Sculpted bedrock. River visible in middle of view- reach is above the falls. | Bedrock interspersed with grasses and forbs. Intermittent groves of oak, one lodgepole pine in view. | Existing attraction flow pipeline visible at edge of view. |
| **Line** | River creates a strong line at base of very steep hillside. | Clusters of vertical trees in middle ground. Background is steep vegetated slope on opposite bank of river. | Strong horizontal line of attraction flow pipe. Two wood power poles and wires visible (but subordinate). |
| **Color** | River is a shiny ribbon set in a brown landscape. | Brownish yellow grasses and gray-green trees. | Shiny white metal pipeline on top of existing ladder deck. |
| **Texture** | | | |

| **Distance to Components of Facilities (describe what project components would be seen from KOP)** | |
|---|---|
| **Foreground: (0 to 1 mile)** | Likely site of settling ponds and spoil disposal (300 ft-long by 100 ft-long area). Grade from Trail drops about 10-15' down to floodplain. New fish channel would be slightly visible although very low profile and largely screened by existing oaks and basalt outcrops. Existing attraction flow pipe would remain visible, but it would be painted and cleaned up. Rock quarry appearance could be expected to last for decades as vegetation would be very slow to establish due to limited soil. |

| | |
|---|---|
| **Middleground: (1 mi. to 5 mi.)** | East bank of river is nearly vertical. Some evidence of sloughing. Oaks adjacent to state highway corridor screen it from view. Hills are vegetated in grasses and very few trees. Steep slopes form the horizon of this viewscape. |
| **Background: ( 5 mi. to horizon)** | NA |
| **Angle of observation as seen from KOP or traveling through the landscape** | East to Southeast |
| **Length of Time Facility Comp-onent(s) in View From KOP and viewed by whom** | Walkers: 2 minutes<br>Bikers: 45 seconds<br>Horse Riders: 1 minute |
| **Sensitivity Level of Viewers From KOP** | High |
| **Viewers** | Users of Klickitat Trail |
| **Potential Facility Contrast Issues** | Spoil placement would be a strong visual contrast to the existing sculpted basalt interspersed with grasses and other perennial vegetation. If larger boulders were deposited on top of the pile, might better mimic existing boulder field. With vegetation though, would look like a quarry site from the Trail. Viewers still may prefer this over the dump site that is present now.<br><br>Addition of an equipment storage building in an unbuilt area may be a visual contrast. |

# *Visual Contrast Rating Worksheet: KOP 1*

| | |
|---|---|
| **Project Name** | Lyle Falls Fishway |
| **KOP 1** | Klickitat Trail |
| **VQO /SMS Rating** | VQO = Partial Retention; SMS= Moderate Scenic Integrity |
| **Facility Distance From KOP** | 10 feet to spoil disposal site.<br>100 yards to new ladder outlet.<br>50 feet to the new equipment storage building. |

**Proposed Activity Description**: Modify existing fish passage facility

| | **Land/Water** | **Vegetation** | **Structures** |
|---|---|---|---|
| **Form** | Only a thin ribbon line of the river is visible; largely blocked by bedrock protrusion. | Open grassy areas would be covered with rock. No change in trees. | Potentially upstream end of new fishway may be visible, but it will be below grade, so if apparent, would be subtle. Equipment storage building briefly would be visible when walking on the trail. Stand of pines provides some screening; heavily vegetated berm adjacent to trail provides majority of screening. |
| **Line** | While deposited rock would be same as that deposited by the river, it would be unnatural in texture. | | New 24x40 foot building would be a new mass in an unbuilt area. |
| **Color** | Foreground color would become dark with basalt rather than the brown of grasses. | No change | New building would be dark colored to reduce visual contrast. |
| **Texture** | Jagged rock in foreground- the look of a rock quarry | | The split-face stone building material with dark metal roof would contrast with the grove of pine and oak in which it would be placed, but use of these materials would be an enhancement compared to the current white metal storage container. |

| Degree of Contrast<br>1 = Strong<br>2 = Moderate<br>3 = Weak<br>4 = None | Land/Water | Vegetation | Structures |
|---|---|---|---|
| **Form** | Land: 2; Water:4 | 3 | 2 |
| **Line** | Land: 3; Water:4 | 3 | 2 |
| **Color** | Land: 3; Water:4 | 3 | 3 |
| **Texture** | Land: 1; Water:4 | 2 | 3 |

**Does design meet SMS management objectives?**
Potentially not. Activities are to be visually subordinate to the landscape.

