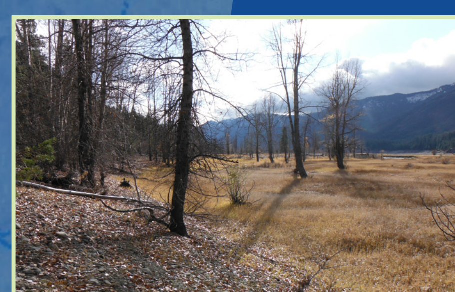
Cle Elum Pool Raise Project

A Component of the Yakima River Basin Integrated Water Resource Management Plan

DRAFT Environmental Impact Statement

KITTITAS COUNTY, WASHINGTON



U.S. Department of the Interior
Bureau of Reclamation
Pacific Northwest Region
Columbia-Cascades Area Office
Yakima, Washington

State of Washington
Department of Ecology
Central Regional Office
Yakima, Washington

Ecology Publication Number: 14-12-003

September 2014

Mission Statements

The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

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

The mission of the Department of Ecology is to protect, preserve and enhance Washington's environment, and promote the wise management of our air, land and water for the benefit of current and future generations.

United States Department of the Interior
BUREAU OF RECLAMATION
Columbia-Cascades Area Office
1917 Marsh Road
Yakima, Washington 98901-2058

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CCA-1123
ENV-6.00

To: Interested Individuals, Organizations, and Agencies

Subject: Cle Elum Pool Raise Project Draft Environmental Impact Statement, Kittitas County, Washington

Dear Ladies and Gentlemen:

Enclosed for your review and comment is the Draft Environmental Impact Statement (EIS) for the Cle Elum Pool Raise Project (CEPR). The CEPR is a component of the Yakima River Basin Integrated Water Resource Management Plan (Integrated Plan). This Draft EIS evaluates five alternatives to increase the capacity of the reservoir and improve aquatic resources for fish habitat, rearing, and migration in the Cle Elum and upper Yakima Rivers:

- Alternative 1—No Action Alternative
- Alternative 2—Additional Stored Water Used for Instream Flow with Rock Shoreline Protection
- Alternative 3—Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection
- Alternative 4—Additional Water Used for Total Water Supply Available with Rock Shoreline Protection
- Alternative 5—Additional Water Used for Total Water Supply Available with Hybrid Shoreline Protection.

Common components to all the action alternatives are:

- Modifying the radial gates at Cle Elum Dam to provide an additional 14,600 acre-feet of storage capacity in Cle Elum Reservoir;
- Providing for shoreline protection of Cle Elum Reservoir; and
- Accomplishing necessary environmental mitigation.

This Draft EIS was prepared in compliance with the National Environmental Policy Act (NEPA), Public Law 91-190, and the State of Washington Environmental Policy Act (SEPA), Chapter

43.21C RCW, and the SEPA Rules (Chapter 197-11 WAC). A joint NEPA and SEPA scoping process was held from October 30, 2013, to December 16, 2013.

Comments may be submitted orally, electronically, or by regular mail. Oral comments will be accepted at both of the public meetings. The meetings will be from 4-7 p.m. on the dates and locations listed below:

October 21, 2014 Hal Holmes Center 209 N. Ruby Street Ellensburg, WA 98926	October 22, 2014 U.S. Forest Service Cle Elum Ranger District 803 W. 2nd Street Cle Elum, WA 98922

Requests to provide comments orally at the public meetings will be handled on a first-come, first-served basis. Comments will be transcribed by a court reporter. In the interest of available time, each speaker will be asked to limit oral comments to 5 minutes. Longer comments should be summarized and submitted in writing either at the public meeting or identified as meeting comments and sent to Ms. Candace McKinley, Environmental Program Manager, no later than November 25, 2014, at the address below.

The public meeting facilities are physically accessible. Individuals who need accessibility accommodations, including sign language interpreters or other auxiliary aids, may contact Ms. McKinley. Requests should be made as early as possible to allow sufficient time to arrange for accommodation.

Comments may also be submitted electronically, by telephone, by facsimile, or by mail to Ms. McKinley. Comments on this document must be postmarked by November 25, 2014, to ensure inclusion into the Final EIS. Before including your name, address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

For further information regarding this document or to submit comments, please contact:

Ms. Candace McKinley
Environmental Program Manager
Bureau of Reclamation
Columbia-Cascades Area Office
1917 Marsh Road
Yakima, WA 98901-2058
Phone: 509-575-5848, ext. 613
Fax: 509-454-5650
Email: cepr@usbr.gov

Those wishing to obtain the Draft EIS in the form of a printed document or on compact disk (CD-ROM) or an Executive Summary of the Draft EIS may contact Ms. McKinley at the address or phone number given above.

The Draft EIS is available for viewing on the Internet at http://www.usbr.gov/pn/programs/eis/cleelumraise/index.html.

Additional information regarding the Integrated Plan may be found at http://www.usbr.gov/pn/programs/yrbwep/2011integratedplan/index.html.

Sincerely,

Dawn Wiedmeier
Area Manager
Columbia-Cascades Area Office
Bureau of Reclamation
1917 Marsh Road
Yakima, Washington 98901-2058

Derek I. Sandison
Director, Office of Columbia River
Department of Ecology
303 S. Mission Street, Suite 200
Wenatchee, Washington 98801

Enclosure

Draft Environmental Impact Statement
Cle Elum Pool Raise Project
Kittitas County, Washington

Joint Lead Agencies:	**For further information contact**:
U.S. Department of the Interior Bureau of Reclamation	Ms. Candace McKinley Environmental Program Manager Columbia-Cascades Area Office 1917 Marsh Road Yakima, Washington 98901-2058 509-575-5848, ext. 613
State of Washington Department of Ecology	Mr. Derek I. Sandison Director, Office of Columbia River 15 W. Yakima Ave, Suite 200 Yakima, Washington 98902-3452 509-457-7120

Cooperating Governments and Agencies:

Confederated Tribes and Bands of the Yakama Nation
U.S. Department of Agriculture, U.S. Forest Service
U.S. Department of Energy, Bonneville Power Administration
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service

This Draft Environmental Impact Statement (DEIS) for the Cle Elum Pool Raise Project was prepared jointly by the U.S. Department of the Interior Bureau of Reclamation and Washington State Department of Ecology. The project is part of Title XII legislation (108 Stat. 4526 U.S. Code) and is an element of the Yakima River Basin Integrated Water Resource Management Plan (Integrated Plan). This DEIS evaluates a No Action Alternative and four action alternatives: Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection; Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection; Alternative 4 – Additional Stored Water Used for Total Water Supply Available (TWSA) with Rock Shoreline Protection; and Alternative 5 – Additional Stored Water Used for TWSA with Hybrid Shoreline Protection.

This DEIS was prepared in compliance with the National Environmental Policy Act (NEPA) 42 USC 4371 et seq. and the State of Washington Environmental Policy Act (SEPA), Chapter 43.21C RCW, and the SEPA Rules (Chapter 197-11 WAC).

<u>**SEPA FACT SHEET**</u>

Brief Description of Proposal:

Reclamation and the Washington State Department of Ecology have jointly prepared this Draft Environmental Impact Statement (DEIS) on the Cle Elum Pool Raise Project. This document was prepared in compliance with the National Environmental Policy Act (NEPA) and Washington State Environmental Policy Act (SEPA). Ecology is the SEPA lead agency for the proposal.

The Cle Elum Pool Raise Project would allow up to an additional 14,600 acre-feet of water to be stored and released from Cle Elum Reservoir by modifying the existing spillway radial gates at Cle Elum Dam. Reclamation and Ecology developed the project in response to congressional legislation (Title XII), and the project is an element of the Yakima River Basin Integrated Water Resource Management Plan (Integrated Plan).

Proponents and Contacts:

U.S. Department of the Interior, Bureau of Reclamation

Contact: Ms. Candace McKinley
Environmental Program Manager
Columbia-Cascades Area Office
1917 Marsh Road
Yakima, Washington 98901-2058
509-575-5848, ext. 613

State of Washington, Department of Ecology

Contact: Mr. Derek I. Sandison
SEPA Responsible Official
Director, Office of Columbia River
15 W. Yakima Ave, Suite 200
Yakima, Washington 98902-3452
509-457-7120

Permits, Licenses, and Approvals Required for Proposal:

To implement any component of the action alternative, the lead agency would need to apply for any required permits and comply with various laws, regulations, and Executive Orders. The following are those that are likely to apply:

- National Environmental Policy Act
- Endangered Species Act
- Magnusson-Stevens Fishery Conservation and Management Act
- Fish and Wildlife Coordination Act
- Secretary's Native American Trust Responsibilities
- National Historic Preservation Act
- Native American Graves Protection and Repatriation Act
- Executive Order 11988: Floodplain Management
- Executive Order 11990: Protection of Wetlands
- Executive Order 12898: Environmental Justice
- Executive Order 13007: Indian Sacred Sites
- Executive Order 13175: Consultation and Coordination with Indian Tribal Governments
- Clean Water Act
- State Environmental Policy Act
- Dam Safety Permit
- Hydraulic Project Approval

Additionally, Reclamation and Ecology would coordinate with Kittitas County on the applicability of local regulations, including critical areas regulations and the Shoreline Management Program.

Authors and Contributors:

A list of authors and contributors is provided in a section that follows Chapter 5.

Date of Issue:

September 23, 2014

Public Comment Period:

The DEIS will be available for a 60-day public comment period. Comments must be received or postmarked by 5 p.m. PST on November 25, 2014, and may be submitted orally, in writing via regular mail, by facsimile, or by email to:

Ms. Candace McKinley
Environmental Program Manager
Columbia-Cascades Area Office
1917 Marsh Road
Yakima, Washington 98901-2058
Phone: 509-575-5848, ext. 613
Fax: 509-454-5650
Email: cepr@usbr.gov

Public Meetings:

Reclamation and Ecology will conduct two public meetings to receive comments on the DEIS. The meetings will be held from 4-7 p.m. on the following dates and at the following locations:

October 21, 2014 Hal Holmes Center 209 N. Ruby Street Ellensburg, WA 98926	October 22, 2014 U.S. Forest Service Cle Elum Ranger District 803 W. 2nd Street Cle Elum, WA 98922

Timing of Additional Environmental Review:

Reclamation and Ecology anticipate releasing the Final EIS on the Cle Elum Pool Raise Project in March 2015.

Document Availability:

The DEIS can be viewed online at: http://www.usbr.gov/pn/programs/eis/cleelumraise/index.html. The document may be obtained in hard copy or CD by written request to the SEPA Responsible Official listed above, or by calling 509-575-5848, ext. 613. To ask about the availability of this document in a format for the visually impaired, call the Office of Columbia River at 509-662-0516. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

Location of Background Materials:

Background materials used in the preparation of this DEIS are available online at:

Cle Elum Pool Raise Project

http://www.usbr.gov/pn/programs/eis/cleelumraise/index.html

Additional information about the Yakima River Basin Integrated Water Resource Management Plan is available at:

http://www.usbr.gov/pn/programs/yrbwep/2011integratedplan/index.html.

Cle Elum Pool Raise Project Area

ACRONYMS AND ABBREVIATIONS

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$\mu g/m^3$	microgram per cubic meter
AASHTO	American Association of State Highway and Transportation Officials
APE	Area of Potential Effects
ADT	average daily traffic
bgs	below ground surface
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMPs	best management practices
BPA	Bonneville Power Administration
C	Celsius
CAA	Clean Air Act
CAO	Critical Areas Ordinance
CAR	Coordination Act Report
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CIG	Climate Impact Group
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
Colville Tribes	Confederated Tribes of the Colville Reservation
Corps	U.S. Army Corps of Engineers
CRMP	Cultural Resources Management Plan
CSA	Conservation Support Area
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CWA	Clean Water Act

CY	cubic yards
DAHP	Department of Archaeology and Historic Preservation
dB	decibels
dBA	A-weighted decibels
DEIS	Draft Environmental Impact Statement
DNR	Department of Natural Resources
DO	dissolved oxygen
DOI	Department of the Interior
DPS	distinct population segment
Ecology	Washington State Department of Ecology
EDNA	Environmental Designation for Noise Abatement
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
F	Fahrenheit
FEIS	Final Environmental Impact Statement
FR	Federal Register
ft	feet
FWCA	Fish and Wildlife Coordination Act
GHG	greenhouse gas
GLO	General Land Office
H-to-V	horizontal-to-vertical
I-	Interstate
IMPLAN	Impact Analysis for PLANning model
in/sec	inches per second
Integrated Plan	Yakima River Basin Integrated Water Resource Management Plan
Integrated Plan PEIS	*Yakima River Basin Integrated Water Resource Management Plan Final Programmatic Environmental Impact Statement*

IO	input-output
ITA	Indian Trust Asset
KDRPP	Kachess Drought Relief Pumping Plant project
kg/gal	kilograms per gallon
KKC	Keechelus to Kachess Conveyance project
kV	kilovolt
kW	kilowatt
LiDAR	Light Detection and Ranging
L_{max}	average maximum noise level
Master Agreement	*1987 Master Interagency Agreement*
MCR	Middle Columbia River
mg/L	milligrams per liter
Milestone	Water Supply Facility Permit and Funding Milestone
MOCA	Managed Owl Conservation Area
MSAT	mobile source air toxics
MUTCD	Manual of Uniform Traffic Control Devices
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NF	National Forest road
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_X	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTU	nephelometric turbidity units

NWI	National Wetland Inventory
O_3	ozone
OHV	off-highway vehicle
OHWM	ordinary high water mark
O&M	operations and maintenance
OSS	on-site sewer systems
Pb	lead
PEIS	Programmatic Environmental Impact Statement
PHS	Priority Habitats and Species
PIT	Passive Integrated Transponders
PM	particulate matter
PM2.5	particulate matter less than 2.5 microns
PM10	particulate matter less than 10 microns
ppm	parts per million
PPV	peak particle velocity
PSD	Prevention of Significant Deterioration
PUD	Public Utility District
RCW	Revised Code of Washington
Reclamation	Bureau of Reclamation
SEPA	State Environmental Policy Act
Service	U.S. Fish and Wildlife Service
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SMA	Shoreline Management Act
SMP	Shoreline Master Program
SO_2	sulfur dioxide
SOAC	System Operations Advisory Committee
SPAMA	Snoqualmie Pass Adaptive Management Area
SR	State Route

TCF	Teanaway Community Forest
TCP	Traditional Cultural Properties
TDG	total dissolved gases
TMDL	total maximum daily load
TOC	total organic carbon
TWSA	total water supply available
USC	U.S. Code
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
VdB	vibration decibel
VMS	Visual Management Systems
VQO	Visual Quality Objective
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation
Yakama Nation	Confederated Tribes and Bands of the Yakama Nation
YRBWEP	Yakima River Basin Water Enhancement Project

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Introduction

The U.S. Department of the Interior Bureau of Reclamation and the Washington State Department of Ecology have prepared this Draft Environmental Impact Statement (DEIS) on the Cle Elum Pool Raise Project. Reclamation and Ecology are jointly leading and preparing this DEIS as a combined National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) document. The Yakama Nation, U.S. Forest Service (USFS), Bonneville Power Administration (BPA), and National Marine Fisheries Service (NMFS) are serving as cooperating agencies in preparation of the DEIS.

Proposed Action

Reclamation and Ecology propose to construct the Cle Elum Pool Raise Project within the congressional authorization given in Sections 1205 and 1206, Title XII, Yakima River Basin Water Enhancement Project (YRBWEP), of the Yavapai-Prescott Indian Tribe Water Rights Settlement Act of 1994 (Public Law 103-434, (108 Stat. 4526 U.S. Code)).[1] The authorization includes among other provisions:

- Modify the radial gates at Cle Elum Dam to provide an additional 14,600 acre-feet of storage capacity in Cle Elum Reservoir;
- Provide for shoreline protection of Cle Elum Reservoir; and
- Accomplish necessary environmental mitigation.

Reclamation proposes to use the additional stored water from the Cle Elum Pool Raise Project to improve instream flows consistent with the existing Title XII authorization (108 Stat. 4526 USC), or Reclamation would seek congressional authorization to redesignate the water as part of the Yakima Project Total Water Supply Available (TWSA) for both instream and out-of-stream uses.

The individual components of the proposed Cle Elum Pool Raise Project include:

- Modify the existing spillway radial gates to increase their height by 3 feet;
- Install erosion protection along portions of the shoreline;
- Raise the height of three existing earthen dikes north and east of the dam to provide additional freeboard;

[1] The complete text of the portions of Title XII that pertain directly to the Cle Elum Pool Raise Project is included in Appendix A.

- Modify facilities and roads at the Cle Elum River Campground and Wish Poosh boat ramp to avoid inundation; and
- Acquire real property interests where necessary to accommodate shoreline erosion protection and/or provide access for construction and maintenance.

Purpose and Need for the Action

The mission of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. To advance this mission within the Yakima Project, Reclamation prepared the *Yakima River Basin Integrated Water Resource Management Plan Programmatic EIS* (Integrated Plan PEIS) (Reclamation and Ecology, 2012) to develop a comprehensive program of water resource and habitat improvements focused on fish passage, aquatic habitat, and water supply. The Integrated Plan PEIS confirmed that the current water resources infrastructure, programs, and policies in the Yakima River basin are not capable of consistently meeting the demands for fish and wildlife, irrigation, and municipal water supply.

The Integrated Plan PEIS preferred alternative included a wide range of projects and actions that contribute to solving the basin's water supply and aquatic ecosystem needs and included the Cle Elum Pool Raise Project in the Structural and Operational Changes Element. The Integrated Plan PEIS Record of Decision (signed by Reclamation on July 9, 2013) identified the Cle Elum Pool Raise Project as one of the projects necessary to help address these needs in the upper Yakima River basin (Reclamation, 2013). The purpose of the Cle Elum Pool Raise Project is to meet these needs and fulfill the intent of the congressional authorization expressed in Title XII to increase the capacity of the reservoir and improve aquatic resources for fish habitat, rearing, and migration in the Cle Elum and upper Yakima Rivers. In addition, if Congress authorizes designation of the additional stored water to be used as part of TWSA consistent with the Integrated Plan Record of Decision, then the proposed action would also help meet demands for water supply.

Yakima Integrated Water Resource Management Plan

Reclamation and Ecology developed the Integrated Plan to meet the future water needs of the Yakima River basin. Based on over 30 years of studies in the basin, the agencies determined that current water supply in the basin does not meet instream or out-of-stream demand, including the aquatic demands for fish and wildlife and the out-of-stream needs of irrigation and municipal supply. In addition, climate change predictions indicate that the basin's snowpack will decrease, reducing spring and summer runoff.

The Integrated Plan addresses the need to restore ecological functions in the Yakima River system and to provide more reliable and sustainable water resources for the health of the riverine environment, as well as agriculture, municipal, and domestic water users. The Integrated Plan meets these needs while anticipating changing water uses and effects of predicted climate change on water resources in the basin.

Section 1.1 of the Integrated Plan PEIS presents the goals of the Integrated Plan as follows:

- Provide opportunities for comprehensive watershed protection, ecological restoration and enhancement addressing instream flows, aquatic habitat, and fish passage;
- Improve water supply reliability during drought years for agricultural and municipal needs;
- Develop a comprehensive approach for efficient management of water supplies for irrigated agriculture, municipal and domestic uses, and power generation;
- Improve the ability of water managers to respond and adapt to potential effects of climate change; and
- Contribute to the vitality of the regional economy and sustain the riverine environment.

To address these goals, the Integrated Plan includes seven elements: reservoir fish passage, structural and operational changes to existing facilities, surface water storage, groundwater storage, habitat and watershed protection and enhancement, enhanced water conservation, and market reallocation. The seven elements each include recommended projects to meet the goals. The structural and operational changes element includes the Cle Elum Pool Raise Project. The project would help meet the goal of enhancing instream flows, which would benefit fish habitat.

Alternatives

This DEIS evaluates the potential environmental impacts associated with the Cle Elum Pool Raise Project. The Cle Elum Pool Raise Project would modify the existing radial gates at the dam spillway to raise the level of the reservoir pool 3 feet, allowing up to an additional 14,600 acre-feet of water to be stored and released from Cle Elum Reservoir. The existing dam would remain as is.

In addition to the No Action Alternative, Reclamation and Ecology are evaluating four action alternatives for the Cle Elum Pool Raise Project. All four action alternatives would include the same approach to raising the reservoir pool level by modifying the existing spillway radial gates. The action alternatives also include raising the elevation of the right abutment of the dam and the dam’s saddle dikes to ensure adequate freeboard (a factor of safety usually expressed in feet above a flood level; in this case, it is a 3-foot zone of additional protection from wave erosion). As part of the project, Reclamation would protect USFS recreational facilities and access at Cle Elum River and Wish Poosh campgrounds and portions of Salmon La Sac Road.

Reclamation and Ecology are proposing the following two alternatives for allocating and using the additional stored water:

- For instream flow, as consistent with the Title XII legislation (108 Stat. 4526 USC) to improve conditions for fish; and

- For TWSA and out-of-stream uses as well as instream flows, requiring additional congressional authorization.

Reclamation and Ecology are also proposing the following two strategies for shoreline protection:

- Rock shoreline protection, consisting mostly of riprap with some plantings; and
- Hybrid shoreline protection, consisting of a range of treatments, including rock riprap and various bioengineered techniques.

Under both shoreline protection alternatives, Reclamation would continue its existing shoreline monitoring and maintenance program. Both forms of shoreline protection may require Reclamation to acquire private land or easements across private land from willing sellers.

Table ES-1 summarizes the components of the action alternatives.

Table ES-1. Summary of Action Alternative Components

	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Modify existing spillway radial gates to allow additional water to be stored.	Same for all action alternatives			
Increase the reservoir pool elevation by 3 feet, allowing up to an additional 14,600 acre-feet of water to be stored.	Same for all action alternatives			
Use of additional stored water.	Instream flows[1]		TWSA[2]	
Shoreline protection method.	Rock	Hybrid	Rock	Hybrid
Increase the freeboard at the saddle dikes and right bank abutment.	Same for all action alternatives			
Protect Federal property, such as USFS recreation facilities and access.	Same for all action alternatives			

[1]Consistent with 108 Stat. 4526 USC; [2]Requires additional congressional authorization

Alternative 1 – No Action Alternative

Alternative 1, the No Action Alternative, represents the most likely future conditions in the absence of implementing the proposed action. The No Action Alternative forms the baseline for comparison of potential impacts of the proposed action and the action alternatives. Under the No Action Alternative, Reclamation and Ecology would not implement the Cle Elum Pool Raise Project and additional water would not be stored in or released from the reservoir.

For purposes of this DEIS, Reclamation and Ecology consider the No Action Alternative to include the following projects and actions:

- Interim juvenile fish passage facility and operations currently in place at Cle Elum Dam, including reconstruction of the facility.
- Ongoing fish reintroduction at Cle Elum Reservoir and upper Cle Elum River.

Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection

Under Alternative 2, Reclamation would increase the Cle Elum Reservoir pool level by 3 feet, allowing an additional 14,600 acre-feet of water to be stored in the reservoir. Reclamation would allocate the additional stored water to meet instream flow needs as authorized in the Title XII legislation (108 Stat. 4526 USC). Reclamation would implement a rock shoreline protection strategy to reduce the potential for increased shoreline erosion.

Alternative 2 includes the following major components:

- Modify the existing Cle Elum Dam spillway radial gates to increase the reservoir pool elevation by 3 feet, resulting in inundation of some shoreline areas.
- Allocate the additional stored water for instream flows.
- Implement rock shoreline protection to stabilize shorelines adjacent to private property that would experience increased erosion from the higher reservoir level.
- Monitor shoreline conditions and implement appropriate shoreline protection measures where necessary in conjunction with Reclamation's existing annual shoreline monitoring assessment.
- Raise the elevation of three existing earthen saddle dikes north and east of the dam and raise the height of the right abutment of the dam to provide adequate freeboard.
- Provide shoreline protection for Federal property, including USFS recreation facilities and access at Wish Poosh and Cle Elum River Campgrounds.
- Provide erosion protection for portions of Salmon La Sac Road.
- Acquire land or easements, or both, from private landowners where necessary to accommodate shoreline protection.

Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection

Under Alternative 3, Reclamation and Ecology propose to use the additional stored water for instream flows as described for Alternative 2, but Reclamation would employ a hybrid shoreline protection strategy. Reclamation would protect shorelines using rock walls where needed combined with bioengineered shoreline protection, such as perched beaches, anchored logs, and other techniques. All other project components would be the same as described for Alternative 2.

Alternative 4 – Additional Stored Water Used for TWSA with Rock Shoreline Protection

Under Alternative 4, Reclamation and Ecology propose to use the additional stored water for

TWSA to provide water supply for irrigation districts or for instream flows. This alternative would require additional authorization from Congress. Reclamation would employ the same Rock Shoreline Protection strategy described for Alternative 2. All other project components would be the same as Alternative 2.

Alternative 5 – Additional Stored Water Used for TWSA with Hybrid Shoreline Protection

For Alternative 5, Reclamation and Ecology propose to use the additional stored water for TWSA as described for Alternative 4, but would employ Hybrid Shoreline Protection strategy as described for Alternative 3. All other project components would be the same as described for Alternative 2.

Summary of Environmental Consequences

Chapter 4 of the DEIS describes the environmental consequences of the alternatives, including the No Action Alternative. The Cle Elum Pool Raise Project would provide additional stored water to benefit streamflows and fish or water supply. Depending on how Reclamation chooses to use the additional stored water, Alternatives 2 and 3 would provide either a 20 percent increase in winter streamflows in the Cle Elum River or maintain higher reservoir pool levels and provide better passage conditions for outmigrating salmon for the proposed Cle Elum Fish Passage project. Both water use scenarios would benefit fish, including federally listed bull trout and Middle Columbia River (MCR) steelhead, by either expanding overwintering habitat for salmonids or improving fish passage conditions. Alternatives 4 and 5 would increase water supply in drought years by up to 1.6 percent. This would improve conditions for proratable water rights users, but provide fewer benefits to fish.

Under all action alternatives, the additional stored water would inundate approximately 46 additional acres around the reservoir. The additional inundation would occur for about 40 days in June and July in years when water is available to fill the reservoir. Some losses to vegetation would occur and areas of coniferous forest would likely be replaced by more flood-tolerant species such as deciduous tree/shrub communities. Reclamation expects impacts to vegetation and wildlife habitat to be minor because of the limited duration and scale of the inundation.

The increased inundation would increase erosion along some of the shoreline. All action alternatives include shoreline protection to reduce this erosion and to protect private property and Federal facilities. However, Reclamation expects approximately 2 to 5 acres of area could erode in addition to the current levels of erosion. Reclamation would continue its annual shoreline survey program to identify erosion problems and approaches to address the problems. All action alternatives would protect recreational facilities along the reservoir, so Reclamation anticipates no long-term impacts to recreation.

Under all action alternatives, modification of the radial spillway gates would alter the historic Cle Elum Dam and the increased reservoir pool would impact archaeological resources along the shoreline. Reclamation would develop and implement a treatment plan for cultural resources directly affected by the project and a Cultural Resource Management Plan to address ongoing and future operational and land management implications of the project.

Most impacts associated with the Cle Elum Pool Raise Project would be temporary construction impacts such as increased noise, dust, and traffic. These construction activities would also temporarily affect visual quality and the recreational experience around the reservoir. Construction would require clearing and grading of some areas. Reclamation would restore most of the disturbed areas with native vegetation following construction. Reclamation expects all construction impacts to be minor. Construction would occur in phases over a 5 year period, reducing the number of truck trips, vehicle emissions, and area disturbed during any one construction year. Reclamation would conduct all shoreline construction activities above the water line while the reservoir is drawn down, so no impacts to fish would occur.

Table ES-2 provides a summary of impacts and benefits associated with the No Action and four action alternatives.

Table ES-2. Summary Comparison of Impacts

<table>
<tr><th colspan="4">Surface Water</th></tr>
<tr><th>Alternative</th><th>Spillway Radial Gate Modifications to Raise the Reservoir Level</th><th>Use of Additional Stored Water</th><th>Shoreline Protection</th></tr>
<tr><td>Alternative 1 – No Action</td><td colspan="3">No opportunity to improve instream flows or improve water supply for TWSA. Water supplies for proratable irrigation districts would fall below 70 percent of entitlements more frequently. Reservoir would take longer to fill during dry years.</td></tr>
<tr><td>Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection</td><td>• Construction of the spillway gates would occur when the reservoir is drawn down near the end of the irrigation season and would not affect operation of the spillway gates or water storage and water releases from the dam.
• Reservoir storage capacity increase of 3.3 percent.
• Inundation of additional 46 acres of shoreline during pool raise with small increases in reservoir fluctuations.
• Slight reduction of flow from the reservoir in spring when additional water is being stored.
• Reservoir will fill above existing full pool level at elevation 2,240 in 72 percent of years and fill to elevation 2,243 in 52 percent of years.
• Reservoir will stay above existing full pool for an average of 39 days (June 2 – July 10) during years sufficient runoff is available to fill the reservoir.</td><td>• Construction would not affect reservoir operations because it would occur when the reservoir is drawn down.
• Additional stored water would provide instream flows of approximately 36 cfs for 6 months (20 percent increase in winter flows).
• Increased instream flows would improve overwintering fish habitat.
• Alternative use of water would maintain higher pool levels all year and provide better passage conditions for outmigrating smolts for proposed Cle Elum Fish Passage project.</td><td>• Construction would not affect reservoir storage or releases.
• No impacts to long-term reservoir operation.</td></tr>
</table>

Surface Water			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	• Volume stored and surface area would be the same as Alternative 2. • Additional water stored in the reservoir would be retained until needed for water supply Construction would not affect reservoir storage or releases. • Reservoir will fill above existing full pool level at elevation 2,240 in 71 percent of years and fill to elevation 2,243 in 53 percent of years. • Reservoir will stay above existing full pool for up to 2 days longer than Alternative 2	• Increased water supply in drought years of up to 1.6 percent compared to baseline conditions.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 2.

<table>
<tr><th colspan="4">Earth</th></tr>
<tr><th>Alternative</th><th>Spillway Radial Gate Modifications to Raise the Reservoir Level</th><th>Use of Additional Stored Water</th><th>Shoreline Protection</th></tr>
<tr><td>Alternative 1 – No Action</td><td colspan="3">Shoreline erosion would continue as it currently occurs. The west shoreline could have the greatest potential impact; the east shoreline includes some shoreline protection. No construction-related impacts would occur.</td></tr>
<tr><td>Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection</td><td>• Minimal construction-related impacts associated with the radial gate modification.
• Increases in shoreline erosion where no shoreline protection is proposed.
• 8,300 feet (17 percent) of the west shoreline would be susceptible to erosion.
• 2 to 5 acres of area could be eroded with 17,000 to 34,000 CY of material deposited in the reservoir.
• Impacts are considered minor compared to the size of the reservoir.</td><td>• No additional erosion would occur.</td><td>• Short-term increase in erosion during construction.
• Approximately
  • 22 acres of clearing
  • 195,000 CY of excavation
  • 55,000 CY of fill
  • 45,00 CY of riprap
  • 15 acres revegetated
  • 5 mi of temporary access roads
• Long-term protection from erosion.</td></tr>
</table>

Earth			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**

Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	• Short-term increase in erosion during construction.
			• Approximately
			  ◦ 30 acres of clearing
			  ◦ 195,000 CY of excavation
			  ◦ 215,000 CY of fill
			  ◦ 6,100 CY of riprap
			  ◦ 12,000 CY of large rock
			  ◦ 20 acres revegetated
			  ◦ 5 mi of temporary access roads
			• Hybrid shoreline protection could keep more shoreline bank slopes exposed to wave erosion than rock shoreline protection and would therefore result in more erosion in the first years after construction
			• Long-term protection from erosion.

Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Surface Water Quality			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Construction-related water quality impacts will not occur. Existing water quality trends will continue. Criteria that currently do not meet water quality standards, including seasonal temperature exceedances, would continue and potentially increase with climate change conditions.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• No construction impacts would occur because construction will occur in dry conditions when the reservoir is drawn down. • Nutrient and sediment loads could increase by a small amount associated with erosion, and short term localized exceedances of water quality standard could occur. • Temperature increases are not expected to be measureable. • Long-term nutrient and dissolved oxygen levels, and temperature would remain similar to existing conditions resulting in the reservoir remaining oligotrophic.	• No construction impacts would occur. • Both decreases and increases to streamflows in the Cle Elum and Yakima rivers would occur. • Decreases in Yakima River instream flows would occur in spring, when flows are highest; water quality impacts would not occur. • Discharges to Cle Elum River would raise water temperatures no more than 0.3° C, which would meet State Water Quality Standards.	• Short-term suspended sediment and turbidity increases after shoreline protection is constructed. Some exceedances may exceed state standard of 5 NTU over background. Exceedances would be localized in construction area and dissipate and settle within the water column. • Long-term turbidity or suspended sediment impacts are not expected.

Surface Water Quality			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	• Impacts would be the same as Alternative 2.		• Short-Term suspended sediment and turbidity increases after shoreline protection is constructed. Some exceedances may exceed state standard of 5 NTU over background. • Reservoir may experience an increase in suspended sediment by 1.5 to 3.0 mg/l for a period of 5 years following the 5-year construction period associated with fine sediments in the fill material. Exceedances would be localized and dissipate and settle within the water column. • Minor to no turbidity impacts expected over the first decade of operation. Reservoir may experience an increase in suspended sediment by 0.25 to 0.5 mg/l after construction areas stabilize.
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Impacts would be the same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Impacts would be the same as Alternative 3.		

Groundwater			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	There would be no construction impacts to groundwater, because no construction would occur. Groundwater conditions would continue consistent with baseline conditions.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Potential construction impacts associated with spills or leaks, dewatering not required. • Temporary and cyclical groundwater level responses to the increased pool level could occur. Maximum fluctuation of 3 feet is expected. • No anticipated negative effects on local aquifers, wells, or on-site septic systems (OSS) due to depth of wells and separation of inundated areas from OSS.	• Possible small temporary and cyclical fluctuations in groundwater levels adjacent to downstream rivers, but fluctuations would be within the range of normal seasonal variability.	• Spills or leaking construction equipment could affect groundwater quality. • No long-term impacts to groundwater are expected.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Fish			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No changes in reservoir levels and no increases in instream flows downstream of Cle Elum Dam would result in continued low fish survival and productivity in the Cle Elum River. Kokanee and lake trout populations would gradually decline. Existing trends of fish survival and productivity could continue and/or worsen with climate change or other changed conditions in the basin.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Construction impacts would not occur because construction would occur when the reservoir is drawn down. • Increased erosion in newly exposed shoreline areas could increase turbidity, impacts not expected to be significant. • Small impacts from changes to riparian vegetation, no lasting impacts are expected. • Minor increases in new littoral habitats and shifts in spawning habitats. Species using littoral habitats including mountain whitefish, cutthroat, brown, and rainbow trout and others would benefit. • Risk of stranding when the reservoir level recedes is similar to No Action alternative.	• Increased flows would expand overwintering habitat for resident and anadromous salmonids in the Cle Elum River. • Increased flows would incrementally bring Cle Elum River closer to unregulated flows, improving habitat conditions for native fish and ecosystems. • Additional water carried over to following year would improve efficiency of fish passage for out-migrating juvenile salmon. • Lower flows in spring would occur when high flows from snowmelt fill the reservoir above 2,240 feet. Impacts to fish in Cle Elum River not expected because current flow regime would continue.	• No construction impacts because construction would occur in the dry period. • Potential minor negative impacts to fish by interrupting natural hydrogeomorphic processes. • Riprap may increase the diversity and abundance of invertebrate prey and fish habitat use. Benefits would be minor because of the limited number of days when reservoir elevation is increased.

Fish			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	• Similar to Alternative 2, but less potential to negatively affect fish due to use of natural habitat-forming processes for shoreline protection.
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	• More water could be used for irrigation rather than instream flows, reducing benefits to fish. • Timing of flow releases would not occur at a time that would benefit spawning or migration in Yakima and Cle Elum rivers.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 3.

Vegetation and Wetlands			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Minimal construction impacts would occur, associated with reconstruction of fish passage facilities. Ongoing projects would not affect vegetation or wetlands. Existing conditions and trends would continue.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Increased reservoir pool would seasonally inundate about 2 acres of wetland, including 1 acre of emergent wetland vegetation. • No significant impacts anticipated because wetland vegetation communities around the reservoir are already adapted to seasonal inundation. • Small shifts in wetland vegetation composition could occur, but would not result in substantial loss of wetland acreage. • 30 acres of coniferous forest, 11 acres of deciduous tree/shrub, and 0.1 acres of herbaceous vegetation would be inundated. Some coniferous trees could succumb to increased flooding, however, they could become snags or large debris, with habitat value. • Species with habitat in inundated areas would likely adapt, some loss of USFS Survey and Manage plant species may occur.	Proposed flows would not affect wetland or riparian vegetation communities downstream of the Cle Elum Dam. Temporarily reduced flows unlikely to substantially reduce hydrologic inputs to wetland and riparian communities.	• Rock shoreline protection activities would permanently impact approximately 22 acres of shoreline, small portions of which could include patches of wetlands. Affected wetland would comprise a very small percentage of the more than 140 acres of palustrine wetland mapped along the shoreline. • Shoreline protection measures could cause small indirect, long-term impacts due to modification of vegetation and wetlands. Not expected to be a significant long-term impact, representing a less than 1 percent of total acreage in the watershed. • USFS Survey and Manage plant species are not expected to be affected. • No long-term impacts expected once construction is complete.

Vegetation and Wetlands			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	• Hybrid shoreline protection would permanently impact approximately 30 acres of shoreline, small portions of which could include patches of wetlands. Affected wetland impacts would comprise a very small percentage of the more than 140 acres of palustrine wetland mapped along the shoreline. • Shoreline protection measures could cause small indirect, long-term impacts due to modification of vegetation and wetlands. This is not expected to be a significant long-term impact, representing less than 1 percent of total acreage in the watershed. • USFS Survey and Manage Species are not expected to be affected. • No long-term impacts expected once construction is complete. Vegetation is likely to reestablish on some types of hybrid shoreline protection.
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.

Vegetation and Wetlands			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 3.

Wildlife			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No short-term disturbance to wildlife would occur. Current trends and patterns of wildlife habitation would continue.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Construction of spillway gate modifications would case short-term disturbance in the vicinity of the dam, causing wildlife using the open water habitats to relocate. • Approximately 46 acres of terrestrial habitat along the shoreline would be flooded for about 40 days in June and early July during drought years. Impacts not expected to be significant because this represents only a small percentage increase in inundated area, and inundated areas currently provide limited habitat. • Inundation could impact wildlife habitat where foraging habitat or nesting sites, but impacts would be minor because of the availability of similar habitat in the reservoir area.	Impacts to wildlife would not occur because changes to instream flow levels would occur during the winter months, outside of the breeding season.	• Minimal short-term disturbance from construction would occur, expected to be minor. • Long-term impacts to wildlife are limited by the small scale of shoreline protection projects relative to total shoreline available, and because most projects would occur in previously disturbed areas.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		

Wildlife			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Threatened and Endangered Species			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No Action alternative would continue current conditions, which could result in detrimental long term impacts to listed species in the Cle Elum and upper Yakima rivers. There would be no opportunity to increase instream flows for bull trout and MCR steelhead, which would continue trends of degraded spawning and migration habitat.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Construction of spillway gate modifications would cause short-term disturbance in the vicinity of the dam, but no listed species are likely to be affected in this developed area. • Positive temporary increases in bull trout productivity could occur associated with inundation. Effects would be minor. • Negative effects to bull trout could occur associated with increased turbidity. Effects would be minor. • Northern spotted owl and Marbled Murrelet are unlikely to be found in the immediate vicinity of the reservoir, and would be unaffected.	• Increased instream flows would benefit bull trout and MCR steelhead downstream of Cle Elum Dam. • Higher winter flows would improve habitat connectivity and promote access to side channel or off channel habitats for bull trout and would improve habitat functions for MCR steelhead	• Construction could cause short-term disturbance to bull trout and northern spotted owl if present in the work area vicinity. • Noise during construction may elicit disturbance behaviors in spotted owls or marbled murrelets that are in the area, however, their presence is unlikely. • No long-term impacts are anticipated.

Threatened and Endangered Species			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	• No benefit to bull trout and MCR steelhead in the lower Cle Elum or upper Yakima rivers if water is used for irrigation. • Use of water for TWSA would not impact other listed species.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 2.

Visual Quality			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Visual quality conditions would remain the same as they are currently.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Localized, adverse impacts during construction activities. • Localized impacts from reservoir pool changes especially in first few years. Increased inundation would be most noticeable in the upper reservoir and along inundated narrow shoreline areas. • No impact to overall, long-term visual character of the area because the overall appearance of the reservoir would be the same as current conditions	• Visual quality would not be impacted.	• Localized impacts during construction activities, approximately 2 months. • Completed shoreline protection would be a long-term visual change on the landscape, but would minimally contrast with existing features.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	• Similar to Alternative 2, hybrid shoreline protection would minimally contrast with existing shoreline.
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	• No impact.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 3.

Air Quality			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No changes from the existing air quality conditions would occur.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	Minor emissions from construction would occur, but they would not violate any air quality standards or result in any air quality impacts.		
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Climate Change			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Under the No Action alternative there would be no increase of greenhouse gas emissions. Climate change could affect water related resources in the overall Yakima River basin. Additional stored water from the Cle Elum Pool Raise Project would not be available to help offset the impacts of climate change.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Minor increase of greenhouse gas emissions during construction, but well below the significance threshold established by Ecology. • Alternative 2 would have a small, positive impact on the ability of fish to adapt to changing climate conditions by increasing streamflows.		
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	• Same as Alternatives 2 and 3. • Use of additional stored water for TWSA would provide Reclamation with greater flexibility in responding to water shortages for proratable water users that are a result of climate change.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 4.		

Noise and Vibration			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	There would be no construction related noise and vibration impacts generated by the No Action alternative.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Minor, temporary increases in construction noise and vibration during daytime hours. • No long-term noise or vibration impacts. • No violation of noise standards.		
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Recreation			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No changes to recreational facilities or opportunities would occur.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Higher water levels would inundate some recreational facilities at Cle Elum River and Wish Poosh campgrounds. • Access roads at Wish Poosh campground would be inundated and informal boat launch areas along the east bank of the Cle Elum River would be inundated. • Shoreline protection for the inundated areas would avoid disrupting use of these facilities. • Dispersed camping areas would be inundated, and dispersed camping activities could relocate to other areas not currently affected.	• A small increase in instream flows in the Cle Elum and Yakima rivers would not affect recreation.	• Construction could cause minor, temporary disruptions to recreation from August through October. • Speelyi Beach would be closed for a period of less than 2 months. • Shoreline protection measures at Federal recreation facilities would protect recreation uses and access. • Construction would occur after Labor Day when camping use is lower. • Access on Salmon La Sac Road would be reduced to one lane but remain open during construction. • Affected recreational facilities would be replaced or improved following completion of shoreline protection measures.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		

Recreation			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Land and Shoreline Use			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Land uses and practices will continue as they currently occur.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Inundation of an additional approximately 43 acres of federally owned lands and approximately 3 acres of privately owned property. Structures would not be affected. • Increased inundation would not change the ability of property owners to use the land because on a small portion of the shoreline would be inundated for up to 40 days during drought years. • Additional inundation of the Cle Elum River where it enters the reservoir could affect designation of this portion of the river as a Wild and Scenic River.	• Variations in instream flows would not affect land use.	• Temporary disruption of private residential properties during construction. • Acquisition of approximately 20 acres of land in narrow strips adjacent to the shoreline, which would not render private properties unsuitable for existing uses. • Reclamation would acquire land only from willing sellers.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		

Land and Shoreline Use			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	• Small improvement of reliability of irrigation water supply, which could alter the type of crops planted. • No increase in the amount of irrigated land would occur.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 2.

Utilities			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No changes or impacts to utilities would occur.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	No conflicts with existing utilities would occur. Impacts to wells and other utilities at Wish Poosh Campground would be addressed through shoreline protection measures.		
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Transportation			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Traffic impacts would be limited to increases associated with reconstruction of fish passage facilities, which are expected to be minor.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Increases in truck traffic during modification of the spillway gates, expected to be a minimal impact to local roads. • Shoreline protection measures will avoid impacts from inundation to Salmon La Sac Road. • No other impacts anticipated.		• Less than 5 percent increase in truck traffic along the lowest traveled sections of SR-903 for construction traffic. • Closure of a portion of Lake Cabins Road for less than 2 weeks, but no access would be disrupted as alternate routes are available. • No other traffic disruptions anticipated.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2. Increases of construction-related truck traffic along SR-903 or Lake Cle Elum Dam Road would be slightly higher, but still not representing a significant impact.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Cultural Resources			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No impact beyond those occurring due to current operations.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Adverse effect on the character-defining features of the dam. • Inundation would impact one identified archaeological site.	No cultural resources would be affected by the use of the additional stored water.	• No impacts identified based on current surveys. • Surveys of all construction areas will be done prior to construction.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Indian Sacred Sites			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No impact to Indian sacred sites is anticipated to occur.		
Alternative 2 - 5	No impacts anticipated under any of the action alternatives.		

Indian Trust Assets			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No impact.		
Alternative 2 -5	No impacts anticipated under any of the action alternatives.		

Socioeconomics			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No direct impacts would occur. No construction –related costs, but no direct increases in local employment associated with new construction jobs and support services. Current economic trends would continue, but increased uncertainty about the availability of proratable supplies for irrigation could result in a shirt toward crops with lower irrigation needs, and lower economic value.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Construction expenditures would fuel minor economic increases in the surrounding 4 county area over a 5-year period. • 27 jobs supported throughout the state.	• Unquantified increase in recreational or commercial fishing activity.	• Construction expenditures would result in minor economic increases in the surrounding 4-county area over a 5-year period. • 115 jobs supported.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	• Statewide economic increases would be similar in magnitude to Alternative 2
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	• Increased agricultural production and market value during severe drought years relative to the No Action Alternative.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 3.

Environmental Justice			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No impact.		
Alternatives 2 -5	No disproportionate impact to environmental justice populations under any of the action alternatives.		