**Explanation:** The spoil disposal pile would have the appearance of a quarry until vegetation becomes established. It would be a very dominant foreground element. The new equipment storage building would be placed in a grove of trees, reducing its visibility from the Klickitat Trail.

**Additional mitigation measures recommended.**
Reserve larger rocks to place on top of other excavation debris to more closely resemble size of basalt boulders deposited by river. Still, texture would differ from the sculpted appearance of rocks worn by the river. Potentially soil or sand could be brought it and dumped in crevasses to facilitate vegetation reestablishment.

The new storage building would not be visually subordinate to the landscape; however, immediate foreground **v**iews are considered indistinctive and of low scenic quality. The landscape is without unity, intactness, harmony and is not unique. A split-face concrete storage building would be added in an undeveloped area, introducing the only permanent structure in the view. It would not be inconsistent with fishway management activities that go on but these uses may not be apparent to the casual trail user. It would be a subordinate element in the setting due to the short viewing duration of trail users. Final design could place the new storage building slightly west of the current location, nearer the trail-side berm. This would further reduce visibility from the trail.

**View from KOP 1**

# *Visual Resource Inventory Field Form: KOP 2*

| | | | |
|---|---|---|---|
| **Lyle Falls Fish Passage Facility** | | | |
| **Photo Point** | **Klickitat Trail (2) parallel with existing ladder** | | |
| **Date/Time** | 9/27/06, 11:15 AM | | |
| **Weather** | Clear, Sunny | | |
| **Photo Direction** | East, southeast | | |
| **SMS Class** | Moderate Scenic Integrity (same as a VQO of Partial Retention) | | |
| **KOP Location** | Klickitat Trail, due west of parking/camping area and fish ladder. | | |
| **Characteristic Landscape Description** | | | |
| | **Land/Water** | **Vegetation** | **Structures** |
| **Form** | Disturbed. Large area cleared for road, informal camp sites, storage and parking. River not visible. | Oak and pine provide intermittent screening from trail. Some understory vegetation also screens. | Dumpster, temporary camper sites (tents, trailers, vehicles), stockpile of wood. |
| **Line** | Dirt road and tents dominate the setting. | | Power lines slightly visible. |
| **Color** | Brown of dirt, and slope ascending the opposite bank of the river. | Dusty gray-green oaks and pines. Brown grasses in understory. Most colorful plant is the plentiful poison oak. | Dumpster and tents contrast with setting. |
| **Texture** | Very inconsistent texture: cleared road, spiky understory plants, and scattered trees. Not a coherent setting. | | |
| **Distance to Components of Facilities (describe what project components would be seen from KOP)** | | | |
| **Foreground: (0 to 1 mile)** | Cleared area for fish ladder and fishing access parking. Dirt surfaced road. Falls and fish ladder not visible. Steep ascending slope to the east. Some understory vegetation between trail and camping area. Camp sites exposed to trail. | | |
| **Middleground: (1 mi. to 5 mi.)** | Steep slope ascending opposite bank of river. Vegetated with oaks, grasses. | | |
| **Background: ( 5 mi. to horizon)** | None. | | |
| **Angle of observation as seen from KOP** | East | | |

| | |
|---|---|
| **Time Facility Component(s) in View From KOP** | Less than one minute for walkers due to vegetation screening. |
| **Sensitivity Level of Viewers From KOP** | High |
| **Viewers** | Recreational users. |
| **Potential Facility Contrast Issues** | Construction staging area could be located in this area. This would be highly visible, but temporary. New structures not expected to be visible. |