Cumulative Impacts

Cumulative impacts are the effects that may result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). "Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Section 4.24 of this DEIS evaluates cumulative impacts. The various environmental element sections in Chapters 3 and 4 of the DEIS also examine many of the cumulative impacts. Those analyses discuss the effects of past processes and trends that have cumulatively influenced or led to the resource conditions that exist today.

In addition, Reclamation considers four projects to be reasonably foreseeable future projects—the Cle Elum Fish Passage Project, the Kachess Drought Relief Pumping Plant (KDRPP) and Keechelus to Kachess Conveyance (KKC) Projects, and ongoing Interstate-90 (I-90) construction. The Cle Elum Pool Raise Project would provide benefits to fish and streamflow conditions that would be beneficial at a basin-wide level when implemented with other proposed projects. The Cle Elum Pool Raise Project construction could add cumulatively to construction impacts in the area such as traffic congestion, dust, and noise. It could also cumulatively contribute to regional trends toward reduced habitat, impacts to historic and cultural resources, and construction impacts in the region. These impacts would be minor and limited in scale; therefore, the project is not likely to contribute to significant cumulative impacts of foreseeable future projects.

Environmental Commitments

Environmental commitments are measures or practices adopted by a project proponent to reduce or avoid adverse effects that could result from project operations. Chapter 4 describes specific mitigation measures for project impacts on each resource. The following list summarizes major environmental commitments for the Cle Elum Pool Raise Project. Reclamation and Ecology share the responsibility to ensure obligations to protect natural resources are fulfilled.

- Construct all shoreline protection measures above the water line while the reservoir is drawn down, to avoid in-water work.
- Complete all planned shoreline protection measures prior to raising the level of the reservoir.
- Continue the existing shoreline inventory to identify erosion problems and appropriate control measures.
- Obtain all applicable Federal, State, and local permits.
- Coordinate with Ecology's water quality staff to ensure compliance with the State antidegradation policy.

- Install shoreline protection in locations on the west side of Cle Elum Reservoir to mitigate for erosion impacts.
- Install guardrails and other mitigation measures in specific locations to prevent unauthorized vehicle and dispersed camping access of Cle Elum River and Reservoir.
- Prior to construction, conduct cultural resource studies of all areas that would be disturbed by construction.
- Develop a treatment plan for all cultural resources directly impacted by the project.
- Develop a Cultural Resource Management Plan to address ongoing and future operational and land management implications of the proposed project.
- Prior to construction, conduct wetland surveys using current wetland delineation methodology. Design shoreline protection measures to avoid wetland impacts. If wetland impacts occur, comply with mitigation measures established in permit conditions to ensure no net loss.
- Prior to construction, coordinate with USFS to determine the presence of any Sensitive or Survey and Manage species and take steps to minimize impacts to those species.
- Install guardrails and other mitigation measures in specific locations to prevent unauthorized vehicle and dispersed camping access of Cle Elum River and Reservoir.
- Prior to construction, survey utilities in construction areas and take appropriate measures to minimize conflicts with any identified utilities.
- Prior to raising the pool level, identify any potentially affected on-site septic systems (OSS) to establish baseline conditions.
- Develop mitigation strategies for any OSS that would become noncompliant as a result of the increased reservoir pool.
- Implement current best management practices (BMPs) when appropriate to enhance resource protection and avoid additional potential effects to surface and groundwater quality, earth resources, fish, wildlife, and their habitats.

Public Involvement

Reclamation and Ecology initiated the public scoping process for this DEIS in October 2013. Reclamation and Ecology held two public scoping meetings in Yakima, Washington on November 20, 2013 and two scoping meetings in Cle Elum, Washington on November 21, 2013. At the meetings, Reclamation described the Proposed Action and gave attendees the opportunity to comment on the project, the scope of the EIS, the EIS process, and resources evaluated in the EIS.

The scoping period began October 30, 2013, and concluded December 16, 2013. During this period 17 comment documents and telephone calls were received. The comments covered a wide range of environmental effects. The major concerns were with surface water and the use of the additional stored water and impacts to fish, vegetation and wetlands, wildlife, threatened and endangered species, recreation, land use, transportation; socioeconomics; and cumulative effects.

Reclamation and Ecology prepared a Scoping Summary Report that summarizes the comments received (Reclamation and Ecology, 2014a). Reclamation will provide the report to readers upon request, or a reader can access the report from the Yakima River Basin Water Enhancement Project (YRBWEP) 2011 Integrated Plan website: http://www.usbr.gov/pn/programs/yrbwep/2011integratedplan/index.html.

Consultation and Coordination

Reclamation has initiated consultation with the U.S. Fish and Wildlife Service (Service) and NMFS under the Endangered Species Act (ESA). Reclamation has completed consultation with the Service under the Fish and Wildlife Coordination Act. Reclamation has initiated consultation with the Washington Department of Archaeology and Historic Preservation under Section 106 of the National Historic Preservation Act. Government-to-Government consultation with the Confederated Tribes of the Yakama Nation, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and the Confederated Tribes of the Colville Reservation is ongoing. Reclamation has contacted the Bureau of Indian Affairs (BIA) Yakima Office and the BIA Colville Tribes Office regarding Indian Trust Assets or trust lands in the project area.

Reclamation and Ecology are committed to ongoing coordination with the Tribes and resource agencies. Reclamation will complete ESA coordination with the Service and NMFS. Reclamation will complete cultural resource surveys and will continue coordination with the DAHP on impacts to cultural resources. Reclamation and Ecology will continue to consult with the Yakama Nation, CTUIR, and Colville Tribes.

What Comes Next?

Public Review of the DEIS

Reclamation and Ecology announced the release of this DEIS on their websites and in local and regional newspapers. These announcements included the timeframe for public review and dates, times, and locations of public meetings. The public will have 60 days to review and provide comments on the DEIS.

Two public hearings will be held during the public review period, as described on the Fact Sheet. Participants will be encouraged to provide comments through several mechanisms, including written comment cards, letters, e-mails, and oral comments at the meeting.

Reclamation and Ecology will give equal consideration to all comments received on the DEIS, regardless of how submitted, and will post the comments on the Cle Elum Pool Raise Project website at: http://www.usbr.gov/pn/programs/eis/cleelumraise/index.html.

Preparation of the Final EIS

Reclamation and Ecology will carefully consider all comments received on the DEIS and will consider adjusting alternatives, supplementing or improving the analysis, or making factual corrections in response to substantive comments. Reclamation and Ecology expect to complete the Final EIS in spring 2015.

Record of Decision

Reclamation will conclude the NEPA process by issuing a Record of Decision no sooner than 30 days after the FEIS is completed. The Record of Decision will identify Reclamation's and Ecology's decision on the proposed action, and will describe the basis for that decision.

Chapter 1

INTRODUCTION AND BACKGROUND

CHAPTER 1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

The U.S. Department of the Interior Bureau of Reclamation and the Washington State Department of Ecology have prepared this Draft Environmental Impact Statement (DEIS) on the Cle Elum Pool Raise Project. Reclamation and Ecology are joint leads in preparing this DEIS as a combined National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) DEIS. The Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), U.S. Forest Service (USFS), Bonneville Power Administration (BPA), and National Marine Fisheries Service (NMFS) are serving as cooperating agencies in preparing the DEIS in accordance with 40 Code of Federal Regulations (CFR) Section 1501.6.

1.2 Proposed Action

Reclamation and Ecology propose to construct the Cle Elum Pool Raise Project within the congressional authorization given in Sections 1205 and 1206, Title XII, Yakima River Basin Water Enhancement Project (YRBWEP), of the Yavapai-Prescott Indian Tribe Water Rights Settlement Act of 1994 (Public Law 103-434, (108 Stat. 4526 U.S. Code)). The sections applicable to the Cle Elum Pool Raise Project are included in the text box on the following page. Appendix A contains the complete text related to YRBWEP. The authorization includes among other provisions:

- Modify the radial gates at Cle Elum Dam to provide an additional 14,600 acre-feet of storage capacity in Cle Elum Reservoir;
- Provide for shoreline protection of Cle Elum Reservoir;
- Accomplish necessary environmental mitigation; and
- Use stored water for instream flows.

Reclamation proposes to use the additional stored water from the Cle Elum Pool Raise Project to improve instream flows consistent with the existing Title XII authorization, or Reclamation would seek congressional authorization to redesignate the water as part of the Yakima Project Total Water Supply Available (TWSA) for both instream and out-of-stream uses.

The individual components of the proposed Cle Elum Pool Raise Project include the following:

- Modify the spillway radial gates to increase their height by 3 feet;
- Install erosion protection along portions of the shoreline;

- Raise the height of three existing earthen dikes north and east of the dam to provide additional freeboard;
- Modify facilities and roads at the Cle Elum River Campground and Wish Poosh boat ramp to avoid inundation; and
- Acquire real property interests where necessary to accommodate shoreline erosion protection or provide access for construction and maintenance, or both.

> Excerpt from: Yakima River Basin Water Enhancement Project, of the Yavapai-Prescott Indian Tribe Water Rights Settlement Act of 1994 (Public Law 103-434) pertaining to Cle Elum Pool Raise Project.
>
> Section 1205 states:
>
> "(b) WATER FROM LAKE CLE ELUM- Water accruing from the development of additional storage capacity at Lake Cle Elum, made available pursuant to the modifications authorized in section 1206(a), shall not be part of the Yakima River basin's water supply as provided in subsection (a)(1). Water obtained from such development is exclusively dedicated to instream flows for use by the Yakima Project Superintendent as flushing flows or as otherwise advised by the System Operations Advisory Committee. Water may be carried over from year-to-year in the additional capacity to the extent that there is space available. Releases may be made from other Yakima Project storage facilities to most effectively utilize this additional water, except that water deliveries to holders of existing water rights shall not be impaired."
>
> Section 1206 states:
>
> "(a) MODIFICATIONS AND IMPROVEMENTS- There is hereby authorized to be appropriated to the Secretary--
> (1) at September 1990 prices, plus or minus such amounts as may be justified by reason of ordinary fluctuation of applicable indexes, $2,934,000 to--
> (A) modify the radial gates at Cle Elum Dam to provide an additional 14,600 acre-feet of storage capacity in Lake Cle Elum,
> (B) provide for shoreline protection of Lake Cle Elum, and
> (C) construct juvenile fish passage facilities at Cle Elum Dam, plus
> (2) such additional amounts as may be necessary which may be required for environmental mitigation.
> (b) OPERATION AND MAINTENANCE APPROPRIATIONS- There is hereby authorized to be appropriated to the Secretary such sums as may be necessary for that portion of the operation and maintenance of Cle Elum Dam determined by the Secretary to be a Federal responsibility."

1.3 Purpose and Need for the Action

The mission of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. To advance this mission within the Yakima Project, Reclamation prepared the *Yakima River Basin Integrated Water Resource Management Plan Programmatic EIS* (Integrated Plan PEIS) (Reclamation and Ecology, 2012) to develop a comprehensive program of water resource and habitat improvements focused on fish passage, aquatic habitat, and water supply. The Integrated Plan PEIS confirmed that the current water resources infrastructure, programs, and policies in the Yakima River basin are not capable of consistently meeting the demands for fish and wildlife, irrigation, and municipal water supply (Reclamation and Ecology, 2012).

The Integrated Plan PEIS preferred alternative included a wide range of projects and actions that contribute to solving the basin's water supply and aquatic ecosystem needs. The Cle Elum Pool Raise Project is included in the Structural and Operational Changes Element of the preferred alternative. The Integrated Plan PEIS Record of Decision (signed by Reclamation on July 9, 2013) identified the Cle Elum Pool Raise Project as one of the projects necessary to help address these needs in the upper Yakima River basin (Reclamation, 2013). The purpose of the Cle Elum Pool Raise Project is to help meet these needs and fulfill the intent of the congressional authorization expressed in Title XII, to increase the capacity of the reservoir and improve aquatic resources for fish habitat, rearing, and migration in the Cle Elum and upper Yakima Rivers. In addition, if Congress authorizes designation of the additional stored water to be used as part of TWSA consistent with the Integrated Plan Record of Decision, then the proposed action would also help meet demands for water supply.

1.4 Cle Elum Reservoir Background and History

1.4.1 Location and Setting

Cle Elum Dam is located in the upper Yakima River basin in Kittitas County, 8 miles northwest of the City of Cle Elum, Washington (Figure 1-1).[1] Reclamation completed the earthfill dam in 1933, which expanded the existing natural lake to a 4,800-acre reservoir. Reclamation facilities include Cle Elum Dam and three small saddle dikes. The dam has a maximum structural height of 165 feet and a crest length of 1,800 feet including the main dike. The earthfill dam forms a reservoir with an active capacity of 436,900 acre-feet. Cle Elum Reservoir has the largest storage capacity and average annual runoff of all the reservoirs in the Yakima River basin.

The dam is equipped with a gated spillway (sill elevation 2,223)[2] with a capacity of 40,000 cubic feet per second (cfs) at a reservoir elevation of 2,240 feet. The spillway is a dam safety feature consisting of five radial gates and a concrete-lined open channel in the right abutment of the dam. Reclamation designed the spillway for emergency use when the capacity of the dam outlet works is not sufficient to release water from a full reservoir. When releasing floodwaters from a nearly full reservoir, Reclamation typically sets the gates to have equal openings to prevent overtopping of any one gate. Reclamation raises (opens) the gates

[1] The Yakama Nation disagrees with the depiction of the southwest boundary of the Yakama Nation Reservation.

[2] Elevations at Cle Elum Reservoir are based on Reclamation's local datum established when the dam was constructed. Elevations do not correspond to standard datum. The Cle Elum datum is approximately 5.4 feet below the NAVD88 datum.

independently using overhead cable hoists. The curved gates open by rotating upward around two anchored pivots. Reclamation tests each gate and hoist twice annually for safety.

Reclamation leaves one spillway gate partially open for a portion of the year to supply water to the fish passage flume at the temporary juvenile fish passage facility at the dam. Reclamation handles all other routine releases from the reservoir through the dam outlet works. The outlet works consist of a gated control tower and a reinforced concrete pipe through the right abutment of the dam. Water released from the dam flows into the Cle Elum River, which flows into the Yakima River 8 miles downstream from the dam. Water released from Cle Elum Reservoir supplies the Kennewick, Kittitas, Roza, Sunnyside, and Wapato irrigation divisions in the Yakima Project (Figure 1-1). Cle Elum Reservoir is the main source of water to meet the large irrigation demands in the lower Yakima River basin.

1.4.2 Yakima Project

Reclamation operates Cle Elum Reservoir as part of the Yakima Project. Congress authorized the Yakima Project in 1905, directing Reclamation to develop irrigation facilities in the Yakima River basin. The Yakima Project includes five major storage reservoirs—Keechelus, Kachess, Cle Elum, Bumping Lake, and Rimrock (Figure 1-1). Water is stored and released in these reservoirs to meet irrigation demands, flood control needs, and instream flow requirements. Reclamation operates the reservoirs as a pooled system with no reservoir or storage space designated for a specific area.

A complex group of Federal and State statutes and regulations, as well as court decisions and orders, regulate water management in the Yakima River basin. Sections 1.6.3 and 1.6.4 of the Integrated Plan PEIS (Reclamation and Ecology, 2012) describe regulations and legal decisions related to water management in the basin. The following paragraphs describe the key issues relevant to understanding the Cle Elum Pool Raise Project.

Entitlements, or water rights, in the Yakima River basin are divided into two classes: "nonproratable" and "proratable." Nonproratable entitlements are “senior” and generally are held by water users who were irrigating prior to construction of the Yakima Project reservoirs. Water users with nonproratable water rights receive water first. All other Yakima Project water rights are proratable, with water rights that are junior to the senior nonproratable water rights. These junior water right holders share equally any water shortages.

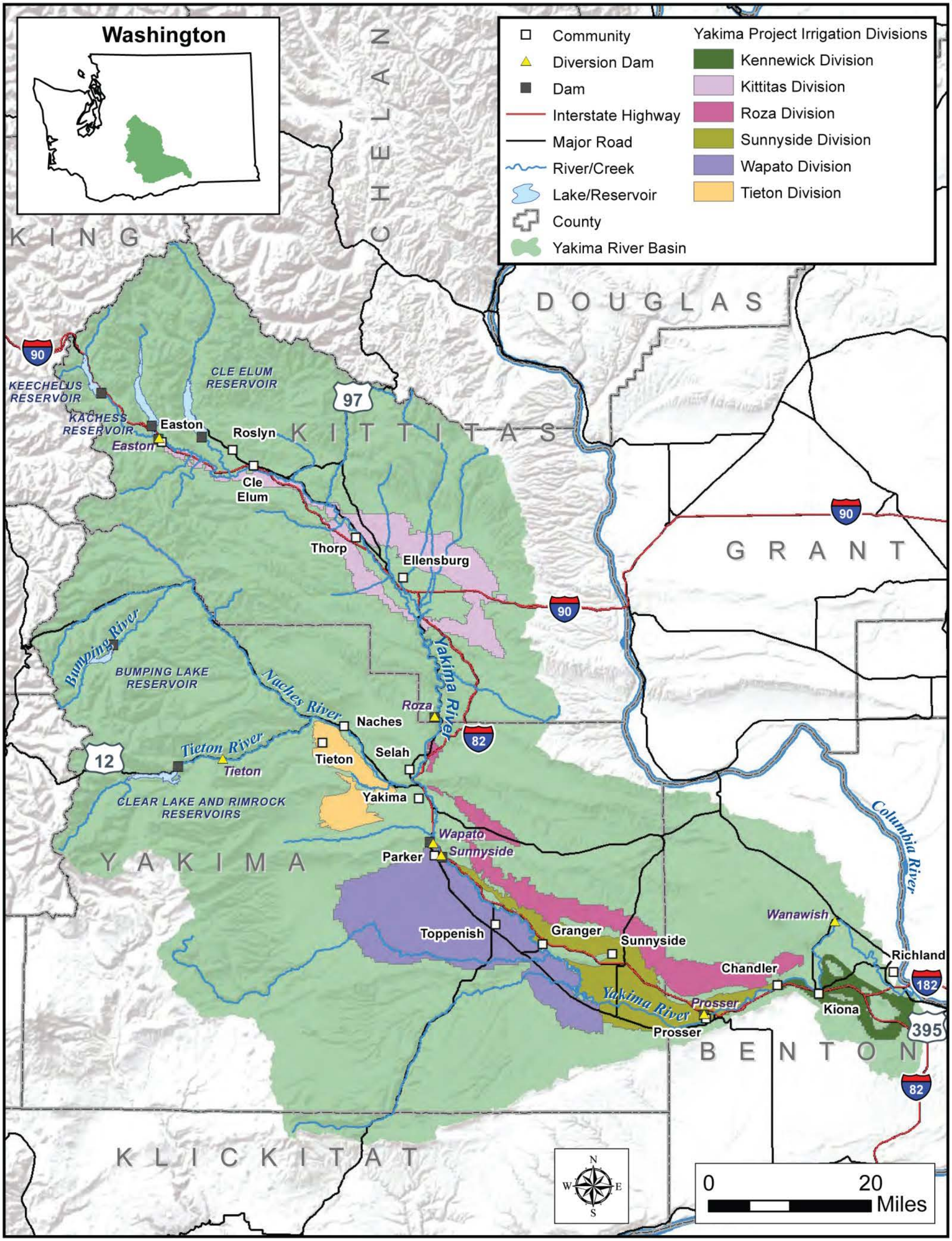


Figure 1-1. Yakima Basin

Prorationing refers to the process of equally reducing the amount of water delivered to proratable water right holders in deficit years based on TWSA. TWSA is defined as:

> "That amount of water available in any year from natural flow of the Yakima River, and its tributaries, from storage in the various Government reservoirs on the Yakima River watershed and from other sources, to supply the contract obligations of the United States to the Yakima River and its tributaries" (Civil Action No. 21 (1945 Consent Decree) Article 4, 1st Para.).

TWSA is estimated annually based on forecasted runoff, forecasted return flows, and storage contents.

In 1981, the Reclamation Yakima Field Office Manager established the System Operations Advisory Group (SOAC) to help manage the Yakima Project to reduce flow-related impacts to fish. Four members comprise the SOAC, consisting of fishery biologists representing the Yakama Nation, U.S. Fish and Wildlife Service (Service), Washington Department of Fish and Wildlife (WDFW), and irrigation entities represented by the Yakima Basin Joint Board. SOAC provides information, advice, and assistance to Reclamation on fish-related issues associated with the operations of the Yakima Project. The Yakima Field Office Manager is ultimately responsible for operations of the Yakima Project.

1.4.3 History of the Cle Elum Pool Raise Project

Reclamation and Ecology have recognized the need for additional water early in Yakima Project for many years as water demands in the Yakima basin increased and storage remained the same. The 1977 drought in the Yakima basin prompted legislative action for additional water supply. In 1979, the Washington State Legislature provided $500,000 for ". . . preparation of feasibility studies related to a comprehensive water supply project designed to alleviate water shortage in the Yakima River basin." Also in 1979, Congress authorized, funded, and directed the U.S. Department of the Interior, through the Bureau of Reclamation, to ". . . conduct a feasibility study of the Yakima River Basin Water Enhancement Project (YRBWEP) in cooperation with the State" (Act of December 28, 1979, Public Law 96-162). Section 1.8.1 provides additional information about Federal authorization. Beginning in the 1980s, Reclamation conducted numerous studies to identify ways to increase the amount of stored water in Cle Elum Reservoir. These studies identified potential options including accessing inactive storage (water stored below the elevation of the outlet channel and thereby inaccessible with existing facilities) and increasing the storage capacity of the reservoir. Reclamation determined that raising the reservoir pool level by 3 feet would provide the most amount of water for the least cost and result in the fewest environmental impacts.

In the early 1990s, interest in continuing the YRBWEP study process was renewed. As a result, Congress enacted Title XII of the Yakima River Basin Water Enhancement Project Act of October 31, 1994, Public Law 103-434 (commonly referred to as Phase II of YRBWEP). This legislation authorized implementation and study of primarily nonstorage components for YRBWEP. The legislation intended that the YRBWEP study and implementation results would be the basis for future YRBWEP Phase III legislation, to include elements such as construction of water storage features needed for a complete

YRBWEP plan to meet habitat, agricultural, municipal, and industrial needs of the basin. As part of YRBWEP, Congress authorized the pool raise project as the Cle Elum Improvements Project in 1994 (Section 1.2).

Refinement of the Cle Elum Pool Raise alternatives occurred over a 20-year period starting with the 1994 congressional authorization. Reclamation initially evaluated the environmental impacts associated with the pool raise in its *1999 Yakima River Basin Water Enhancement Project, Washington, Final Programmatic Environmental Impact Statement* (Reclamation, 1999a). Reclamation issued the Record of Decision on the Final YRBWEP PEIS in March 1999 and selected Alternative 2A, which includes the Cle Elum Pool Raise Project, as the preferred alternative (Reclamation, 1999b). The Record of Decision noted that additional project-level NEPA analyses, consultation, and permitting would be required for specific projects included in the Record of Decision. The Final PEIS and Record of Decision are available on Reclamation's Cle Elum Pool Raise Project website at http://www.usbr.gov/pn/programs/eis/cleelumraise/index.html.