# *Visual Contrast Rating Worksheet: KOP 2*

| | |
|---|---|
| **Project Name** | **Lyle Falls Fishway** |
| **KOP 2** | Klickitat Trail adjacent to parking area parallel with existing ladder |
| **VQO /SMS Rating** | VQO = Partial Retention; SMS = Moderate Scenic Integrity |
| **Facility Distance From KOP** | 100 yards to fish ladder;<br>100 feet to proposed equipment storage building |

**Proposed Activity Description**: Modify existing fish passage facility

| | **Land/Water** | **Vegetation** | **Structures** |
|---|---|---|---|
| **Form** | River not visible. Dirt road likely would receive several inches of gravel, covering the dirt. | Trees would not be affected by construction. Some understory disturbance likely. | Existing cleared parking area likely to be used as staging area during construction. Temporary effect. Modified ladder structure would not be visible. |
| **Line** | No change | No change | No change. |
| **Color** | Gravel on access road changes surface from brown to gray. | No change | No change. |
| **Texture** | Road texture, which dominates the view, would change from dust to crushed rock. | No change | No change. |

| **Degree of Contrast**<br>**1 = Strong**<br>**2 = Moderate**<br>**3 = Weak**<br>**4 = None** | **Land/Water** | **Vegetation** | **Structures** |
|---|---|---|---|
| **Form** | 3 | 4 | 4 |
| **Line** | 4 | 4 | 4 |
| **Color** | 3 | 4 | 4 |
| **Texture** | 3 | 4 | 4 |

**Does design meet VQO / SMS management objectives?**
No

**Explain:**
This foreground viewpoint is considered indistinctive and of low scenic quality. The landscape is without unity, intactness, harmony and is not unique. Changes from this KOP would be temporary, with the possible exception of the access road /parking area surface.

**Additional mitigation measures recommended.**
None.

**View from KOP 2 (1 of 2)**

**View from KOP 2 (2 of 2)**

# *Visual Resource Inventory Field Form: KOP 3*

| **Lyle Falls Fish Passage Facility** | |
|---|---|
| **Photo Point** | **(3) View from a Highway 142 informal roadside turn-out, at approximately Milepost 1.75 from Lyle** |
| **Date/Time** | 9/27/06; 12:45 PM. |
| **Weather** | Clear, sunny |
| **Photo Direction** | Southwest |
| **SMS Class** | Moderate Scenic Integrity (same as a VQO of Partial Retention) |
| **KOP Location** | Appx 0.5 mile upstream of the existing fish ladder, overlooking the entire project area from an informal trail at the top of a cliff. Roadside pull-out looks well-used and could accommodate several cars. There are no signs posted or services (garbage receptacle, etc). Site is reported used by the tribal "fish cops". |

**Characteristic Landscape Description**

| | **Land/Water** | **Vegetation** | **Structures** |
|---|---|---|---|
| **Form** | Appx 1 mile of river visible through trees. Entire project area visible. Broad floodplain with extensive exposed basalt bedrock and deposits. | Floodplain supports sparse mature oaks and pine. Western slope densely vegetated with oak and pine. | Fish ladder fully visible. Remnants of dip-netting operation upstream of ladder outlet strewn across rocky river bank. |
| **Line** | Thread of the river is the dominant foreground element. | | Klickitat Trail apparent in middle ground as a horizontal line. Partially screened by trail-side vegetation. Transmission line a subordinate element. Fish ladder strongly contrasts with setting – horizontal line and mass conflict with setting. |
| **Color** | River flows green, turning to white with turbulence at the ladder. | Grey-green trees interspersed with a range of browns of the grasses and drying herbaceous shrubs. | Ladder is lighter color than rocks into which it is set. |