In 2010, Reclamation and Ecology recommended incorporating the Cle Elum Pool Raise Project into the Integrated Plan PEIS (Section 1.7). Reclamation and Ecology prepared a technical memorandum on the Cle Elum Pool Raise Project as part of the studies undertaken for the Integrated Plan PEIS (Reclamation and Ecology, 2011c). The technical memorandum updated Reclamation's 2000 and 2002 estimates of cost, extent of additional shoreline inundation, and areas needing shoreline protection. The technical memorandum also evaluated forms of shoreline protection other than the traditional use of rock, and using the additional water for TWSA in addition to the congressionally authorized uses.

Reclamation and Ecology evaluated the environmental impacts of the Cle Elum Pool Raise Project at a programmatic level in the Integrated Plan PEIS (Reclamation and Ecology, 2012). Since that time, Reclamation and Ecology have conducted additional hydrologic modeling to develop options for using the additional stored water. Additional studies to evaluate shoreline conditions at Cle Elum Reservoir have resulted in proposals for shoreline protection strategies (Reclamation, 2014a, 2014b, and 2014c). These studies identified shoreline protection options that are less expensive than traditional rock protection with fewer environmental impacts.

Reclamation and Ecology have prepared this project-specific DEIS to evaluate the impacts to the environment from five alternatives, including No Action (Section 2.3).

1.5 Intended Use of this Environmental Impact Statement

The purpose of an EIS is to provide information to the public, decisionmakers, and permitting agencies in the decisionmaking process. An EIS identifies and evaluates alternatives that meet the project objectives, analyzes the potential environmental effects, and identifies measures to reduce or avoid potential environmental effects resulting from the action alternatives. An EIS also discloses unavoidable, adverse environmental impacts; cumulative impacts; the relationship of short-term uses and long-term productivity; and irreversible and irretrievable commitments of resources. In addition, NEPA requires that an

EIS consider indirect effects of a project, which typically occur later in time or a distance from the proposed project.

This DEIS is being circulated for review and comment to engage interested members of the public, agencies, stakeholders, and Tribes. Reclamation and Ecology will consider comments received during the public review period and responses to comments will be included in the Final EIS (FEIS). The agencies will conduct continued public outreach before completion of the FEIS.

The Federal lead agency will use the FEIS when considering approval of alternatives to accomplish the proposed action. All cooperating agencies and other Federal, State, and local agencies with authority over any aspect of the proposed action are expected to use the information contained in the FEIS to meet some, if not all, of their information needs, to make decisions, and to issue permits with respect to the proposed action consistent with their authority. Table 1-1 presents the roles and responsibilities of Federal, State, and local agencies that may use the FEIS to support their decisionmaking needs.

Reclamation will publish the FEIS, use it to support the Federal decision, and document that decision in Reclamation's Record of Decision.

Table 1-1. Federal Agency Roles and Responsibilities

Federal Agency	Role/Responsibility
Reclamation	• NEPA lead agency. Also responsible for Record of Decision
USFS (cooperating agency)	• Verify consistency of project facilities with management of the Okanogan-Wenatchee National Forest • Regulate occupancy and use of National Forest lands under the National Forest Management Act and Northwest Forest Plan
NMFS (cooperating agency)	• Complete Federal ESA consultation • Verify compliance with the Magnuson-Stevens Act
Service	• Complete Federal ESA consultation • Verify compliance with the Fish and Wildlife Coordination Act
U.S. Army Corps of Engineers (Corps)	• Permit project under Section 404 of the Clean Water Act
U.S. Environmental Protection Agency (EPA)	• Review impacts on air quality for compliance with the Clean Air Act • Review and file the EIS

As the SEPA lead agency for this EIS, Ecology will use the FEIS to meet its SEPA requirements to evaluate probable significant adverse impacts of the proposed action. Ecology will also use the FEIS to support future decisionmaking and permitting for the proposed action and selected alternative.

1.6 National and State Environmental Policy Act Review Process

The National Environmental Policy Act of 1969 (NEPA) requires that the action agency determine whether there are any environmental impacts associated with proposed Federal actions. This Draft Environmental Impact Statement (DEIS) for the Cle Elum Pool Raise Project describes this evaluation. The State Environmental Policy Act (Chapter 43.21C

RCW) requires an EIS for all major actions having a probable significant, adverse environmental impact.

Reclamation filed a Notice of Intent to prepare an EIS in the Federal Register on October 30, 2013, informing the public of the proposed environmental analysis and identifying opportunities for involvement during EIS preparation. On November 4, 2013, Ecology issued a SEPA Determination of Significance. The Notice of Intent and Determination of Significance initiated the scoping process. During the scoping period, Reclamation, Ecology, and the cooperating agencies collaborated with the public and interested parties to define a range of issues and alternatives for the EIS.

This DEIS presents Reclamation's and Ecology's disclosure of the potential effects of actions proposed and accompanying alternatives, impacts, and mitigation. Reclamation published a Notice of Availability on September 23, 2014 in the Federal Register announcing the availability of this DEIS for review and comment by the public, as well as Tribes, other Federal and State agencies, decisionmakers, and local jurisdictions having interest in the proposed action. The comment period for this DEIS is 60 days, ending on November 25, 2014.

After the DEIS public comment period is completed, Reclamation and Ecology will consider all substantive comments, conduct further analysis if necessary, and prepare a FEIS. Reclamation will publish a Notice of Availability in the Federal Register for the FEIS. The NEPA process ends with the preparation of a Record of Decision by Reclamation. The Record of Decision explains the agency's decision, describes the alternatives considered (including the environmentally preferred alternative), and discusses any commitments for mitigating potential environmental effects and monitoring those commitments. SEPA does not require preparation of a decision document, but does require that the lead agency not take action on a project for 7 days after issuance of the FEIS.

1.6.1 Tiering to the Integrated Plan PEIS

This DEIS is tiered to the Integrated Plan PEIS (Reclamation and Ecology, 2012). According to NEPA, tiering of environmental analysis "refers to the coverage of general matters in broader environmental impact statements … with subsequent narrow statements or environmental analyses …, incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared" (40 CFR 1508.28). SEPA regulations are similar, stating that agencies may conduct a "phased review" so that the environmental analysis "focuses on issues that are ready for decision and exclude from consideration issues already decided or not yet ready" (WAC 197-11-060).

Reclamation originally evaluated the Cle Elum Pool Raise Project at a programmatic level in the 1999 *Yakima River Basin Water Enhancement Project, Washington, Final Programmatic Environmental Impact Statement* (Reclamation, 1999a). Reclamation and Ecology later evaluated the project at a broad level in the Integrated Plan PEIS. The more site specific analysis in this DEIS is based on the additional technical and environmental studies and project design that Reclamation and Ecology have undertaken on the Cle Elum Pool Raise Project since completion of the Integrated Plan PEIS in 2012.

Reclamation incorporates by reference portions of the Integrated Plan PEIS relevant to the Cle Elum Pool Raise Project in this DEIS under the provisions of 40 CFR 1502.21 and 43 CFR 46.135. The Integrated Plan PEIS evaluates potential impacts of implementing the Integrated Plan, a comprehensive approach to water resources and ecosystem restoration improvements in the Yakima River basin. Section 1.7 of this DEIS summarizes the Integrated Plan and describes how it was developed. The Integrated Plan PEIS is available online at http://www.usbr.gov/pn/programs/yrbwep/reports/FPEIS/fpeis.pdf.

1.6.2 Documents Adopted under SEPA

Pursuant to provisions of the SEPA Rules (WAC 197-11-630), Ecology has adopted the *Yakima River Basin Integrated Water Resource Management Plan Final Programmatic EIS* (Reclamation and Ecology, 2012) to meet a portion of Ecology's responsibilities under SEPA (see Notice of Adoption for the Integrated Plan PEIS in Appendix B). The Integrated Plan PEIS is a joint NEPA and SEPA document prepared by Reclamation and Ecology. The Integrated Plan PEIS evaluates the potential impacts of implementing the Integrated Plan, a comprehensive approach to water resources and ecosystem restoration improvements in the Yakima River basin. Reclamation and Ecology evaluated the Cle Elum Pool Raise Project at a programmatic level in the Integrated Plan PEIS.

1.7 Summary of the Integrated Plan

Reclamation and Ecology developed the Integrated Plan to address existing and forecast water needs of the Yakima River basin. Based on over 30 years of studies in the basin, Reclamation and Ecology determined that current water supply in the basin does not meet instream or out-of-stream demand, including the aquatic demands for fish and wildlife and the out-of-stream needs for irrigation and municipal supply. In addition, climate change predictions indicate that the basin's snowpack will decrease, reducing spring and summer runoff (see Sections 3.13 and 4.13 of the Integrated Plan PEIS). Chapter 1 and Section 2.2 of the Integrated Plan PEIS describe how the Integrated Plan was developed (Reclamation and Ecology, 2012).

The Integrated Plan addresses the need to restore ecological functions in the Yakima River system and to provide more reliable and sustainable water resources for the health of the riverine environment, as well as agriculture, municipal, and domestic water users. The Integrated Plan meets these needs while anticipating changing water uses and effects of predicted climate change on water resources in the basin.

Section 1.3 of the Integrated Plan PEIS presents the goals of the Integrated Plan as follows:

- Provide opportunities for comprehensive watershed protection, and ecological restoration and enhancement, addressing instream flows, aquatic habitat, and fish passage;
- Improve water supply reliability during drought years for agricultural and municipal needs;

- Develop a comprehensive approach for efficient management of water supplies for irrigated agriculture, municipal and domestic uses, and power generation;
- Improve the ability of water managers to respond and adapt to potential effects of climate change; and
- Contribute to the vitality of the regional economy and sustain the riverine environment.

To address these goals, the Integrated Plan includes seven elements: reservoir fish passage, structural and operational changes to existing facilities, surface water storage, groundwater storage, habitat and watershed protection and enhancement, enhanced water conservation, and market reallocation. The seven elements each include recommended projects to meet the goals (Section 2.4 of the Integrated Plan PEIS). The Cle Elum Pool Raise Project is included in the structural and operational changes element. The project would further, in part, the overall goals of the Integrated Plan (Section 2.4.4.1 of the Integrated Plan PEIS). Chapter 4 of the Integrated Plan PEIS evaluated the impacts of the Cle Elum Pool Raise Project at a programmatic level.

The following Reclamation and Ecology websites contain information about implementation of the Integrated Plan:

http://www.usbr.gov/pn/programs/yrbwep/2011integratedplan/index.html and

http://www.ecy.wa.gov/programs/wr/cwp/YBIP.html.

1.8 Authorization for the Proposed Action

1.8.1 Federal Authorization

The Secretary of the Interior authorized the Tieton and Sunnyside Divisions of the Yakima Project under the Reclamation Act of June 17, 1900 and December 12, 1905, for the purposes of storage, diversion, development of waters, and the construction of irrigation works for the reclamation of arid lands. Reclamation constructed Cle Elum Dam under this authority in 1933.

The YRBWEP was authorized on December 28, 1979 (93 Stat. 1241, Public Law 96-162, Feasibility Study—Yakima River Basin Water Enhancement Project). As described in Section 1.2, Congress specifically authorized the Cle Elum Pool Raise Project in Sections 1205 and 1206 of Title XII of the Yavapai-Prescott Indian Tribe Water Rights Settlement Act of 1994 YRBWEP. Sections 1205(e) of the Act also authorized fish, wildlife, and recreation as additional purposes of the Yakima Project.

1.8.2 Washington State Authorization

The Washington State Legislature authorized implementation of the Integrated Plan, including the Cle Elum Pool Raise Project in the 2013 Yakima Policy Bill (2SSB 5367). The bill establishes mechanisms for implementing work on the Integrated Plan. It authorized

Ecology to implement the Integrated Plan and to develop solutions that provide concurrent benefits for both instream and out-of-stream uses. The goals of this effort are to protect and enhance fish and wildlife resources, improve water availability and reliability, establish more efficient water markets, manage the variability of water supplies, and prepare for the uncertainties of climate change through operational and structural changes. The bill included authorization for the Washington State Department of Natural Resources (DNR) to purchase private land in the Teanaway River basin to establish the Teanaway Community Forest (TCF) and instructions that DNR, in collaboration with WDFW, manage it for the following purposes consistent with the Integrated Plan:

- To protection and enhance the water supply and protect the watershed,
- To maintain working lands for forestry and grazing while protecting key watershed functions and aquatic habitat,
- To maintain where possible expand recreational opportunities consistent with watershed protection and
- To conserver and restore vital habitat for fish.

The DNR completed purchase of the property in October 2013. DNR and WDFW are working with an Advisory Committee to develop a management plan for the TCF.

A specific provision of the bill related to the Cle Elum Pool Raise Project is establishment of a “Water Supply Facility Permit and Funding Milestone” (Milestone). To achieve the Milestone, permitting and funding must be completed by 2020 for one or more water supply facilities designed to provide at least 214,000 acre-feet of additional water supply. If the Milestone is not met, the bill authorizes the Board of Natural Resources to transfer the TCF land to the common school trust and to manage the land for the beneficiaries of the trust. The intent of the Cle Elum Pool Raise Project is to provide over 14,000 acre-feet toward the 214,000-acre-foot Milestone.

Additional authorization for the State of Washington to implement the Integrated Plan is contained in the 2013 to 2015 Capital Budget (ESSB 5035, Section 3077). This section of the Capital Budget appropriates $32 million in capital funds to move several Integrated Plan projects and activities forward and approximately $99 million for the purchase of the TCF land.

1.8.3 Water Rights

Reclamation operates the Yakima Project according to Federal and State law and regulation, and court orders and decisions as described in Section 1.8 and in the Integrated Plan PEIS in Sections 1.6.3 and 1.6.4. Reclamation will comply with State storage statutes regarding this project. Since Yakima River basin surface water rights have been fully adjudicated and confirmed (except for Ahtanum Creek), Reclamation will not seek any new secondary use rights for the purposes described in the alternatives. However, existing water rights may need to proceed through a State administrative process to change elements of the water right, such as place of use or purpose of use, if necessary.

Additionally, Reclamation may need to make temporary use of water for certain project purposes, including construction and dust control. The agencies will base this temporary use of water on existing and confirmed water rights, or on a limited State permit.

1.9 Summary of Applicable Federal Regulations

This section describes the Federal laws, Secretarial Orders, and Executive Orders that may apply to the proposed project. Section 1.6 describes the NEPA process. Chapter 5 describes the status of consultations and compliance with the regulations. The following list may not be comprehensive.

1.9.1 Endangered Species Act

The Endangered Species Act (ESA) (Public Law 93-205, dated 12/28/73) requires all Federal agencies to ensure that their actions do not jeopardize the continued existence of ESA-listed species, or destroy or adversely modify their critical habitat. As part of the ESA Section 7 process, an agency must request a list of species from the Service and NMFS that identifies threatened and endangered species within or near the Federal action area. The agency then must evaluate impacts to those species and designated critical habitat through preparation of a Biological Assessment. If the action may impact any ESA-listed species or designated critical habitat, the agency must consult with the Service or NMFS, or both. Section 4.9 describes potential impacts to ESA-listed species.

1.9.2 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) (Public Law 96-366, dated 9/29/1980) provides for equal consideration of wildlife conservation in coordination with other features of water resource development programs. The FWCA requires that any plans to impound, divert, control, or modify any stream or other body of water must be coordinated with the Service and State wildlife agency through consultation directed toward prevention of fish and wildlife losses and development or enhancement of these resources. The Coordination Act Report (CAR) documents the results of the consultation.

1.9.3 National Historic Preservation Act

The National Historic Preservation Act (NHPA) (Public Law 89-665, dated 10/15/1966) of 1966, as amended, requires that Federal agencies consider the effects that their projects have on properties eligible for or listed on the National Register of Historic Places (NRHP). Regulations in 36 CFR 800 describe the procedures that Federal agencies must follow to comply with the NHPA. For any undertaking, Federal agencies must determine if there are properties of NRHP quality in the project area, the effects of the project on those properties, and the appropriate mitigation for adverse effects. In making these determinations, Federal agencies are required to consult with the State Historic Preservation Office (SHPO), Native

American Tribes with a traditional or culturally significant religious interest in the study area, the interested public, and in certain cases, the Advisory Council on Historic Preservation.

1.9.4 Native American Graves Protection and Repatriation Act

Native American Graves Protection and Repatriation Act (NAGPRA) (Public Law 101-601, dated 10/16/1990) of 1990 regulates Tribal consultation procedures in the event of discoveries of Native American graves and other NAGPRA "cultural items." Under the Act, discovery of graves or other NAGPRA cultural items requires the Federal agency to consult with Tribes during project planning. NAGPRA details the procedures required for repatriation of human skeletal remains and other cultural items with the Tribes.

1.9.5 Clean Water Act

The Clean Water Act (Public Law 92-500, dated 10/18/1972) regulates discharges of pollutants into the water of the U.S. and establishes surface water quality standards. The Corps regulates the discharge of dredge and fill material into the waters of the U.S., including wetlands, under Section 404 of the Act. Permit review and issuance follows a process that encourages, in sequence, avoiding impacts, followed by minimizing impacts, and finally requiring mitigation for unavoidable impacts to the aquatic environment. Section 4.4 and Section 4.7 of the Act, respectively, describe the potential impacts to water quality and wetlands.

1.9.6 Executive Order 11990: Wetlands

Executive Order 11990, dated May 24, 1977, directs Federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial value of wetlands in carrying out programs affecting land use. Wetlands provide great natural productivity, hydrological utility, environmental diversity, natural flood control, improved water quality, recharge of aquifers, flow stabilization of streams and rivers, and habitat for fish and wildlife resources. Section 4.7 describes potential impacts to wetlands.

1.9.7 Executive Order 13007: Indian Sacred Sites

Executive Order 13007, dated May 24, 1996, instructs Federal agencies to promote accommodation of access to, and to protect the physical integrity of, American Indian sacred sites. A "sacred site" is a specific, discrete, and narrowly delineated location on Federal land. An Indian Tribe or an Indian individual determined to be an appropriately authoritative representative of an Indian religion must identify a site as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion. The Tribe or authoritative representative must inform the agency of the existence of such a site. Section 4.20 describes potential impacts to Indian sacred sites.

1.9.8 Executive Order 12898: Environmental Justice

Executive Order 12898, dated February 11, 1994, instructs Federal agencies to make achieving environmental justice part of its mission to the extent practicable and permitted by law. Agencies are to achieve this by addressing, as appropriate, disproportionately high and adverse human health or environmental effects on minority populations and low income populations. Environmental justice means the fair treatment of people of all races, income, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no person or group of people should shoulder a disproportionate share of negative environmental impacts resulting from the execution of environmental programs. Section 4.22 describes the potential environmental justice impacts associated with the Cle Elum Pool Raise Project.

1.9.9 Executive Order 11988: Floodplain Management

Executive Order (EO) 11988, dated May 24, 1977, instructs Federal agencies to determine whether the Proposed Action will occur in a floodplain prior to taking an action. If the action does occur in a floodplain, the agency must consider alternatives to avoid adverse effects to the greatest extent practicable. If the only feasible alternatives are located within a floodplain, the agency shall take action to design or modify its action to minimize potential harm to or within the floodplain consistent with regulations accompanying EO 11988.

1.9.10 Executive Order 13175: Consultation and Coordination with Tribal Governments

Executive Order 13175, dated November15, 2000, instructs Federal agencies to consult, to the greatest extent practicable and to the extent permitted by law, with Tribal Governments prior to taking actions that affect federally recognized Tribes. Each agency shall assess the impact of Federal Government plans, projects, programs, and activities on Tribal trust resources and assure consideration of Tribal rights and concerns during the development of such plans, projects, programs, and activities. Section 5.3 documents Reclamations' Tribal consultation and coordination process for this project.

1.9.11 Secretarial Order 3175: Department Responsibilities for Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States (with the Secretary of the Interior acting as trustee) for Indian Tribes or Indian individuals. Examples of ITAs are lands, minerals, hunting and fishing rights, and water rights.

The United States has an Indian trust responsibility to protect and maintain rights reserved by or granted to Indian Tribes or Indian individuals by treaties, statutes, and EOs. These rights are sometimes further interpreted through court decisions and regulations. This trust responsibility requires that officials from Federal agencies, including Reclamation, take all actions reasonably necessary to protect ITAs. Section 4.21 describes potential ITAs in the Cle Elum Pool Raise Project area.

1.9.12 Executive Order 13112: Invasive Species

Executive Order 13112, dated February 3, 1999, directs Federal agencies as follows:

- Use relevant programs and authorities to prevent the introduction of invasive species
- Detect and respond rapidly to and control invasive species in a cost-effective and environmentally sound manner
- Monitor invasive species populations
- Provide for restoration of native species and habitat conditions in invaded ecosystems
- Conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control
- Promote public education on invasive species and the means to address them

Furthermore, it instructs Federal agencies to not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere. The EO contains an exception so that the agency may authorize, fund, or carry out such actions if it determines that the benefits clearly outweigh the potential harm caused by invasive species and that it takes all feasible and prudent measures to minimize risk of harm. Section 4.7 describes Reclamation's process for addressing invasive species.

1.10 Permits, Consultations and Approvals

To construct the Cle Elum Pool Raise Project, Reclamation and Ecology will obtain all required Federal and State permits and meet other requirements set forth by law, regulation, ordinance, and policy. Table 1-2 summarizes the potential permit requirements identified to date. The applicable resource sections in Chapters 3 and 4 discuss other laws. Chapter 5 describes Reclamation's public involvement and agency consultations and coordination.

Table 1-2. Summary of Potential Permit Requirements and Other Approvals

Agency	Permits and Other Requirements	Jurisdiction/Purpose
Federal Agencies		
Service and NMFS	Endangered Species Act (16 USC § 1531)	Consultation to determine effects on threatened and endangered species.
NMFS	Magnuson-Stevens Fishery Conservation and Management Act (16 USC §§ 1801-1802)	Consultation with NMFS on activities that may adversely affect Essential Fish Habitat (EFH) to determine whether the Proposed Action “may adversely affect” designated EFH for relevant commercially, federally-managed fisheries species within the Proposed Action area.
Service	Fish and Wildlife Coordination Act (16 USC 661066c)	Coordination with the Service on the effects of the project on fish and wildlife.
Corps	Clean Water Act Section 404 (§ 404, 33 USC §1251 et seq.)	Permitting and minimization of impacts associated with the discharge of dredged or fill material into waters of the United States, including wetlands.
State Agencies		
Ecology	Clean Water Act Section 401 (33 USC § 1251 et seq.)	Ecology issues a Section 401 Water Quality Certification to indicate that it has reasonable assurance that a project will comply with State water quality standards and other aquatic resources protection requirements under Ecology’s authority.
Ecology	Construction National Pollution Discharge Elimination System (NPDES) (90.48 RCW). Clean Water Act Section 402 (§ 402, 33 USC § 1251 et seq.)	Required for construction projects engaged in clearing, grading, and excavating activities that disturb 1 or more acres.
WDFW	Hydraulic Project Approval (77.55 RCW)	Required for construction projects that use, divert, obstruct, or change the natural bed or flow of State waters.
WDFW	Fish and Wildlife Coordination Act (16 USC 661066c)	Coordination with WDFW on effects of the project on fish and wildlife species.
Washington Department of Archaeology and Historic Preservation (DAHP)	National Historic Preservation Act (NHPA) (16 USC § 470 et seq.)	Reclamation and Ecology will complete Section 106 Consultation to determine whether the project would impact historic or cultural resources.
Local Agencies		
Kittitas County	Critical Areas Ordinance Shoreline Master Program	Required for actions taking place on private land within the County’s shoreline jurisdiction.

1.11 Public Involvement

Reclamation and Ecology collaborated with several agencies, entities, and organizations to develop the Integrated Plan and the Cle Elum Pool Raise Project. Chapter 6 of the Integrated Plan PEIS (Reclamation and Ecology, 2012) describes the public process for the Integrated Plan.

Publication of a Federal Register Notice of Intent to prepare an EIS officially began the scoping process for this DEIS on October 30, 2013. Reclamation and Ecology held public scoping meetings on November 20, 2013, in Yakima and November 21, 2013, in Cle Elum, Washington. Major issues raised during scoping included the uses of the additional stored water and potential impacts to specific resources such as fish, threatened and endangered species, wetlands, vegetation, and recreation. Chapter 5 provides more information on the scoping process and comments. The scoping report is available at http://www.usbr.gov/pn/programs/yrbwep/2011integratedplan/index.html.

1.12 Document Organization

This DEIS includes the following chapters:

- **Chapter 1** provides background information on the Cle Elum Pool Raise Project and the Integrated Plan, the purpose and need for the action, legal authorities for the project, permits and approvals, and a brief description of public involvement. Chapter 1 also includes information on Reclamation's incorporation by reference of the Integrated Plan PEIS and Ecology's adoption of the Integrated Plan PEIS.

- **Chapter 2** describes the Proposed Action, reasonable alternatives to the Proposed Action, and the No Action Alternative. The chapter describes the alternatives development process and alternatives eliminated from detailed evaluation.

- **Chapter 3** describes the affected environment and existing conditions for the environmental resources that the Proposed Action and alternatives could affect.

- **Chapter 4** evaluates the potential environmental consequences (direct and indirect) of the Proposed Action and alternatives and identifies mitigation measures that would avoid or reduce adverse effects of the Proposed Action and alternatives. For the purpose of this document, a section at the end of the chapter presents cumulative impacts and a section is included to describe how the Proposed Action meets the goals of the Integrated Plan. The chapter also describes other aspects of Reclamation's compliance with NEPA procedures, including a description of unavoidable adverse impacts, the commitment of resources, relationship between short-term and long-term productivity, and Reclamation's environmental commitments for the Proposed Action.

- **Chapter 5** describes the public involvement, consultation, and coordination, and compliance undertaken in the preparation of this DEIS.

Ancillary materials follow Chapter 5 and include a list of DEIS preparers, the distribution list, references, and a glossary of project-specific terms. Appendices to accompany information presented in this DEIS are attached at the end of the document.

Chapter 2

PROPOSED ACTION AND ALTERNATIVES

CHAPTER 2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

This DEIS evaluates the potential environmental impacts associated with the Cle Elum Pool Raise Project. The Cle Elum Pool Raise Project would modify the existing radial gates at the dam spillway to raise the level of the reservoir pool 3 feet, allowing up to an additional 14,600 acre-feet of water to be stored and released from Cle Elum Reservoir. The existing dam would remain as is. The Cle Elum Pool Raise Project would inundate areas around the reservoir that currently are not inundated for an average of about 40 days per year, generally in June and July. Because the raised pool level would increase erosion on some areas of shoreline, the project includes installing shoreline protection to protect public and private lands and facilities.

Reclamation and Ecology are evaluating four action alternatives for the Cle Elum Pool Raise Project. All four action alternatives include the same approach to raising the reservoir pool level by modifying the existing spillway radial gates on the dam. The action alternatives also include raising the elevation of the right dam abutment and three saddle dikes to ensure adequate freeboard (a factor of safety usually expressed in feet above a flood level; in this case, it is a 3-foot zone of additional protection from wave erosion). As part of the project, Reclamation would protect USFS recreational facilities and access at Cle Elum River and Wish Poosh campgrounds, and portions of Salmon La Sac Road.

Each action alternative allocates the additional stored water to one of two uses:

- Instream flow, as consistent with 108 Stat. 4526 USC, to improve conditions for fish, or
- TWSA and out-of-stream uses, requiring additional congressional authorization, as well as instream flows.

The existing congressional authorization (108 Stat. 4526 USC) allows Reclamation to use the additional stored water to improve instream flows downstream of the dam, or the additional stored water could be carried over from year to year in additional capacity to the extent space is available in the reservoir. Reclamation may release water equal to the increased volume stored at Cle Elum at other times of the year at varying rates and from other Yakima Project reservoirs in lieu of releases from Cle Elum, as stated in Section 1205 of 108 Stat. 4526 USC. Further congressional authorization would be required to use the additional water for TWSA and out-of-stream uses.

Each action alternative also includes one of two methods for shoreline protection:

- Rock shoreline protection, consisting mostly of rock riprap with some plantings, or
- Hybrid shoreline protection, consisting of a range of treatments, including rock riprap and various bioengineered techniques.

Under both shoreline protection methods, Reclamation would continue its existing shoreline monitoring and maintenance program. Reclamation would monitor the reservoir shoreline to identify areas experiencing increased erosion from the higher reservoir level, and would implement appropriate shoreline protection measures in those areas consistent with the selected alternative.

Both forms of shoreline protection may require Reclamation to acquire private land in fee title or easements across private land from willing sellers. Reclamation may acquire approximately 20 acres of land as part of the Cle Elum Pool Raise Project. The acquisitions or easements would allow installation of the shoreline protection measures or access for construction and maintenance, or both. In some cases, Reclamation may acquire land or easements where installation of shoreline protection is not practical.

2.2 Alternative Development Process

Reclamation developed the Cle Elum Pool Raise proposal over the past two decades through various studies and Federal authorization as described in Section 1.4.3. Reclamation and Ecology developed alternatives for this DEIS in response to the Title XII legislation (Section 1.2); contemporary studies; the Integrated Plan PEIS; input received during public scoping and coordination with cooperating agencies (Chapter 5); and the purpose and need statement (Section 1.3).

Reclamation and Ecology developed four action alternatives for implementation of the Cle Elum Pool Raise Project in addition to the No Action Alternative required by NEPA and SEPA. The action alternatives share the same approach for increasing the reservoir level and protecting USFS facilities and Salmon La Sac Road, but use different combinations of approaches for use of the additional water and for shoreline protection. The five alternatives examined in detail in this DEIS are:

- Alternative 1 – No Action Alternative
- Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection
- Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection
- Alternative 4 – Additional Stored Water Used for TWSA with Rock Shoreline Protection
- Alternative 5 – Additional Stored Water Used for TWSA with Hybrid Shoreline Protection

Table 2-1 summarizes the project components included in each action alternative.

Table 2-1. Summary of Action Alternative Components

	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Modify existing spillway radial gates to allow additional water to be stored.	Same for all action alternatives			
Increase the reservoir pool elevation by 3 feet, allowing up to an additional 14,600 acre-feet of water to be stored.	Same for all action alternatives			
Use of additional stored water.	Instream flows[1]		TWSA[2]	
Shoreline protection method.	Rock	Hybrid	Rock	Hybrid
Increase the freeboard at the saddle dikes and right dam abutment.	Same for all action alternatives			
Protect Federal property, such as USFS recreation facilities and access, and Salmon La Sac Road.	Same for all action alternatives			

[1]Consistent with 108 Stat. 4526 USC. [2]Requires additional congressional authorization.

2.3 Alternative 1 – No Action Alternative

The No Action Alternative represents the most likely future conditions in the absence of implementing the Proposed Action. The No Action Alternative forms the baseline for comparison of potential impacts of the Proposed Action and the action alternatives. Under the No Action Alternative, Reclamation and Ecology would not implement the Cle Elum Pool Raise Project and additional water would not be stored in or released from the reservoir. Reclamation would continue to manage water supply provided by Cle Elum Reservoir consistent with current operational practices and constraints, and would continue inspections and maintenance of shorelines in accordance with current procedures.

For the purpose of this DEIS, Reclamation and Ecology consider the No Action Alternative to include projects and actions that meet all of the following criteria:

- Planned and designed,
- Authorized with identified funding for implementation and
- Scheduled for implementation.

Reclamation and Ecology have identified the following projects and actions as meeting all three criteria and have included these projects in the No Action Alternative:

- Interim juvenile fish passage facility and operations currently in place at Cle Elum Dam, including reconstruction of the facilities, and
- Ongoing fish reintroduction at Cle Elum Reservoir and upper Cle Elum River.

The Cle Elum Dam Fish Passage Facilities and Fish Reintroduction Project EIS described the ongoing fish reintroduction program (Reclamation and Ecology, 2011b). The fish reintroduction using the interim juvenile (downstream) fish passage facilities is included as the baseline condition for fish as described in Section 3.6. Reclamation completed the NEPA Categorical Exclusion Checklist for reconstruction of the interim fish passage facility in June 2014 (Reclamation, 2014d). Reclamation is reconstructing the facility because it is nearing the end of its design life. Reclamation will conduct the reconstruction work on the existing dam spillway and anticipates no substantial adverse impacts from reconstruction. The completed interim fish passage facility will operate in the same way as the existing facility.

2.4 Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection

Under Alternative 2, Reclamation proposes to increase the Cle Elum Reservoir pool level by 3 feet, allowing an additional 14,600 acre-feet of water to be stored in the reservoir. Reclamation would allocate the additional stored water to meet instream flow needs as authorized in 108 Stat. 4526 USC. Reclamation would implement a rock shoreline protection strategy to reduce the potential for increased shoreline erosion. Construction would occur over several seasons and could take approximately 5 years to complete. Reclamation would not raise the reservoir level to the maximum pool elevation until the proposed shoreline protection is completed.

Alternative 2 includes the following major components:

- Modify the existing Cle Elum Dam spillway radial gates to increase the reservoir pool elevation by 3 feet, resulting in inundation of some shoreline areas.
- Allocate the additional stored water for instream flows.
- Implement rock shoreline protection to stabilize shorelines adjacent to private property that would experience increased erosion from the higher reservoir level.
- Monitor shoreline conditions and implement appropriate shoreline protection measures where necessary in conjunction with Reclamation’s existing annual shoreline monitoring assessment.
- Raise the elevation of three existing earthen saddle dikes north and east of the dam and raise the height of the right abutment of the dam to provide adequate freeboard.
- Provide shoreline protection for Federal property, including USFS recreational facilities and access at Wish Poosh and Cle Elum River Campgrounds.
- Provide erosion protection for portions of Salmon La Sac Road.
- Acquire land or easements, or both, from private landowners where necessary to accommodate shoreline protection.

2.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

To raise the reservoir pool level, Reclamation would modify the five existing spillway radial gates (Figure 2-1) by installing a 3-foot-high by 37-foot-wide fabricated steel extension on top of each gate. Reclamation would also install flow diverters on top of each extension to funnel overtopping debris toward the middle of the gates (Figure 2-2). Reclamation would install a cover onto the downstream face of each gate to protect it from collecting debris.

2.4.1.1 Spillway Radial Gate Modifications Construction Activities

Modifications of the spillway radial gates would include minimal grading and gravel surfacing of the existing access road along the right dam abutment. Construction would occur in the dry, when reservoir levels are below the spillway floor. The expected construction duration is approximately 6 to 9 months starting in the fall when reservoir levels are low. The construction sequence for modifying the radial gates would include the following:

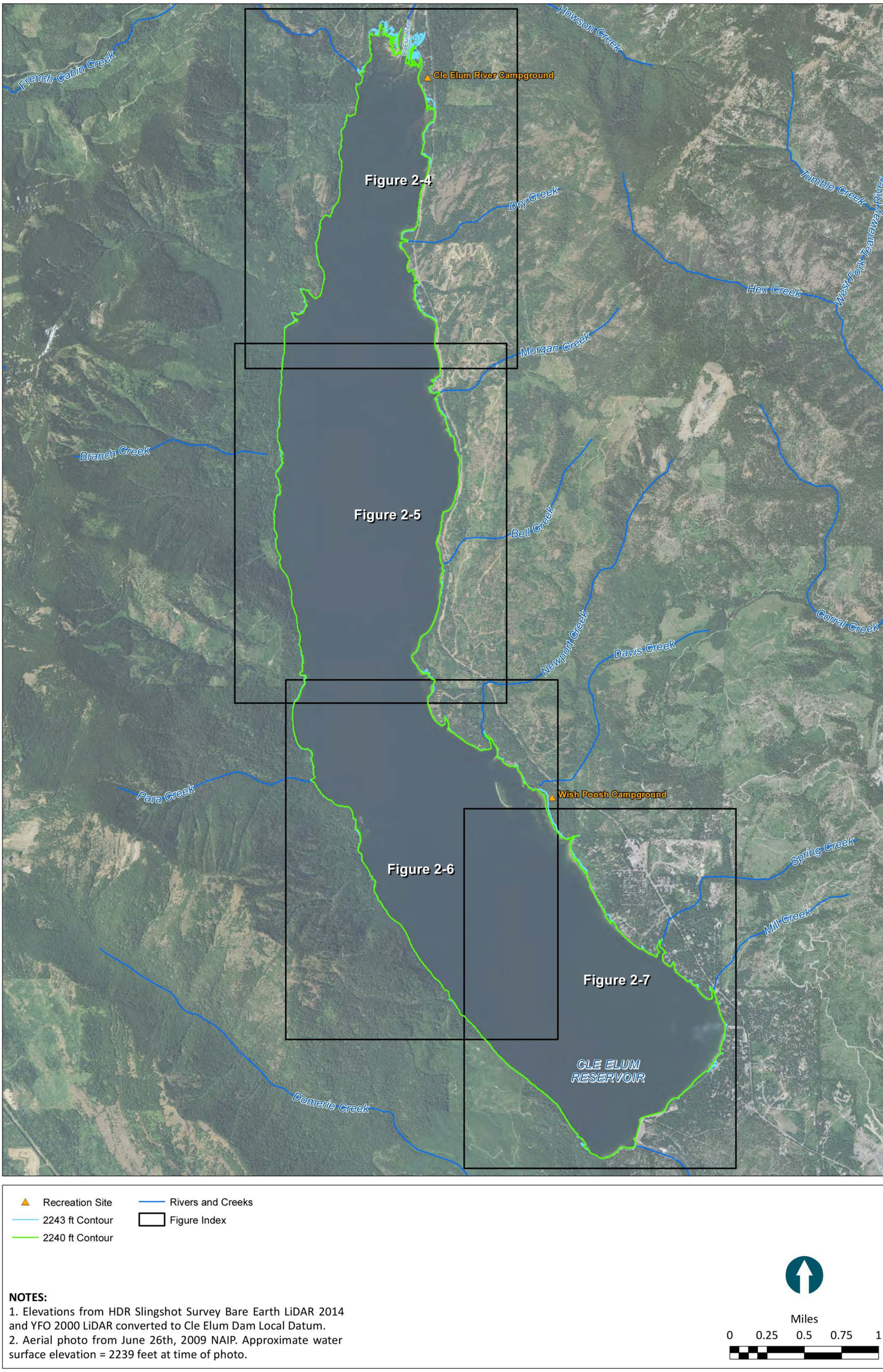
- Install temporary erosion control measures on the access road and isolate the work area using plastic sheeting.
- Sandblast the existing radial gates in place.
- Install the new gate extensions.
- Install a nonreflective cover on the downstream face of the gates.
- Weld steel reinforcement to the horizontal beams and trunnion arms.
- Recoat the gates after structural welding is complete.
- Replace the timber bottom and rubber side seals on each gate with similar materials.

2.4.1.2 Increased Reservoir Pool

Modifying the existing spillway radial gates would allow an additional 14,600 acre-feet of water to be stored in Cle Elum Reservoir, increasing its total capacity to 451,500 acre-feet. The higher reservoir level would increase the area of inundation on the reservoir shoreline by approximately 46 acres, increasing its surface area at high pool to approximately 4,914 acres. Figure 2-3 to Figure 2-7 illustrate the difference between the existing high reservoir level at elevation 2,240 and the proposed higher reservoir level at elevation 2,243.

Figure 2-1. Existing Cle Elum Dam Spillway Radial Gates

Figure 2-2. Cle Elum Dam Spillway Radial Gate with Proposed Modifications



NOTES:

1. Elevations from HDR Slingshot Survey Bare Earth LiDAR 2014 and YFO 2000 LiDAR converted to Cle Elum Dam Local Datum.
2. Aerial photo from June 26th, 2009 NAIP. Approximate water surface elevation = 2239 feet at time of photo.

Figure 2-3
Project Area Overview

NOTES:
1. Elevations from HDR Slingshot Survey Bare Earth LiDAR 2014 and YFO 2000 LiDAR converted to Cle Elum Dam Local Datum.
2. Aerial photo from June 26th, 2009 NAIP. Approximate water surface elevation = 2239 feet at time of photo.

Figure 2-4
Project Area – Upstream North

NOTES:
1. Elevations from HDR Slingshot Survey Bare Earth LiDAR 2014 and YFO 2000 LiDAR converted to Cle Elum Dam Local Datum.
2. Aerial photo from June 26th, 2009 NAIP. Approximate water surface elevation = 2239 feet at time of photo.

Figure 2-5
Project Area – Downstream Southwest

NOTES:
1. Elevations from HDR Slingshot Survey Bare Earth LiDAR 2014 and YFO 2000 LiDAR converted to Cle Elum Dam Local Datum.
2. Aerial photo from June 26th, 2009 NAIP. Approximate water surface elevation = 2239 feet at time of photo.

Figure 2-6
Project Area – Downstream Southeast

Recreation Site
2240 ft Contour (Existing Full Pool)
Increased Inundation Area
Privately Owned Parcels Partially Inundated by the Project
Parcel
Tributaries

NOTES:
1. Elevations from HDR Slingshot Survey Bare Earth LiDAR 2014 and YFO 2000 LiDAR converted to Cle Elum Dam Local Datum.
2. Aerial photo from June 26th, 2009 NAIP. Approximate water surface elevation = 2239 feet at time of photo.

Feet
0 500 1,000 1,500 2,000

Figure 2-7
Project Area – Downstream South

Hydrologic modeling using the RiverWare model[1] was conducted to estimate the period of inundation when the reservoir would fill to elevation 2,243. Table 2-2 describes the range of dates when storage first exceeds elevation 2,240 and when reservoir levels drop below elevation 2,240 for the years in which the reservoir is filled to elevation 2,243. On average, reservoir levels would exceed elevation 2,240 starting June 1 and stay above that level until July 10. Those dates apply to years in which sufficient runoff occurs to fill the reservoir above elevation 2,240. Section 4.2 provides additional information about reservoir operations.

Table 2-2. Expected Periods of Additional Inundation for the Pool Raise Project

Reservoir Level	Date		
	Average	Earliest	Latest
When reservoir level exceeds elevation 2,240	June 1	April 21	June 24
When reservoir level drops below elevation 2,240	July 10	May 31	August 11

2.4.1.3 Operation and Maintenance

Reclamation would perform the same operation and maintenance activities on the modified radial gates as it does currently. The agency currently operates the radial gates to store water above the spillway crest during spring and early summer when runoff may fill the reservoir to the desired maximum operating level of elevation 2,240. The gated spillway is a dam safety feature designed for emergency use, typically in response to extreme runoff/flood events, to avoid excessive filling of the reservoir when the capacity of the dam outlet works is not sufficient to adequately pass the large inflow event. Section 1.4.1 describes operation of the spillway and radial gates in more detail.

Currently, operation and maintenance (O&M) activities on the spillway and radial gates include clearing debris from the spillway, inspecting the gates, testing gate mechanisms, and periodic recoating of metal parts. Reclamation would perform the same O&M activities on the modified radial gates; however, the modified radial gates would be less prone to trapping debris, and result in reduced maintenance issues and corrosion removal.

2.4.2 Additional Stored Water for Instream Flows

Under Alternative 2, Reclamation and Ecology propose to use the additional water stored in Cle Elum Reservoir to improve instream flows in the lower Cle Elum River and in downstream reaches of the Yakima River. This use of water complies with the Cle Elum Pool Raise Project authorization in the 108 Stat. 4526 USC. Section 1205(b) of the legislation dedicates the

[1] The Center for Advanced Decision Support for Water and Environmental Systems at the University of Colorado developed RiverWare© software. The software is a general river basin modeling tool that simulates operations of complex river and reservoir systems such as the Yakima Project. The software uses an object-oriented modeling approach where objects represent features in the Yakima Project such as reservoirs, streams, river reaches, diversions, and canals. Section 4.2 provides additional information.

additional stored water for instream flows, but allows flexibility in how Reclamation can use the water for instream flows. The legislation authorizes use of the water for “flushing flows or as otherwise advised by the System Operations Advisory Committee” (SOAC). Section 1.4.2 describes the role of SOAC. Section 1205(b) of 108 Stat. 4526 USC also states:

> “water may be carried over from year-to-year in the additional capacity to the extent that there is space available. Releases may be made from other Yakima Project storage facilities to most effectively utilize this additional water, except that water deliveries to holders of existing water rights shall not be impaired.”

Under Alternative 2, Reclamation would store the additional water during spring and early summer when high flows from snowmelt fill the reservoir. Reclamation would release the additional stored water as needed to improve instream flows. Section 4.2.3.1 provides more information about flow releases.

Reclamation anticipates that use of the additional stored water for instream flows may change annually and over time due to improved knowledge of instream flow needs and specific flow needs identified in any one year. For that reason, Reclamation would manage the additional stored water adaptively with advice from SOAC. Reclamation has consulted with SOAC regarding the range of operational scenarios to benefit instream flows. Appendix C includes correspondence with SOAC documenting its concurrence with these proposals.

For Alternative 2, Reclamation would release the additional stored water during fall and winter (October to March) to increase instream flow in the Cle Elum River and increase overwintering habitat for fish in Cle Elum River. The additional stored water would provide increased instream flows of approximately 36 cfs for 6 months. The additional stored water could allow Reclamation to release a similar volume of water from other Yakima Project reservoirs in lieu of releases from Cle Elum Reservoir, as stated in Section 1205(b) of 108 Stat. 4526 USC. Reclamation could conserve or carry over the additional water to the following year. In that case, Reclamation would not release the additional stored water in a year when the reservoir exceeds elevation 2,240. However, the maximum volume of water that could be available the following year is 14,600 acre-feet. Reclamation could also conserve or carry over the additional stored water indefinitely to increase the reservoir level when smolts are outmigrating from the reservoir. The additional stored water would improve downstream fish passage if the proposed Cle Elum Dam fish passage facilities are constructed.

Other scenarios exist for use of the additional stored water to benefit instream flows. They include releasing pulse flows in spring to help smolts outmigrate and releasing additional flows in summer to increase instream flow in the lower Yakima River.

2.4.3 Rock Shoreline Protection

Reclamation has conducted analyses of increased shoreline inundation and erosion to identify the shoreline areas most susceptible to erosion and inundation. Reclamation intends to install shoreline protection adjacent to privately owned property; to protect Federal facilities, such as USFS recreation facilities and their access; and to protect the Salmon La Sac Road embankment (Section 4.3.4.1).

As part of the project, Reclamation would continue its annual shoreline inspection (Section 2.3). If the shoreline inspection identifies erosion issues on unprotected shorelines, Reclamation would coordinate with the USFS, other affected agencies, or private landowner to implement appropriate shoreline protection on those additional areas.