| | | | |
|---|---|---|---|
| **Texture** | Basalt bedrock exposed along river's edge. Deposited sculpted boulders extend inland towards the Klickitat Trail. | | Grated decking on ladder provides visual texture that from this viewpoint helps it to blend with adjacent basalt. |
| **Distance to Components of Facilities (describe what project components would be seen from KOP)** | | | |
| **Foreground: (0 to 1 mile)** | Existing fish ladder full visible. New ladder outlet structure and ladder extension would be closer to KOP 4; therefore, highly visible. Proposed spoil disposal site fully visible from here. New equipment storage building would be visible, although somewhat screened by existing tree cover. Temporary work areas largely would be visible from here. | | |
| **Middleground: (1 mi. to 5 mi.)** | No change. Oaks cover the western slope down to the floodplain. The turbulent reach below Lyle Falls is visible until the channel bends west and cuts down into the deeper canyon. | | |
| **Background: ( 5 mi. to horizon)** | No change. Mount Hood visible on horizon, beyond the stepped escarpments south of Hood River. | | |
| **Angle of observation as seen from KOP or traveling through the landscape** | Southwest. This is a stationary viewpoint. | | |
| **Length of Time Facility Component(s) in View From KOP and viewed by whom** | The site cannot be seen from the highway. One must pull off, leave vehicle, and walk a short distance on an informal dirt trail to the edge of the cliff. There are no guardrails here. Facility could be viewed for as long as one wishes to stand there. | | |
| **Sensitivity Level of Viewers From KOP** | High. | | |
| **Viewers** | Highway travelers who are aware of this undesignated viewpoint. Reportedly used by tribal Fish and Wildlife Police to patrol fishing at the ladder. | | |
| **Potential Facility Contrast Issues** | Entire site would be visible during construction and upon completion. Contrast would be high, but consistent with the existing ladder which has been there for 50 years. So these may be expected cultural structures. | | |

# *Visual Contrast Rating Worksheet: KOP 3*

| | | | |
|---|---|---|---|
| **Project Name** | **Lyle Falls** | | |
| **KOP 3** | View from Highway 147 pull-out | | |
| **VQO /SMS Rating** | VQO = Partial Retention, SMS= Moderate Scenic Integrity | | |
| **Facility Distance From KOP** | 1/3 mile | | |
| **Proposed Activity Description**: Modify existing fish passage facility | | | |
| | **Land/Water** | **Vegetation** | **Structures** |
| **Form** | New ladder outlet would be in deep calm pool of river, upstream of current structure. Otherwise, river would be unchanged. | Trees would not be affected (one may be removed). Grasses would be replaced by basalt spoil disposal within view from KOP 3. | Modification to existing ladder would extend it upstream. Existing equipment storage container would be removed and replaced by a permanent structure. New building would be partially screened from view by existing pine trees. |
| **Line** | | No change. | Ladder extension would add a new unnatural line to the scene. Potential partial views of new storage building, adding a solid horizontal element. |
| **Color** | Little change. | No change | Light grey of the concrete ladder extension would somewhat contrast with the basalt into which it would be set. The new equipment building of split-face concrete construction would be a dark. The roof would be a dark color metal. It would be partially visible. |
| **Texture** | Deposited basalt from blasting operations would have a coarse, rugged texture compared to the sculpted rocks deposited by high river flows. | | Smooth concrete may contrast with basalt bedrock and deposited gravel at the new outlet site. |

| Degree of Contrast<br>1 = Strong<br>2 = Moderate<br>3 = Weak<br>4 = None | Land/Water | Vegetation | Structures |
|---|---|---|---|
| **Form** | 1 | 4 | 1 |
| **Line** | 3 | 4 | 1 |
| **Color** | 3 | 4 | 3 |
| **Texture** | 1 | 4 | 1 |

**Does design meet VQO management objectives?** No.

**Explanation:** Activities are to be visually subordinate to the existing landscape.

**Additional mitigation measures recommended.** If it is feasible to add some soil or sand to the pile of rock (spoil), this may facilitate natural reseeding of grasses and forbs, accelerating blending of this feature with the setting. No measures would screen the new structure from this viewpoint. Selecting a brown-colored concrete for the equipment building would reduce the contrast with the surroundings as would a dark-colored roof.