Reclamation would construct all shoreline protection measures when the reservoir is drawn down, generally from August through September, to avoid in-water work. Reclamation expects that completing the shoreline protection measures would take approximately 5 years. Reclamation would not raise the reservoir level to the maximum pool elevation until all proposed shoreline protection is completed.

The following sections describe the areas of private property proposed for shoreline protection under the action alternatives, the types of rock shoreline protection proposed, the strategies for protecting the saddle dikes and right dam abutment, Federal recreational facilities, and the Salmon La Sac Road embankment.

2.4.3.1 Privately-Owned Areas Proposed for Shoreline Protection

Raising the pool level of the reservoir would inundate an additional approximately 46 acres of shoreline for an average of 40 days per year primarily in June and July during years when runoff is available to fill the additional storage volume. Wave action from wind could cause increased erosion of the reservoir shoreline in some areas where additional inundation occurs. Based on analyses of inundation and erosion potential, Reclamation proposes to construct shoreline protection for approximately 16,900 feet of shoreline as listed in Table 2-3 and illustrated on Figure 2-8.

Table 2-3. Private Properties Proposed for Shoreline Protection

Location	Length of Stabilization (feet)
Speelyi Beach Day Use Area and properties to the north, approximately Mile 0.8 to Mile 1.3, including WSDOT pullout area	2,800
Sandelin Lane properties, approximately Mile 1.5 to Mile 1.9	2,000
Domerie Bay Road properties, approximately Mile 2.1 to Mile 2.6	2,000
Timber Cove Drive area, approximately Mile 4.8 to Mile 5.4	3,200
Approximately Mile 5.7 to Mile 6.0	1,600
Approximately Mile 7.5 to Mile 7.8	1,500
Approximately Mile 8.1 to Mile 8.5	1,400
Properties along the southwest shoreline west of the dam, Mile 0.7 to Mile1.2	2,400

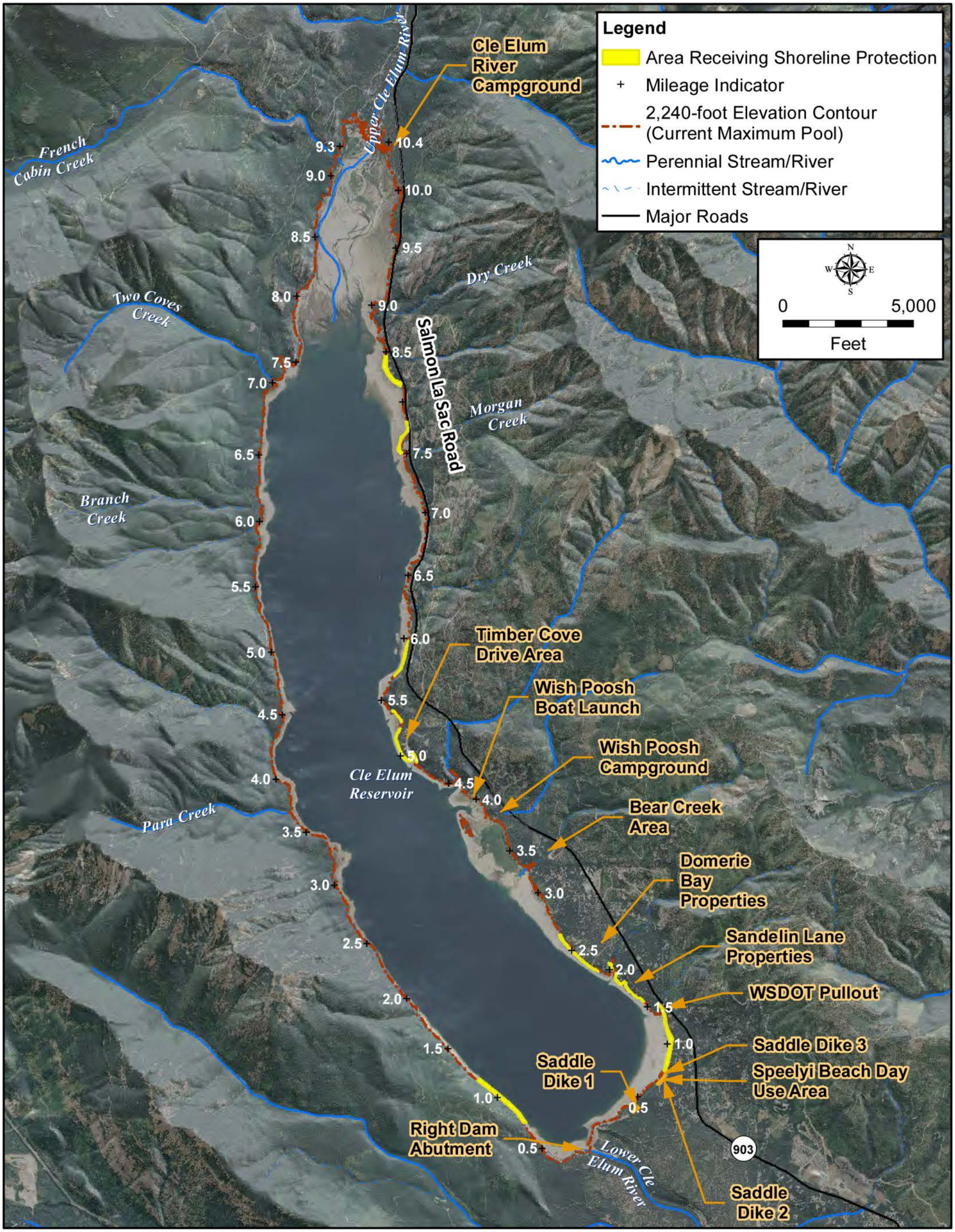


Figure 2-8. Areas Proposed for Shoreline Protection

2.4.3.2 Rock Shoreline Protection Construction Activities

Under the Rock Shoreline Protection strategy, Reclamation would place rock riprap against shorelines as the primary method to protect shoreline banks identified as being susceptible to erosion. Reclamation would install rock walls or gabion basket walls in areas where steep banks occur and space is too narrow for placing rock riprap. (Gabion baskets are wire baskets filled with cobbles and small boulders.)

The rock walls would be comprised of large rock placed in an interlocking fashion at a stable slope (usually 1-to-4 horizontal-to-vertical (H-to-V)). Gabion baskets would be stacked on top of each other at a slope similar to the rock wall.

Prior to installing shoreline protection, Reclamation would clear and grub the area (remove stumps and roots to provide a firm surface for embankments), and grade or fill the existing banks to a stable slope, usually 2-to-1 H-to-V or 3-to-1 H-to-V. Riprap would cover the slopes up to elevation 2,246. After construction, Reclamation would install native vegetation on exposed banks not covered by riprap. Reclamation would import rock material from an off-site commercial quarry near the reservoir area (approximately 15 to 30 miles from the reservoir). The specific quarry source(s) have not yet been confirmed. Reclamation has developed designs for rock shoreline protection for each of the sections of shoreline proposed for stabilization in Figure 2-8 (Reclamation, 2014b).

Table 2-4 shows the estimated quantities of clearing, excavation, fill, riprap protection, and other work to complete rock shoreline protection.

Table 2-4. Estimated Construction Quantities for Rock Shoreline Protection

Item	Estimated Quantity
Length of Shoreline Protection	16,900 feet
Clear and grub	21.7 acres
Cut	192,000 CY
Fill	53,000 CY
Riprap	45,000 CY
Geotextile	161,100 square yards
Restoration area	14.5 acres

2.4.3.3 Access Routes and Staging Areas

To the extent possible, Reclamation would use existing roads, cleared areas, and the dry reservoir bed for staging and access to construction sites. However, construction of approximately 5 miles of new shoreline access roads may be necessary to enter some sites, such as the right abutment of Cle Elum Dam, the shoreline west of the dam, and shorelines adjacent to or on private property where shoreline protection is proposed. New access roads would be approximately 20 feet wide, graded through existing soils, and surfaced with gravel if needed. Reclamation may also need to construct new access roads with paving on short embankments. Most of these roads would be temporary and Reclamation would restore them with native vegetation following construction. Reclamation may retain others for maintenance access.

2.4.3.4 Land Acquisition

Reclamation proposes to acquire fee title land or easements to install shoreline protection along some private property. Reclamation would only acquire land or easements from willing sellers. If Reclamation cannot acquire property necessary for project completion, Reclamation would develop options that may include avoidance or mitigation. This may require additional environmental review in the future.

The shoreline protection measures would extend 25 to 50 feet shoreward of the ordinary high water mark (OHWM). The extent of acquired land would depend on the specific site and the design of shoreline protection for that site. The acquired land or easements would allow access to construct and maintain the shoreline protection. For the alternatives that include rock protection, Reclamation could acquire approximately 20 acres of land.

2.4.3.5 Maintenance of Rock Shoreline Protection

Reclamation currently conducts an annual inspection of shoreline conditions at all five of its storage reservoirs in the Yakima River basin as part of its Directives and Standards and Standard and Operating Procedures (Reclamation, 2001). The inspection includes photographing the shoreline from a boat in the early summer and noting any unusual conditions. Reclamation compares the photographs and notes to inspections from previous years. If the inspection identifies changes to the shoreline, the Storage Program Manager consults with Reclamation engineers and geologists to determine whether the changes require action to protect the shoreline and the appropriate approach to addressing the changes.

Reclamation would include inspection of new shoreline protection measures in its existing program. Maintenance may also include revegetation, irrigation, weeding, spraying, and replacement of plants, as needed. The expected access for long-term maintenance is along the reservoir shoreline or through easements across private property acquired during construction.

2.4.4 Increase Freeboard of Saddle Dikes and the Right Dam Abutment

As part of the Cle Elum Dam construction, Reclamation constructed three saddle dikes in low areas at the south end of the reservoir. These saddle dikes provide freeboard and ensure impounded water and waves are contained within the reservoir during peak reservoir levels and during windstorms. The saddle dikes are located in a natural ridge that extends in a northeast direction from the main dam (Frontispiece and Figure 2-8)). A portion of Saddle Dike 3 provides public access to the Speelyi Beach area.

Reclamation proposes to raise the crest elevation of the three saddle dikes by approximately 3 feet to elevation 2,253 and to raise a portion of the crest elevation of the right abutment of the dam (right refers to the observer facing in the downstream direction). The higher elevation would provide additional freeboard for wave erosion protection. The higher pool elevation would not reach this area. Reclamation would maintain the original crest widths and side slopes. Because these areas are located above the full reservoir pool level, construction could occur any time between spring and fall.

2.4.4.1 Saddle Dike 1

Reclamation would stabilize Saddle Dike 1 by placing a 30-inch-thick layer of riprap on the reservoir side of the dike. The riprap would require approximately 190 cubic yards (CY) of earth that would be excavated from a borrow area, transported, placed, and compacted on the saddle dike. The project would include the following components:

- Construct a new temporary access road roughly 330 feet long by 20 feet wide connecting to the Cle Elum Dam Road.
- Clear approximately 0.75 acres of forest to provide access and a work area around the saddle dike.
- Create a borrow area approximately 250 by 100 feet located 900 feet west of the dam and 200 feet south of the reservoir. Reclamation would use this same borrow area for construction at Saddle Dikes 2 and 3 and the right dam abutment.
- Install erosion control measures around the perimeters of the staging area adjacent to the left dam abutment, access road, and work area.
- Stockpile existing riprap removed from above elevation 2,248 and trees larger than 18 inches in diameter for reuse on the saddle dike and site restoration.
- Import new riprap via public roads, requiring less than 20 truckloads.

Anticipated construction equipment includes a bulldozer, excavator, dump trucks, skid steer, and a vibratory compactor. Construction would take less than 2 weeks. Upon completion of the project, Reclamation would mulch and seed disturbed areas with a native grass mix. Site restoration would include placing salvaged trees across the work area and access road, and cutting the access road to make it impassable.

2.4.4.2 Saddle Dikes 2 and 3

Construction to raise Saddles Dikes 2 and 3 would occur concurrently. As part of the project, Reclamation would replace the existing Speelyi paved boat ramp at Saddle Dike 3 with a concrete boat ramp and repave the asphalt parking area in the Speelyi Beach Day Use Area. Construction would require closing Speelyi Beach Day Use Area for approximately 2 months starting in August and closing a portion of Lake Cabins Road for approximately 2 weeks during the same period. Alternative public access to the beach and residences would be maintained.

Raising Saddle Dikes 2 and 3 would include the following components:

- Clear approximately 1.6 acres of sparsely treed area to establish work areas around the two saddle dikes and a connection zone between the dikes.
- Install erosion control measures around the perimeter of the work area.

- Remove existing riprap from saddle dikes above elevation 2,248 and stockpile for reuse in raising the dikes.
- Remove and dispose of approximately 150 CY of asphalt surfacing and ecology blocks at the day use area, requiring approximately 15 truckloads.
- Retain and protect trees outside the work area, including the large cottonwood trees to the west.
- Remove and store informational signage.
- Construct a new concrete boat ramp, requiring approximately 80 CY of cement.
- Install asphalt paving in the day use area parking area and extend the asphalt to Lake Cabins Road, requiring approximately 90 tons of asphalt.
- Remove the existing vault toilet, replace with portable toilets, and construct an enclosure around the portable toilets.
- Install a gravel surface between the asphalt pavement and new portable toilets.

Construction to raise the freeboard on Saddle Dike 2 and construct the boat ramp and day use area would include excavation of 780 CY of earth from the borrow area west of the dam, conveying and trucking that material to the site, and compacting it in place. Upon completion of the earthwork, the work area would be fine-graded and topped with approximately 180 CY of compacted aggregate base course gravel. Reclamation would install a 30-inch-thick layer of riprap on the slopes north and south of the boat ramp, requiring approximately 1,090 CY of riprap.

To raise the freeboard on Saddle Dike 3, Reclamation would install a 30-inch-thick layer of riprap on the reservoir side of the dike. Construction would require excavating approximately 430 CY of earth from the borrow area, conveying and transporting it to the site, and compacting it in place.

Anticipated construction equipment would include an excavator, dump trucks, cement mixers, asphalt trucks and pavers, skid steer, backhoes, front-end loaders, and vibratory compactors. When construction is complete, Reclamation would mulch and seed disturbed areas with a native grass mix and reinstall USFS informational signage.

2.4.4.3 Raise Sections of the Right Abutment of the Dam

Reclamation would raise low areas of the right abutment of the dam up to elevation 2,253 by constructing a berm extending west from the right wall of the dam spillway. Reclamation would armor the berm with a 30-inch layer of riprap placed on the reservoir side of the berm and surface the top with gravel. Construction would require excavating approximately 3,600 CY of earth from the proposed borrow area west of the dam, transporting it to the site, and compacting it in place. Materials required include approximately 700 CY of riprap and 470 CY of gravel imported from offsite. The project would include the following components:

- Clear approximately 3.5 acres of forest to provide access and a work area.
- Create a borrow area approximately 250 feet by 100 feet, approximately 900 feet west of Cle Elum Dam (this is the same borrow pit identified for construction of the Saddle Dikes).
- Install erosion control measures around the perimeters of the staging area, access roads, and work area.
- Stage equipment in an existing cleared area south of the spillway.
- Utilize existing unimproved dirt road between the work and borrow areas.

Construction equipment would include an excavator, dump trucks, skid steer, backhoes, front-end loaders, and vibratory compactors. Reclamation would mulch and seed disturbed areas with native grasses.

2.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Reclamation proposes to provide shoreline protection in areas where necessary to maintain access and use of USFS recreation facilities. The shoreline protection was developed in cooperation with the USFS. Construction would occur during the off-season between Labor Day and Memorial Day when both Wish Poosh and Cle Elum River Campgrounds are closed. Reclamation would also add riprap protection to portions of Salmon La Sac Road.

2.4.5.1 Wish Poosh Campground

Reclamation proposes the following work at the campground:

- Raise the elevation of approximately 1,075 linear feet of the boat launch access road and stabilize the reservoir side of the road.
- Stabilize portions of the boat launch parking lot and relocate the wellhouse access road.
- Remove the water and electrical services to Picnic Island and the boat launch area.

Construction to raise the boat launch access road includes the following components:

- Remove approximately 300 CY of asphalt surfacing.
- Extend the Davis Creek culvert. Install a temporary cofferdam to isolate the work area and attach a culvert extension to the existing culvert.
- Establish a work area extending approximately 20 feet from the toe of the road embankment.

- Establish a 100-foot-by-100-foot borrow area on the reservoir bed, 600 feet south of the work area along the gravel road to Picnic Island. Use the existing gravel road for access between the work area and borrow area.
- Clear a total of approximately 1.9 acres of treed area, including approximately 10 to 20 feet on the side of the road and the extents of the borrow area.
- Salvage and stockpile existing riprap from the road embankment.
- Install temporary erosion control measures around the perimeters of the work area, access roads, and borrow area.
- Excavate earth from the borrow area to raise the level of the road and compact the material on the landward side of the road.
- Install asphalt paving atop and tie paving into existing pavement using 230 CY of gravel base and 180 tons of asphalt.
- Install a 24-inch-thick layer of riprap on the reservoir side between elevations 2,238 and 2,247 to protect the roadway embankment from erosion, using approximately 820 CY of riprap.

Reclamation would undertake the following activities in the boat launch parking lot and at Picnic Island:

- Remove water and electrical services to Picnic Island and the boat launch area.
- Remove the vault toilets at Picnic Island and replace with portable toilets. Construct an enclosure around the portable toilets.
- Remove and dispose of the existing stairways. Install a 24-inch thick layer of rock riprap at the location of the removed stairs.
- Remove an existing street lamp at the boat launch area.
- Retain and protect vegetation on the south side of the parking lot.
- Remove asphalt paving on the edge of the parking lot and install a new concrete parapet wall footer and wall with a Cascadian theme grouted stone fascia.
- Backfill the wall and patch the asphalt paving.

Reclamation proposes the following work to relocate the access road to the wellhouse in Wish Poosh Campground:

- Clear a treed area above the reservoir high water line, approximately 16 feet wide and 100 feet long.

- Grade a road through this area and top it with gravel brought in from a commercial source. The specific quarry source(s) have not yet been confirmed.

- Install an access gate at the new road and make the existing access road impassable.

The anticipated types of construction equipment at the site would include an excavator, dump truck, asphalt trucks and pavers, skid steer, backhoe, front-end loader, and vibratory compactor. Reclamation would reseed and mulch disturbed areas using a native grass mix. Construction at Wish Poosh Campground would last approximately 1 month.

2.4.5.2 Cle Elum River Campground

Reclamation proposes to construct improvements to protect five campsites (Sites 1, 2, 3, 9, and 12) and two vault toilets north of Site 9 in Cle Elum River Campground. To protect the campsites from wave action, Reclamation would construct a berm on the south side of the campground along the shoreline and connect it to the existing road embankment. Reclamation would also replace the vault toilets with portable toilets and construct an enclosure around them. Construction of the berm would include the following components:

- Clear and grub trees and vegetation from the berm area (approximately 0.7 acres). Salvage large trees.

- Excavate a 3-foot-deep by 2-foot-wide trench along the shoreline. Reuse the excavated material (roughly 250 CY) in the berm construction.

- Clear vegetation from a borrow location in the reservoir bed (approximately 0.4 acres).

- Excavate 1,400 CY of earth from the borrow site.

- Construct a liner in the trench using imported impervious material, such as compacted select fill, bentonite, or a synthetic membrane.

- Create a 10-foot-wide berm, using earth from the borrow site and compacting it in place in the trench. The berm would be approximately 10 feet wide at the top with 2-to-1 H:V side slopes. The height of the berm would be less than 3 feet above adjacent grade.

- Install a protective cover on the berm. The protective cover would include angular riprap, rounded cobbles, or topsoil with rooted plantings. Install salvaged logs and large wood on the reservoir side of the berm. Anchor the large wood to log anchors or large rocks using wire rope.

Construction equipment would include an excavator, dump truck, mobile crane, skid steer, backhoe, front-end loader, and vibratory compactor. Reclamation would shape and contour the borrow site to match the existing ground and mulch and seed disturbed areas with a native grass mix. Construction at Cle Elum River Campground would last approximately 1 week.

2.4.5.3 Salmon La Sac Road Embankment

At the north end of Cle Elum Reservoir, an earthen embankment provides the base for portions of Salmon La Sac Road. Reclamation has determined that some sections of the road would require additional riprap for protection from the higher reservoir level. The sections of road identified for protection include the following (Figure 2-8):

- A 1,000-foot-long section south of Carillon Cove Drive (approximately 1,000 feet)
- A 2,500-foot-long section between Morgan Creek Road and Night Sky Drive
- A 600-foot-long section near the south end of Cle Elum River Campground

Figure 2-8 illustrates the areas between Mile 5.5 and Mile 8.5 on Salmon La Sac Road.

Reclamation would install additional riprap to raise the elevation of the existing shoreline protection to 2,246 feet. Access would be via the existing road and construction equipment would operate from the existing road. Salmon La Sac Road would remain open during construction, but traffic would be restricted to a single lane. Excavators would clear and reshape the embankment slope above elevation 2,240. Reclamation would place a 24-inch layer of riprap. Construction would require approximately 5,000 CY of riprap trucked to the site from a commercial quarry source. The specific quarry source(s) have not yet been confirmed. Construction on Salmon La Sac Road would last approximately 2 months.

2.5 Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection

Under Alternative 3, Reclamation and Ecology would use the additional stored water for instream flows as described for Alternative 2, but would employ a hybrid shoreline protection strategy.

2.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Reclamation would implement the same spillway radial gate modifications, construction activities, and operations as described for Alternative 2, Additional Stored Water Used for Instream Flow with Rock Shoreline Protection (Section 2.4.1). Modifying the existing spillway radial gates would allow an additional 14,600 acre-feet of water to be stored in Cle Elum Reservoir, increasing its total capacity to 451,500 acre-feet, which is the same for all action alternatives.

2.5.2 Additional Stored Water for Instream Flows

Reclamation and Ecology would use the additional stored water for instream flows as described for Alternative 2 (Section 2.4.2).

2.5.3 Hybrid Shoreline Protection

Under the Hybrid Shoreline Protection strategy, Reclamation would protect shorelines using rock walls where needed combined with bioengineered shoreline protection, such as perched beaches, anchored logs, and other techniques described in Section 2.5.3.2.

2.5.3.1 Areas Proposed for Shoreline Protection

Reclamation would provide shoreline protection for the same areas as described for Alternative 2 (Section 2.4.3). Reclamation has developed designs for each of these areas (Table 2-3).

2.5.3.2 Hybrid Shoreline Protection Methods

Reclamation would use some or all of the treatments described below in areas where increased shoreline erosion is expected. Many of the treatments require the use of logs or rootwads. Reclamation would obtain these materials from its stockpile of trees removed from the reservoir.

- **Perched beach**. A perched beach consists of a band of compacted fill placed directly against existing slopes to create a new beach perched above the existing reservoir bed. Reclamation would use soils from the reservoir placed in a band roughly 50- to 100-feet-wide, 3- to 6-feet-thick, at slopes ranging from 4-to-1 to 8-to-1 H-to-V. At slopes of 4-to-1 up to 8-to-1 H-to-V, Reclamation proposes placing a cobble blanket of 3- to 6-inch rock on top of the fill. For slopes flatter than 8-to-1 H-to-V, no cobble blanket is proposed.

  This treatment is most suitable on shoreline areas with a stable, relatively flat beach slope. Perched beaches would replicate the variable slopes and materials found in natural beaches. On flatter beach slopes, the surface would be fine-grained sand and small gravel; on steeper slopes, the surface would be cobbles. Where drainages, natural topography, and constructed features permit, Reclamation would place lesser thicknesses of fill and permit coves to develop. Figure 2-9 shows an example of how a perched beach might look after construction when placed against an eroding slope.

Figure 2-9. Perched Beach

- **Conventional riprap.** Reclamation would dump or machine place angular, broken rock against prepared slopes. Construction would include the following components:
  - Clear vegetation and organic material and grub roots.
  - Grade and smooth slopes prior to placement of rock.
  - Install a gravel or geotextile filter to prevent displacement of fine material behind the riprap layer.
- **Riprap in vegetated slopes.** This treatment would involve selective clearing followed by machine placement of angular, broken rock around trees and trimmed shrubs, requiring minimal grading of slopes.
- **Rockery wall.** Reclamation would create a rockery wall by stacking large, angular rock in an interlocking fashion; typical slopes range from 1-to-4 to 1-to-6 H:V. Walls would generally be 8- to 10-feet high (Figure 2-10).

Figure 2-10. Typical Rockery Wall

- **Anchored logs.** Anchored logs could be a variety of types, species, configurations, and combinations. Branches and rootwads of whole trees increase the ability to trap and retain sediment, as well as to break up wave energy. Reclamation would use trimmed trees in some locations, as they are easier to transport. The placement of logs may be either parallel or perpendicular to the shoreline. Logs placed parallel to the shoreline are more suitable where wave energy is low, such as in coves and inlets.

- **Log revetment**. Log revetment refers to logs and clusters of logs, placed perpendicular to the shoreline to break up focused wave energy, or where a specific piece of infrastructure is threatened. Reclamation would obtain logs for the project from its stockpile of logs collected from the reservoir and anchor them in place. The logs would have diameters of at least 18 inches, ranging between 30 and 90 feet long.

- **Log terraces.** Reclamation would place rows of anchored logs parallel to the shoreline with cobbles or free-draining gravel behind each row of logs at maximum 1-to-8 H-to-V slope. Figure 2-11 illustrates an example of a short log terrace supporting a slope.

Figure 2-11. Example of a Log Terrace

Reclamation would use some or all of the following treatments in moderate-to-low-wave and energy areas, defined as areas that are sheltered from wind driven waves, with fetch less than 2.5 miles:

- **Slope reshaping**. Cut back existing near-vertical cliffs to a stable slope, typically 1.5-to-1 H-to-V or flatter.
- **Slash and soil.** Place alternating layers of small woody slash material (less than 3 inches in diameter with leaves or needles) and topsoil on the shore, using excavator teeth to break up the slash and work topsoil material into it.
- **Fell and anchor.** Fell whole trees above the erodible slope and anchor them to stable locations, such as stumps, bedrock, or existing trees, located above the extent of erosion. Tree branches and needles would cover the soil, prevent soil particles from dislodging, and retain dislodged particles.
- **Live brush treatment**. Alternate layers of live branches and compacted backfill.
- **Seeding.** Dry broadcast or hydroseed exposed slopes with native plant seeds.
- **Rooted planting.** Install rooted plants on slopes.
- **Live staking.** Install live, woody cuttings into the soil to root, grow, and create a living root mat that stabilizes the soil by reinforcing and binding soil particles together, and by extracting excess soil moisture.
- **Fascines**. Bind dormant branch cuttings together into long sausage-like, cylindrical bundles and place them in shallow trenches, covered with topsoil. Allow the cuttings to sprout and grow.

- **Fabric encapsulated soil lifts**. Place alternating layers of live branch cuttings and compacted soil with natural or synthetic geotextile wrapped around each soil lift.
- **Erosion control fabric**. Secure erosion control fabric to the ground using metal or wooden stakes. Fabric is typically composed of natural loose material, such as straw, jute (vegetable fiber), or coir (coconut husk fibers), which is sandwiched between netting. Netting may be jute, woven coir, or polypropylene (including biodegradable material).
- **Coir logs and straw wattles.** Place cylindrical structures composed of natural coconut husk fibers or straw bound together with jute, coir, or polypropylene netting on the ground. The structures trap sediment, which encourages plant growth within the log or wattle.

2.5.3.3 Hybrid Shoreline Protection Construction Approaches

Reclamation has developed designs for Hybrid Shoreline Protection for each of the sections of shoreline proposed for stabilization in Table 2-3 (Reclamation, 2014b). The following bullets summarize the proposed hybrid shoreline protection strategies, along with the associated construction activities for each site.

- **Speelyi Beach, Mile 0.8 to Mile 1.3.** Reclamation would construct a series of perched beaches along roughly 2,800 feet of shoreline between the Speelyi Beach Day Use Area and the Washington State Department of Transportation (WSDOT) pullout. Minor drainages, including Mill Creek, would form natural separation between the perched beaches. Within the low areas and drainages, Reclamation would install anchored rootwad logs and cluster some of the rootwad logs into revetments. Once the earthwork is completed, Reclamation would place driftwood salvaged from the construction area on the perched beaches and in the coves. Reclamation would revegetate the beach area above the new high water line with native plants. West of the WSDOT pullout, the earthwork would cause the alignment of a minor ephemeral drainage to shift to the north.

- **Sandelin Lane, Mile 1.5 to Mile 1.9.** Along the shoreline adjacent to Sandelin Lane, Reclamation would construct four discontinuous sections of rockery wall against the existing shoreline scarp. A riprap blanket extending roughly 20 feet from the wall and built of 30-inch riprap, 3 feet thick, at a 2-to-1 slope H-to-V would protect the reservoir side of the rockery wall. Anchored rootwad logs arranged in terraces would protect natural low areas and drainages.

- **Domerie Bay Road, Mile 2.1 to Mile 2.6.** Along the shoreline adjacent to Domerie Bay Road, Reclamation would construct three discontinuous sections of shoreline protection, totaling 2,000 feet long. Construction would include log terraces and a perched beach at the north end. The perched beach would extend roughly 500 feet in length and 100-200 feet behind the existing high water line.

- **Timber Cove Drive, Mile 4.8 to Mile 5.4.** Reclamation would install approximately 3,200 feet of rootwad shoreline protection.

- **Mile 5.7 to Mile 6.0.** Reclamation would install approximately 1,600 feet of rootwad shoreline protection.
- **Mile 7.5 to Mile 7.8.** Reclamation would install approximately 1,500 feet of perched beach shoreline protection.
- **Mile 8.1 to Mile 8.5.** Reclamation would install approximately 1,400 feet of perched beach shoreline protection.
- **Properties along the southwest shoreline, Mile 0.7 to Mile 1.2.** Reclamation would install approximately 2,400 feet of rootwad shoreline protection.

2.5.3.4 Construction Activities

Reclamation would construct all hybrid shoreline protection in the dry, when the reservoir is drawn down. Reclamation would install appropriate erosion control measures, such as silt fence and straw wattles, around the perimeters of the staging area, borrow area, access roads, and work area. Trucks would haul imported large rocks, quarry spalls, and riprap via public roads. Commercial sources of materials and haul routes have not yet been confirmed. Heavy equipment to perform the work is likely to include an excavator with a thumb, dump trucks, skid steer, backhoes, front-end loaders, and vibratory compactors.

The following bullets describe construction activities associated with the three most common hybrid shoreline protection techniques:

- **Perched beaches.** Reclamation would locate the borrow area, work area (roughly 120 feet wide, extending from the current high water line into the reservoir bed), staging area, and access roads on the reservoir bed near the construction sites. Construction of the perched beaches would involve the following components:
  - Clear areas on the reservoir of organic material and obstructions.
  - Excavate sand and gravel from the borrow area, and place and compact it on the shoreline, using trucks or scrapers.
  - Place and anchor rootwad logs using an excavator.
  - Spread stockpiled driftwood on top of the new fill and install container plantings at the new high water line.
- **Rockery walls.** In some areas, equipment may need to operate from the top of the slope to perform this work. Construction of the rockery walls would involve the following components:
  - Clear and grub a work area roughly 30 feet wide along the rockery wall alignment. This would mainly involve removing hazardous trees.
  - Salvage and stockpile trees larger than 18 inches in diameter.

- Retain major structures at the top of the eroding slope.
- Remove existing landscaping features, such as rock terraces, retaining walls, and beach access stairs as needed.
- Shape and grade existing banks to a 1-to-1 H-to-V slope, and deposit the excavated material on the reservoir bed.
- Stack large rocks in an interlocking fashion at the toe of the graded slopes and backfill with quarry spalls.
- Place riprap in a 30-inch layer at the toe of the rockery wall.

- **Log terraces.** Construction of the log terraces would involve the following components:
  - Install ecology blocks (large cast concrete blocks used for retaining walls) or other suitable anchors in terraces between elevations 2,240 and 2,243.
  - Secure rootwad logs to the anchors.
  - Place uncrushed 3-inch to 6-inch cobbles between the logs.
  - Mulch and seed disturbed areas with a native grass mix.

Table 2-5 lists the estimated quantities of construction activities.

Table 2-5. Estimated Construction Quantities for Hybrid Shoreline Protection

Item	Estimated Quantity
Length of Shoreline Protection	16,900 feet
Clear and grub	30.1 acres
Cut	195,000 CY
Fill	215,000 CY
Riprap	5,200 CY
Geotextile	9,100 square yards
Large rock	3,100 CY
Quarry spalls	3,600 CY
Restoration area	19.5 acres
Rootwad logs	2,606

2.5.3.5 Access Routes and Staging Areas

Access roads would be similar to those described in Section 2.4.3.3for Rock Shoreline Protection.

2.5.3.6 Land Acquisition

As described in Section 2.4.3.4, Reclamation may need to acquire fee title land or easements to install shoreline protection along private property. For Alternative 3, Reclamation could acquire approximately 20 acres of land.

2.5.3.7 Maintenance for Hybrid Shoreline Protection

Reclamation would continue its existing shoreline inspection program as a means to monitor future erosion with the higher reservoir level as described in Section 2.4.3.5. Access for long-term maintenance would be along the reservoir shoreline or through easements across private property. Under Alternative 3, Reclamation would identify the appropriate shoreline protection strategy for areas identified as needing additional protection from the various techniques described in Section 2.5.3.2. Reclamation would monitor and maintain the hybrid shoreline protection treatments, as needed.

2.5.4 Increase Freeboard of Saddle Dikes and the Right Dam Abutment

Reclamation would raise the crest elevation of the three saddle dikes and right dam abutment by approximately 3 feet to elevation 2,253, and raise low areas of the right abutment of the dam using the same approach and construction activities as described for Alternative 2, Additional Stored Water Used for Instream Flow with Rock Shoreline Protection (Section 2.4.4).

2.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Reclamation would implement shoreline protection measures at Wish Poosh Campground and Boat Launch and Cle Elum River Campground, as well as add riprap protection to portions of Salmon La Sac Road, using the same approach and construction activities as described for Alternative 2, Additional Stored Water Used for Instream Flow with Rock Shoreline Protection (Section 2.4.5).

2.6 Alternative 4 – Additional Stored Water Used for TWSA with Rock Shoreline Protection

Under Alternative 4, Reclamation and Ecology propose to allocate the additional stored water for Total Water Supply Available (TWSA) as well as for instream flows. This alternative would require additional authorization from Congress. Alternative 4 would employ the same Rock Shoreline Protection strategy described for Alternative 2 (Section 2.4.3).

2.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

The proposed spillway radial gate modifications, construction activities, and operations and maintenance would be the same as described for Alternative 2 (Section 2.4.1). Modifying the existing spillway radial gates would allow an additional 14,600 acre-feet of water to be stored in Cle Elum Reservoir, increasing its total capacity to 451,500 acre-feet, which is the same for all action alternatives.

2.6.2 Additional Stored Water Used for TWSA

Under Alternative 4, Reclamation and Ecology propose to use the additional stored water as part of TWSA to provide water supply for proratable irrigation districts or for instream flows. As described in Section 1.4.2, TWSA is a measure of water supply that Reclamation uses to allocate water in the Yakima River basin.

TWSA is defined as follows:

> "That amount of water available in any year from natural flow of the Yakima River, and its tributaries, from storage in the various Government reservoirs on the Yakima watershed and from other sources, to supply the contract obligations of the United States to deliver water and to supply claimed rights to the use of water on the Yakima River and its tributaries, heretofore recognized by the United States."

Reclamation interprets the above to mean:

> . . . the total water supply available for the Yakima River basin above PARW (the United States Geological Survey (USGS) gage at Parker referred to as "Parker gage", located below Union Gap and the Sunnyside Diversion Dam), for the period April through September.

This is expressed in a mathematical formula, reading as follows:

	April 1 through July 31 forecast of runoff
+	August 1 through September 30 projected runoff
+	April 1 reservoir storage contents
+	Usable return flow upstream from Parker gage
=	TWSA

TWSA provides an estimated total water volume available for use in determining the instream flow targets for each year in accordance with the operating criteria of the YRBWEP legislation. The total demand on TWSA for irrigation, regulation, and flows passing Parker gage averages 2.7 million acre-feet (including Title XII target flows) in a normal year. The Title XII target flows refer to the flow targets established through the 1994 Title XII Yakima River Basin Water Enhancement Project legislation (108 Stat. 4526 U.S. Code). Reclamation determines these target flow levels each year based on TWSA for that year. The flows range from 300 cfs to 600 cfs depending on how large TWSA is for that year. Reclamation manages the flow targets at Sunnyside and Prosser Diversion dams on the Yakima River downstream from Yakima. Reclamation manages releases of water from its five reservoirs to meet the targets set for the water year.

An increase in TWSA may result in an increase in minimum flows past Parker gage and Prosser Dam per Title XII Target Flows (Table 2-6). However, hydrologic modeling predicts that would occur infrequently, in about 5 percent of the years modeled. The reason is the volume of additional stored water in Cle Elum Reservoir would be small (14,600 acre-feet) compared to the difference in TWSA that triggers greater target flows (250,000 acre-feet). For that reason, Reclamation would use the additional stored water to supply proratable water users during a drought if the water is available (Section 1.4.2).

Table 2-6 summarizes the Title XII target flows based upon TWSA. See Section 3.3.4.1 of the Integrated Plan PEIS for additional information (Reclamation and Ecology, 2012).

Table 2-6. Title XII Target Flows

TWSA (million acre-feet)				Parker and Prosser Flows (cfs)	Title XII Minimum Flow Past Parker Gage July-September Demand (acre-feet)
Apr-Sept	May-Sept	Jun-Sept	Jul-Sept		
3.20	2.90	2.4	1.9	600	117,000
2.90	2.65	2.2	1.7	500	100,000
2.65	2.40	2.0	1.5	400	84,000
Less than above TWSA				300	68,000

Source: Reclamation and Ecology, 2012

Alternative 4 would require Reclamation to seek additional authorization from Congress to allow uses of the water for other than instream flow. Reclamation, in consultation with SOAC, would manage the increased water supply to help meet the goals of the Integrated Plan, which include providing more reliable and sustainable water resources for the health of the riverine environment and for agricultural, municipal, and domestic water users.

If Reclamation manages the additional stored water to increase water supply for proratable irrigation districts during drought years, the additional stored water would be carried over from year to year until a drought occurs. Hydrologic modeling performed using the RiverWare model predicts an increase in water supply for those proratable districts during drought years of 0.0 percent to 1.6 percent. The average increase is 1.0 to 1.6 percent compared to baseline conditions (Section 4.2.5.2).

2.6.3 Rock Shoreline Protection

The shoreline protection strategies would be the same as described for Alternative 2 (Section 2.4.3).

2.6.4 Increase Freeboard of Saddle Dikes and the Right Dam Abutment

Reclamation would raise the crest elevation of the three saddle dikes by approximately 3 feet to elevation 2,253, and raise low areas of the right abutment of the dam using the same approach and construction activities as described for Alternative 2, Additional Stored Water Used for Instream Flow with Rock Shoreline Protection (Section 2.4.4).

2.6.5 Shoreline Protection for Federal Recreation Facilities and Access

Reclamation would implement shoreline protection measures at Wish Poosh Campground and Boat Launch and Cle Elum River Campground, as well as add riprap protection to portions of Salmon La Sac Road, using the same approach and construction activities as described for Alternative 2, Additional Stored Water Used for Instream Flow with Rock Shoreline Protection (Section 2.4.5).

2.7 Alternative 5 – Additional Stored Water Used for TWSA with Hybrid Shoreline Protection

For Alternative 5, Reclamation and Ecology propose to use the additional stored water for TWSA as described for Alternative 4, but would employ the Hybrid Shoreline Protection strategy as described for Alternative 3. This alternative would require additional authorization from Congress.

2.7.1 Spillway Radial Gate Modifications to Raise Reservoir Level

The proposed spillway radial gate modifications, construction activities, and operations and maintenance would be the same as described for Alternative 2 (Section 2.4.1). Modifying the existing spillway radial gates would allow an additional 14,600 acre-feet of water to be stored in Cle Elum Reservoir, increasing its total capacity to 451,500 acre-feet, which is the same for all action alternatives.

2.7.2 Additional Stored Water Used for TWSA

The description of the additional stored water for TWSA is the same as described for Alternative 4 (Section 2.6.2).

2.7.3 Hybrid Shoreline Protection

The Hybrid Shoreline Protection would be the same as described for Alternative 3 (Section 2.5.3).

2.7.4 Increase Freeboard of Saddle Dikes and the Right Dam Abutment

Reclamation would raise the crest elevation of the three saddle dikes by approximately 3 feet to elevation 2,253, and raise low areas of the right abutment of the dam using the same approach and construction activities as described for Alternative 2, Additional Stored Water Used for Instream Flow with Rock Shoreline Protection (Section 2.4.4).

2.7.5 Shoreline Protection for Federal Recreation Facilities and Access

Reclamation would implement shoreline protection measures at Wish Poosh Campground and Boat Launch and Cle Elum River Campground, as well as add riprap protection to portions of Salmon La Sac Road, using the same approach and construction activities as described for

Alternative 2, Additional Stored Water Used for Instream Flow with Rock Shoreline Protection (Section 2.4.5).

2.8 Comparison of Facilities for Shoreline Protection Alternatives

Table 2-7 compares quantities of the major construction activities associated with the rock shoreline protection alternatives (Alternatives 2 and 4) and the hybrid shoreline protection alternatives (Alternatives 3 and 5) described in the sections above. Using the additional stored water for instream flows (Alternatives 2 and 3) or TWSA (Alternatives 4 and 5) does not require construction other than modification to the radial gates.

Table 2-7. Comparison of Estimated Construction Quantities for the Shoreline Protection Alternatives

Item	Estimated Quantities - Rock Shoreline Alternative	Estimated Quantities - Hybrid Shoreline Alternative
Length of Shoreline Protection	16,900 feet	16,900 feet
Clear and grub	21.7 acres	30.1 acres
Cut	192,000 CY	195,000 CY
Fill	53,000 CY	215,000 CY
Riprap	45,000 CY	5,200 CY
Geotextile	161,100 square yards	9,100 square yards
Large rock	---	3,100 CY
Quarry spalls	---	3,600 CY
Restoration area	14.5 acres	19.5 acres
Rootwad logs	---	2,606
Haul Road Construction	26,500 feet (5 miles)	26,500 feet (5 miles)

Table 2-8 summarizes and compares the costs associated with the proposed alternatives, including the cost of modifying the radial gates, in 2014 dollars.

Table 2-8. Comparison of Estimated Cost of Shoreline Protection Alternatives

Project Component	Estimated Cost - Rock Shoreline Alternative	Estimated Cost - Hybrid Shoreline Alternative
Radial Gate Modification	$900,000	$900,000
Shoreline Protection	$7,700,000	$7,400,000
Saddle Dikes and Right Dam Abutment	$405,000	$405,000
Recreational Facilities and Access	$896,000	$896,000
Acquisition	Not Yet Determined	Not Yet Determined
Total	**$9,901,000**	**$9,601,000**

2.9 Alternatives Eliminated from Detailed Study

Reclamation has evaluated a number of projects in the past for increasing the amount of storage in Cle Elum Reservoir. The projects included proposals to access the inactive storage (water stored in the reservoir below the outlet works) in the reservoir and proposals to increase the storage capacity of the reservoir.

2.9.1 Inactive Storage Proposals

Reclamation released a preliminary engineering report in 1984 that presented conceptual plans and summarized the options for accessing inactive storage at Cle Elum Reservoir (Reclamation, 1984b). Inactive storage is the amount of water in Cle Elum Reservoir that Reclamation cannot access because the water is below the level of the existing outlet works. One option proposed for accessing the inactive storage was to construct a tunnel from the reservoir to discharge to the Yakima River. Reclamation considered this option infeasible because of high cost (over $600 per acre-foot of water in 1984 dollars). The second option was to install a pumping plant or pumps to access the inactive storage. The preliminary study concluded that the pumps and pumping plants would have high costs and would have aesthetic impacts. The report also concluded that the proposed pumping options would be difficult to service and maintain and questioned the reliability of the unproven pumping technology. Reclamation eliminated these inactive storage proposals from future consideration because of high costs, high environmental impacts, and technical issues that made them infeasible.

2.9.2 Increased Storage Proposals

Reclamation also evaluated different options for increasing storage in the reservoir. Proposals included raising the reservoir level from 2 feet to up to 15 feet (Reclamation, 1984a). The 1984 Damsite and Structure Review Team Report determined that it was possible to raise the reservoir elevation 2 to 3 feet without raising the dam, but raising the elevation by 10 to 15 feet would require raising the dam embankments and constructing new dikes. Reclamation determined that the higher elevation increase (10 to 15 feet) would involve high construction costs and more environmental impacts. Reclamation therefore determined that the 3-foot elevation raise proposal would provide increased instream flows, require minimal changes at the dam, and reduce impacts to the adjacent shoreline and dam structure. Reclamation advanced the 3-foot pool raise as a project included in YRBWEP Phase 2 and Congress authorized it in 108 Stat. 4526 USC.

2.10 Summary Comparison of Environmental Impacts of Alternatives

Table 2-9 compares the impacts associated with the No Action Alternative and the four Action Alternatives. Chapter 4 provides additional information about potential impacts.

Table 2-9. Summary Comparison of Impacts

Surface Water			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No opportunity to improve instream flows or improve water supply for TWSA. Water supplies for proratable irrigation districts would fall below 70 percent of entitlements more frequently. Reservoir would take longer to fill during dry years.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Construction of the spillway gates would occur when the reservoir is drawn down near the end of the irrigation season and would not affect operation of the spillway gates or water storage and water releases from the dam. • Reservoir storage capacity increase of 3.3 percent. • Inundation of additional 46 acres of shoreline during pool raise with small increases in reservoir fluctuations. • Slight reduction of flow from the reservoir in spring when additional water is being stored. • Reservoir will fill above existing full pool level at elevation 2,240 in 72 percent of years and fill to elevation 2,243 in 52 percent of years. • Reservoir will stay above existing full pool for an average of 39 days (June 2 – July 10) during years sufficient runoff is available to fill the reservoir.	• Construction would not affect reservoir operations because it would occur when the reservoir is drawn down. • Additional stored water would provide instream flows of approximately 36 cfs for 6 months (20 percent increase in winter flows). • Increased instream flows would improve overwintering fish habitat. • Alternative use of water would maintain higher pool levels all year and provide better passage conditions for outmigrating smolts for proposed Cle Elum Fish Passage project.	• Construction would not affect reservoir storage or releases. • No impacts to long-term reservoir operation.