**View from KOP 3**

# *Visual Resource Inventory Field Form: KOP 4*

**Lyle Falls Fish Passage Facility**

| | |
|---|---|
| **Photo Point** | **(4) 15 feet upstream of gravel bar in Klickitat River pool where new fishway exit structure would be constructed** |
| **Date/Time** | 6/16/07, 11:00 AM |
| **Weather** | Sun |
| **Photo Direction** | Northwest and south |
| **SMS Class** | Moderate Scenic Integrity |
| **KOP Location** | In Klickitat River approximately 500 feet upstream of Lyle Falls |

**Characteristic Landscape Description**

| | **Land/Water** | **Vegetation** | **Structures** |
|---|---|---|---|
| **Form** | The pool has calmer, deeper water than that upstream and downstream reaches. Steep embankment to the east. | Limited riparian vegetation including several small willows and some reeds growing in pockets of sand. It is denser looking downstream, where clusters of larger willows have emerged (see photo). Piles of woody debris on bank. | View downstream includes the bright horizontal line of the existing flow pipeline (see photo). View west includes piles of woody debris, power pole and transmission line. |
| **Line** | To the west and north, basalt emerges from water and extends upward about 15 feet. Bright horizontal line of the existing flow pipeline very apparent (see photo). | Limited shrubby riparian vegetation that is subordinated to basalt setting. | Horizontal flow pipeline strongly contrasts with angular basalt outcrops. |
| **Color** | At appx. 1,500 cfs, river is greenish with grey basalt lining west side of pond. | Pale green grasses and willow against grey basalt. | Gray concrete of existing fishway appears similar to basalt at this distance. Flow pipeline is highly apparent. |

| | | | |
|---|---|---|---|
| **Texture** | From water's edge, basalt subjected to river flows has been sculpted; it sits below exposures of jagged basalt that extend upslope about 15 feet. | Large piles of woody debris deposited by high flows have accumulated along downstream shore of this pool. | Texture of existing structures not discernable at this distance. |
| **Distance to Components of Facilities (describe what project components would be seen from KOP)** | | | |
| **Foreground: (0 to 1 mile)** | From the center of this pool, it is about 75 feet northwest to the shore and about 40 feet to the west. Views are largely foreground, contained by basalt outcrops to the west and north. Views to the east are of a very steep inaccessible embankment. To the south, denser riparian vegetation has colonized the river bank and rocky island, obscuring much of the existing fishway from view. The flow pipeline is very apparent due to its bright white appearance. | | |
| **Middleground: (1 mi. to 5 mi.)** | Views are of the rolling slopes extending high above the river's floodway (see photo). Large patches of brown grass intersperse by dark green pines and oaks. | | |
| **Background: ( 5 mi. to horizon)** | No background views from this location. | | |
| **Angle of observation as seen from KOP or traveling through the landscape** | Boaters traveling south as they enter this pool. They would be seeking exit locations at this point to avoid the hazardous falls, so would be looking primarily west. | | |
| **Length of Time Facility Component(s) in View From KOP and viewed by whom** | If a boater targets an immediate take-out, the viewing duration would be less than one minute. If a boater lingered in the pool, it could be a much longer period of time. | | |
| **Sensitivity Level of Viewers From KOP** | High | | |
| **Viewers** | At this location, limited to kayakers, potentially some canoes, and tribal members who fish the area. | | |
| **Potential Facility Contrast Issues** | Line and color. | | |

# *Visual Contrast Rating Worksheet: KOP 4*

| | | | |
|---|---|---|---|
| **Project Name** | **Lyle Falls Fishway** | | |
| **KOP 4** | Pool in the Klickitat River at proposed fishway exit; boater's point of view from about 2 feet above water surface. | | |
| **VQO /SMS Rating** | VQO = Partial Retention, SMS= Moderate Scenic Integrity | | |
| **Facility Distance From KOP** | 75 feet from proposed fishway exit; 50 feet from transportation channel | | |
| **Proposed Activity Description**: Modify / expand existing fish passage facility | | | |
| | **Land/Water** | **Vegetation** | **Structures** |
| **Form** | New fishway exit would occupy an appx 35-foot length of shoreline, interrupting the irregular basalt outcrop around the west side of the pool. Smooth, water worn boulders (where frequently inundated) transition to sharp-edged boulders at higher elevation. Very little pool area would be affected by the fishway exit. | There is limited riparian vegetation; some willow shrubs would be removed at the fish exit structure site and grasses removed along the transportation channel. Rock dominates the shoreline. | New ladder outlet would be in a back eddy area on NW shore of deep pool, about 350 ft. up-stream of current structure. During typical summer flows, the concrete exit structure would protrude appx 4.5 feet out of the water. Although largely buried, some segments of concrete sidewall of transportation channel would be apparent to boaters. |
| **Line** | The fishway exit would protrude from the upstream (north) side of the pool, occupying limited water surface area. Contrast in line of the new fish trans-portation channel would be reduced by placing it below grade along the slope. | Deciduous vegetation would be removed; likely would reestablish along transportation channel. | New structures would introduce horizontal lines where none are present. Mass would not be particularly apparent from this viewpoint. A highly visible existing element is the large light-colored tube that is the unused attraction flow pipeline (see photo). |

| | | | |
|---|---|---|---|
| **Color** | Grey concrete would emerge from blue-green water in pool. Grey concrete transportation channel would be added to the grey basalt outcrop. | Limited amount of green riparian vegetation would be removed; some likely to reestablish post-construction. | Light grey of the concrete ladder extension would be similar to the grey basalt into which it would be set. |
| **Texture** | From water's edge, basalt sculpted or deposited by river sits below jagged basalt exposures. | Riparian vegetation is denser looking downstream, some of which would be removed for the transportation channel extension, exposing more basalt | Smooth edges of structure would be apparent, but effect minimized by placement of basalt boulders waterward to protect the walls from large wood. |

KOP 4 continued

| **Degree of Contrast**<br>**1 = Strong**<br>**2 = Moderate**<br>**3 = Weak**<br>**4 = None** | **Land/Water** | **Vegetation** | **Structures** |
|---|---|---|---|
| **Form** | 2 | 3 | 2 |
| **Line** | 1 | 3 | 1 |
| **Color** | 2 | 3 | 2 |
| **Texture** | 2 | 3 | 2 |

**Does design meet VQO management objectives?**
Unlikely since activities are to be visually subordinate to the landscape.

**Explain:**
The fishway exit structure and parts of the transportation channel would be highly visible around the west side of this pool. Although boating use is limited, it is reported to be increasing. Most boaters use the back eddies of this pool to exit and portage around Lyle Falls. The new structures will be apparent, but will not be barriers for exiting the pool. Visually they will add a strong element to the landscape, although the linkage to the existing concrete structure will remain somewhat obscured from KOP 4 by downstream riparian vegetation.

**Additional mitigation measures recommended.**
The grey tones of concrete are similar to the water-worn basalt, but coloration could be added to new concrete to more closely match. Placement of basalt boulders on the water side of the fishway exit, and in areas along the new transportation channel may greatly reduce the horizontal and vertical lines of the structure. Painting the existing attraction flow pipeline a darker color would significantly reduce the visual impact of this element from KOP 4.

**View Northwest from KOP 4 at Approximately 1,500 cfs**

**View South (Downstream) from KOP 4 at Approximately 1,500 cfs**

BONNEVILLE POWER ADMINISTRATION

DOE/BP-3842 March 2008