Surface Water			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2	Same as Alternative 2
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	• Volume stored and surface area would be the same as Alternative 2. • Additional water stored in the reservoir would be retained until needed for water supply Construction would not affect reservoir storage or releases. • Reservoir will fill above existing full pool level at elevation 2,240 in 71 percent of years and fill to elevation 2,243 in 53 percent of years. • Reservoir will stay above existing full pool for up to 2 days longer than Alternative 2	• Increased water supply in drought years of up to 1.6 percent compared to baseline conditions.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 2.

Earth			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Shoreline erosion would continue as it currently occurs. The west shoreline could have the greatest potential impact; the east shoreline includes some shoreline protection. No construction-related impacts would occur.		

Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Minimal construction-related impacts associated with the radial gate modification.
	• Increases in shoreline erosion where no shoreline protection is proposed.
	• 8,300 feet (17 percent) of the west shoreline would be susceptible to erosion.
	• 2 to 5 acres of area could be eroded with 17,000 to 34,000 CY of material deposited in the reservoir.
	• Impacts are considered minor compared to the size of the reservoir.
		• No additional erosion would occur.	• Short-term increase in erosion during construction.
			• Approximately
			  ◦ 22 acres of clearing
			  ◦ 195,000 CY of excavation
			  ◦ 55,000 CY of fill
			  ◦ 45,00 CY of riprap
			  ◦ 15 acres revegetated
			  ◦ 5 mi of temporary access roads
			• Long-term protection from erosion.

Earth			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**

Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	• Short-term increase in erosion during construction.
			• Approximately
			  ◦ 30 acres of clearing
			  ◦ 195,000 CY of excavation
			  ◦ 215,000 CY of fill
			  ◦ 6,100 CY of riprap
			  ◦ 12,000 CY of large rock
			  ◦ 20 acres revegetated
			  ◦ 5 mi of temporary access roads
			• Hybrid shoreline protection could keep more shoreline bank slopes exposed to wave erosion than rock shoreline protection and would therefore result in more erosion in the first years after construction
			• Long-term protection from erosion.

Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Surface Water Quality			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Construction-related water quality impacts will not occur. Existing water quality trends will continue. Criteria that currently do not meet water quality standards, including seasonal temperature exceedances, would continue and potentially increase with climate change conditions.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• No construction impacts would occur because construction will occur in dry conditions when the reservoir is drawn down. • Nutrient and sediment loads could increase by a small amount associated with erosion, and short term localized exceedances of water quality standard could occur. • Temperature increases are not expected to be measureable. • Long-term nutrient and dissolved oxygen levels, and temperature would remain similar to existing conditions resulting in the reservoir remaining oligotrophic.	• No construction impacts would occur. • Both decreases and increases to streamflows in the Cle Elum and Yakima rivers would occur. • Decreases in Yakima River instream flows would occur in spring, when flows are highest; water quality impacts would not occur. • Discharges to Cle Elum River would raise water temperatures no more than 0.3° C, which would meet State Water Quality Standards.	• Short-term suspended sediment and turbidity increases after shoreline protection is constructed. Some exceedances may exceed state standard of 5 NTU over background. Exceedances would be localized in construction area and dissipate and settle within the water column. • Long-term turbidity or suspended sediment impacts are not expected.

Surface Water Quality			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	• Impacts would be the same as Alternative 2.		• Short-Term suspended sediment and turbidity increases after shoreline protection is constructed. Some exceedances may exceed state standard of 5 NTU over background. • Reservoir may experience an increase in suspended sediment by 1.5 to 3.0 mg/l for a period of 5 years following the 5-year construction period associated with fine sediments in the fill material. Exceedances would be localized and dissipate and settle within the water column. • Minor to no turbidity impacts expected over the first decade of operation. Reservoir may experience an increase in suspended sediment by 0.25 to 0.5 mg/l after construction areas stabilize.
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Impacts would be the same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Impacts would be the same as Alternative 3.		

Groundwater			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	There would be no construction impacts to groundwater, because no construction would occur. Groundwater conditions would continue consistent with baseline conditions.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Potential construction impacts associated with spills or leaks, dewatering not required. • Temporary and cyclical groundwater level responses to the increased pool level could occur. Maximum fluctuation of 3 feet is expected. • No anticipated negative effects on local aquifers, wells, or on-site septic systems (OSS) due to depth of wells and separation of inundated areas from OSS.	• Possible small temporary and cyclical fluctuations in groundwater levels adjacent to downstream rivers, but fluctuations would be within the range of normal seasonal variability.	• Spills or leaking construction equipment could affect groundwater quality. • No long-term impacts to groundwater are expected.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Fish			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No changes in reservoir levels and no increases in instream flows downstream of Cle Elum Dam would result in continued low fish survival and productivity in the Cle Elum River. Kokanee and lake trout populations would gradually decline. Existing trends of fish survival and productivity could continue and/or worsen with climate change or other changed conditions in the basin.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Construction impacts would not occur because construction would occur when the reservoir is drawn down. • Increased erosion in newly exposed shoreline areas could increase turbidity, impacts not expected to be significant. • Small impacts from changes to riparian vegetation, no lasting impacts are expected. • Minor increases in new littoral habitats and shifts in spawning habitats. Species using littoral habitats including mountain whitefish, cutthroat, brown, and rainbow trout and others would benefit. • Risk of stranding when the reservoir level recedes is similar to No Action alternative.	• Increased flows would expand overwintering habitat for resident and anadromous salmonids in the Cle Elum River. • Increased flows would incrementally bring Cle Elum River closer to unregulated flows, improving habitat conditions for native fish and ecosystems. • Additional water carried over to following year would improve efficiency of fish passage for out-migrating juvenile salmon. • Lower flows in spring would occur when high flows from snowmelt fill the reservoir above 2,240 feet. Impacts to fish in Cle Elum River not expected because current flow regime would continue.	• No construction impacts because construction would occur in the dry period. • Potential minor negative impacts to fish by interrupting natural hydrogeomorphic processes. • Riprap may increase the diversity and abundance of invertebrate prey and fish habitat use. Benefits would be minor because of the limited number of days when reservoir elevation is increased.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	• Similar to Alternative 2, but less potential to negatively affect fish due to use of natural habitat-forming processes for shoreline protection.

Fish			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	• More water could be used for irrigation rather than instream flows, reducing benefits to fish. • Timing of flow releases would not occur at a time that would benefit spawning or migration in Yakima and Cle Elum rivers.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 3.

Vegetation and Wetlands			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Minimal construction impacts would occur, associated with reconstruction of fish passage facilities. Ongoing projects would not affect vegetation or wetlands. Existing conditions and trends would continue.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Increased reservoir pool would seasonally inundate about 2 acres of wetland, including 1 acre of emergent wetland vegetation. • No significant impacts anticipated because wetland vegetation communities around the reservoir are already adapted to seasonal inundation. • Small shifts in wetland vegetation composition could occur, but would not result in substantial loss of wetland acreage. • 30 acres of coniferous forest, 11 acres of deciduous tree/shrub, and 0.1 acres of herbaceous vegetation would be inundated. Some coniferous trees could succumb to increased flooding, however, they could become snags or large debris, with habitat value. • Species with habitat in inundated areas would likely adapt, some loss of USFS Survey and Manage plant species may occur.	Proposed flows would not affect wetland or riparian vegetation communities downstream of the Cle Elum Dam. Temporarily reduced flows unlikely to substantially reduce hydrologic inputs to wetland and riparian communities.	• Rock shoreline protection activities would permanently impact approximately 22 acres of shoreline, small portions of which could include patches of wetlands. Affected wetland would comprise a very small percentage of the more than 140 acres of palustrine wetland mapped along the shoreline. • Shoreline protection measures could cause small indirect, long-term impacts due to modification of vegetation and wetlands. Not expected to be a significant long-term impact, representing a less than 1 percent of total acreage in the watershed. • USFS Survey and Manage plant species are not expected to be affected. • No long-term impacts expected once construction is complete.

Vegetation and Wetlands			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	• Hybrid shoreline protection would permanently impact approximately 30 acres of shoreline, small portions of which could include patches of wetlands. Affected wetland impacts would comprise a very small percentage of the more than 140 acres of palustrine wetland mapped along the shoreline. • Shoreline protection measures could cause small indirect, long-term impacts due to modification of vegetation and wetlands. This is not expected to be a significant long-term impact, representing less than 1 percent of total acreage in the watershed. • USFS Survey and Manage Species are not expected to be affected. • No long-term impacts expected once construction is complete. Vegetation is likely to reestablish on some types of hybrid shoreline protection.
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.

Vegetation and Wetlands			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 3.

Wildlife			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No short-term disturbance to wildlife would occur. Current trends and patterns of wildlife habitation would continue.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Construction of spillway gate modifications would case short-term disturbance in the vicinity of the dam, causing wildlife using the open water habitats to relocate. • Approximately 46 acres of terrestrial habitat along the shoreline would be flooded for about 40 days in June and early July during drought years. Impacts not expected to be significant because this represents only a small percentage increase in inundated area, and inundated areas currently provide limited habitat. • Inundation could impact wildlife habitat where foraging habitat or nesting sites, but impacts would be minor because of the availability of similar habitat in the reservoir area.	Impacts to wildlife would not occur because changes to instream flow levels would occur during the winter months, outside of the breeding season.	• Minimal short-term disturbance from construction would occur, expected to be minor. • Long-term impacts to wildlife are limited by the small scale of shoreline protection projects relative to total shoreline available, and because most projects would occur in previously disturbed areas.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		

Wildlife			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Threatened and Endangered Species			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No Action alternative would continue current conditions, which could result in detrimental long-term impacts to listed species in the Cle Elum and upper Yakima rivers. There would be no opportunity to increase instream flows for bull trout and MCR steelhead, which would continue trends of degraded spawning and migration habitat.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Construction of spillway gate modifications would cause short-term disturbance in the vicinity of the dam, but no listed species are likely to be affected in this developed area. • Positive temporary increases in bull trout productivity could occur associated with inundation. Effects would be minor. • Negative effects to bull trout could occur associated with increased turbidity. Effects would be minor. • Northern spotted owl and Marbled Murrelet are unlikely to be found in the immediate vicinity of the reservoir, and would be unaffected.	• Increased instream flows would benefit bull trout and MCR steelhead downstream of Cle Elum Dam. • Higher winter flows would improve habitat connectivity and promote access to side channel or off channel habitats for bull trout and would improve habitat functions for MCR steelhead	• Construction could cause short-term disturbance to bull trout and northern spotted owl if present in the work area vicinity. • Noise during construction may elicit disturbance behaviors in spotted owls or marbled murrelets that are in the area, however, their presence is unlikely. • No long-term impacts are anticipated.

Threatened and Endangered Species			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	• No benefit to bull trout and MCR steelhead in the lower Cle Elum or upper Yakima rivers if water is used for irrigation. • Use of water for TWSA would not impact other listed species.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 2.

Visual Quality			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Visual quality conditions would remain the same as they are currently.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Localized, adverse impacts during construction activities. • Localized impacts from reservoir pool changes especially in first few years. Increased inundation would be most noticeable in the upper reservoir and along inundated narrow shoreline areas. • No impact to overall, long-term visual character of the area because the overall appearance of the reservoir would be the same as current conditions	• Visual quality would not be impacted.	• Localized impacts during construction activities, approximately 2 months. • Completed shoreline protection would be a long-term visual change on the landscape, but would minimally contrast with existing features.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	• Similar to Alternative 2, hybrid shoreline protection would minimally contrast with existing shoreline.
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	• No impact.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 3.

Air Quality			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No changes from the existing air quality conditions would occur.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	Minor emissions from construction would occur, but they would not violate any air quality standards or result in any air quality impacts.		
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Climate Change			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Under the No Action alternative there would be no increase of greenhouse gas emissions. Climate change could affect water related resources in the overall Yakima River basin. Additional stored water from the Cle Elum Pool Raise Project would not be available to help offset the impacts of climate change.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Minor increase of greenhouse gas emissions during construction, but well below the significance threshold established by Ecology. • Alternative 2 would have a small, positive impact on the ability of fish to adapt to changing climate conditions by increasing streamflows.		
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	• Same as Alternatives 2 and 3. • Use of additional stored water for TWSA would provide Reclamation with greater flexibility in responding to water shortages for proratable water users that are a result of climate change.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 4.		

Noise and Vibration			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	There would be no construction related noise and vibration impacts generated by the No Action alternative.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Minor, temporary increases in construction noise and vibration during daytime hours. • No long-term noise or vibration impacts. • No violation of noise standards.		
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Recreation			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No changes to recreational facilities or opportunities would occur.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Higher water levels would inundate some recreational facilities at Cle Elum River and Wish Poosh campgrounds. • Access roads at Wish Poosh campground would be inundated and informal boat launch areas along the east bank of the Cle Elum River would be inundated. • Shoreline protection for the inundated areas would avoid disrupting use of these facilities. • Dispersed camping areas would be inundated, and dispersed camping activities could relocate to other areas not currently affected.	• A small increase in instream flows in the Cle Elum and Yakima rivers would not affect recreation.	• Construction could cause minor, temporary disruptions to recreation from August through October. • Speelyi Beach would be closed for a period of less than 2 months. • Shoreline protection measures at Federal recreation facilities would protect recreation uses and access. • Construction would occur after Labor Day when camping use is lower. • Access on Salmon La Sac Road would be reduced to one lane but remain open during construction. • Affected recreational facilities would be replaced or improved following completion of shoreline protection measures.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		

Recreation			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Land and Shoreline Use			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Land uses and practices will continue as they currently occur.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Inundation of an additional approximately 43 acres of federally owned lands and approximately 3 acres of privately owned property. Structures would not be affected. • Increased inundation would not change the ability of property owners to use the land because on a small portion of the shoreline would be inundated for up to 40 days during drought years. • Additional inundation of the Cle Elum River where it enters the reservoir could affect designation of this portion of the river as a Wild and Scenic River.	• Variations in instream flows would not affect land use.	• Temporary disruption of private residential properties during construction. • Acquisition of approximately 20 acres of land in narrow strips adjacent to the shoreline, which would not render private properties unsuitable for existing uses. • Reclamation would acquire land only from willing sellers.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		

Land and Shoreline Use			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	• Small improvement of reliability of irrigation water supply, which could alter the type of crops planted. • No increase in the amount of irrigated land would occur.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 2.

Utilities			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No changes or impacts to utilities would occur.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	No conflicts with existing utilities would occur. Impacts to wells and other utilities at Wish Poosh Campground would be addressed through shoreline protection measures.		
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Transportation			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	Traffic impacts would be limited to increases associated with reconstruction of fish passage facilities, which are expected to be minor.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Increases in truck traffic during modification of the spillway gates, expected to be a minimal impact to local roads. • Shoreline protection measures will avoid impacts from inundation to Salmon La Sac Road. • No other impacts anticipated.		• Less than 5 percent increase in truck traffic along the lowest traveled sections of SR-903 for construction traffic. • Closure of a portion of Lake Cabins Road for less than 2 weeks, but no access would be disrupted as alternate routes are available. • No other traffic disruptions anticipated.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2. Increases of construction-related truck traffic along SR-903 or Lake Cle Elum Dam Road would be slightly higher, but still not representing a significant impact.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Cultural Resources			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No impact beyond those occurring due to current operations.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Adverse effect on the character-defining features of the dam. • Inundation would impact one identified archaeological site.	No cultural resources would be affected by the use of the additional stored water.	• No impacts identified based on current surveys. • Surveys of all construction areas will be done prior to construction.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.		
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.		
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.		

Indian Sacred Sites			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No impact to Indian sacred sites is anticipated to occur.		
Alternative 2 - 5	No impacts anticipated under any of the action alternatives.		

Indian Trust Assets			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No impact.		
Alternative 2 -5	No impacts anticipated under any of the action alternatives.		

Socioeconomics			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No direct impacts would occur. No construction –related costs, but no direct increases in local employment associated with new construction jobs and support services. Current economic trends would continue, but increased uncertainty about the availability of proratable supplies for irrigation could result in a shirt toward crops with lower irrigation needs, and lower economic value.		
Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection	• Construction expenditures would fuel minor economic increases in the surrounding 4 county area over a 5-year period. • 27 jobs supported throughout the state.	• Unquantified increase in recreational or commercial fishing activity.	• Construction expenditures would result in minor economic increases in the surrounding 4-county area over a 5-year period. • 115 jobs supported.
Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 2.	• Statewide economic increases would be similar in magnitude to Alternative 2
Alternative 4 – Additional Water Used for TWSA with Rock Shoreline Protection	Same as Alternative 2.	• Increased agricultural production and market value during severe drought years relative to the No Action Alternative.	Same as Alternative 2.
Alternative 5 – Additional Water Used for TWSA with Hybrid Shoreline Protection	Same as Alternative 2.	Same as Alternative 4.	Same as Alternative 3.

Environmental Justice			
Alternative	**Spillway Radial Gate Modifications to Raise the Reservoir Level**	**Use of Additional Stored Water**	**Shoreline Protection**
Alternative 1 – No Action	No impact.		
Alternatives 2 -5	No disproportionate impact to environmental justice populations under any of the action alternatives.		

Chapter 3

AFFECTED ENVIRONMENT

CHAPTER 3.0 AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the environmental setting of Cle Elum Reservoir and the surrounding area. The chapter defines the area of impact analysis for each resource. The chapter also describes the environmental resources and resource uses potentially affected by the Proposed Action or alternatives. Section 4.0, Environmental Consequences, discusses potential effects. Photos 3-1 through 3-12 depict the environmental setting of Cle Elum Reservoir and the surrounding area.

Reclamation and Ecology obtained much of the background information in this chapter from the Cle Elum Dam Fish Passage Facilities and Fish Reintroduction Project Final EIS (Reclamation and Ecology, 2011b) and the Yakima River Basin Integrated Water Resource Management Plan Final Programmatic EIS (Reclamation and Ecology, 2012). Unless otherwise noted, these documents are the sources of information for this chapter.

3.2 Surface Water Resources

This section describes the operation of Reclamation's Yakima Project and Cle Elum Dam. Section 3.3.5 of the Integrated Plan PEIS (pp. 3-26 to 3-24, Reclamation and Ecology, 2012) describes the operation of the Yakima Project in detail. The following subsections focus on the operational requirements that determine the quantity of water retained in and released from Cle Elum Reservoir and the timing of those releases. The area of impact analysis for surface water is Cle Elum Reservoir and its surrounding shoreline (see Photos 3-1 and 3-2), including the delta where the upper Cle Elum River enters the reservoir; the Cle Elum River downstream of the reservoir (see Photo 3-3); and the Yakima River downstream from the Cle Elum River.

3.2.1 Yakima Project Operations

As described in Section 1.4, Reclamation operates its five Yakima Project reservoirs in a coordinated manner to provide for the needs of the system as a whole. The releases from each reservoir are balanced to meet system wide irrigation and water demands in conjunction with natural runoff and return flow available in the basin. No single reservoir is designated to supply the needs of one particular area, irrigation district, or Yakima Project division. The major storage facilities store runoff during the winter, spring, and summer seasons. This water is released during low-flow periods in the summer and fall seasons for irrigation.

Operational releases at Cle Elum Dam are affected by the presence of spring Chinook salmon redds in the Cle Elum River downstream from the dam (see Section 3.6.2 for additional information on salmonids). The presence of redds downstream results in conflicting needs for the operational releases from Keechelus, Kachess, and Cle Elum Reservoirs. Reclamation makes an effort to reduce the impacts of Yakima Project operations on fishery resources and has developed reservoir release protocols to provide appropriate water flows to protect salmon redds, while managing water for irrigation.

Photo 3-1. Cle Elum Reservoir (elevation 2,192.5)

Photo 3-2. Looking Northwest from Near Wish Poosh Campground (elevation 2,192.5)

Photo 3-3. Upper Cle Elum River

Photo 3-4. Looking West from Salmon La Sac Road at Upper End of Reservoir (elevation 2,192.5)

Photo 3-5. Looking Southeast to Dam from Near Wish Poosh Campground (elevation 2,192.5)

Photo 3-6. View from Speelyi Beach Boat Launch (elevation 2,192.5)

Photo 3-7. Wish Poosh Boat Launch (elevation 2,192.5)

Photo 3-8. USFS Signage at Dispersed Recreation Area

Photo 3-9. Cle Elum Dam Spillway and Temporary Fish Passage Flume

Photo 3-10. Looking Northwest from Salmon La Sac Road (elevation 2,192.5)

Photo 3-11. Looking Northeast to Cle Elum Dam near Baker's Road

Photo 3-12. Looking southeast from Cle Elum River Bridge

3.2.2 Cle Elum Dam and Reservoir Operations

Cle Elum Reservoir has a surface area of 4,868 acres and a total capacity of 436,900 acre-feet (427,930 acre-feet available for use) at its full pool elevation of 2,240 feet. The drainage area tributary to the reservoir is 203 square miles.

Cle Elum Reservoir is operated to meet irrigation demands, flood control, and instream flows for fish (Section 1.4.2). The prime flood control season extends from November through mid-June. During that period and before spring runoff forecasts are available, Reclamation reserves 126,000 acre-feet of reservoir capacity for flood control on the Yakima River.

The mean annual runoff from the Cle Elum watershed is 672,000 acre-feet and has varied from 366,000 acre-feet to 1,046,000 acre-feet. Cle Elum Reservoir regulates about 20 percent of the entire annual runoff above Parker Gage (average of 3,410,000 acre-feet), which is located downstream on the Yakima River near the City of Union Gap. Parker Gage is the primary control point for upper Yakima Project operations and is the point at which Title XII instream flows are set (Section 3.3.5.4, pp. 3-22 to 3-24 of the Integrated Plan PEIS). The reservoir has the largest storage capacity in the Yakima River basin and is the main resource for meeting the large irrigation demands in the Yakima River basin above Parker Gage, which includes the Roza Irrigation District, Sunnyside Division, and Wapato Irrigation Project (Figure 1-1).

Annually, the greatest volume of water released from Cle Elum Reservoir occurs in July and August to meet most of the lower Yakima River basin irrigation demands. Late season irrigation demands (mid-September and October) are met primarily from Rimrock Reservoir in the Naches River basin (Figure 1-1). In September, Reclamation reduces the July and August median release of 2,863 cfs from Cle Elum Reservoir to a minimum flow range of 180 to 300 cfs to protect spawning areas in the upper Yakima River. To meet irrigation demands in the Yakima River system, Reclamation increases the releases from Tieton and Bumping Reservoirs in the Naches River basin starting in September. The name of this operation is "flip-flop." The flip-flop operation allows Reclamation to meet a target flow of approximately 200 cfs in the Cle Elum River during winter for spring Chinook salmon incubation and early rearing.

Figure 3-1 is a hydrograph showing flows and cfs for the Cle Elum River below Cle Elum Reservoir for the period of October 1, 1997 to September 30, 2002. This series of years is representative of drought (2001), wet (1999), and normal (1998, 2000, 2002) runoff conditions.

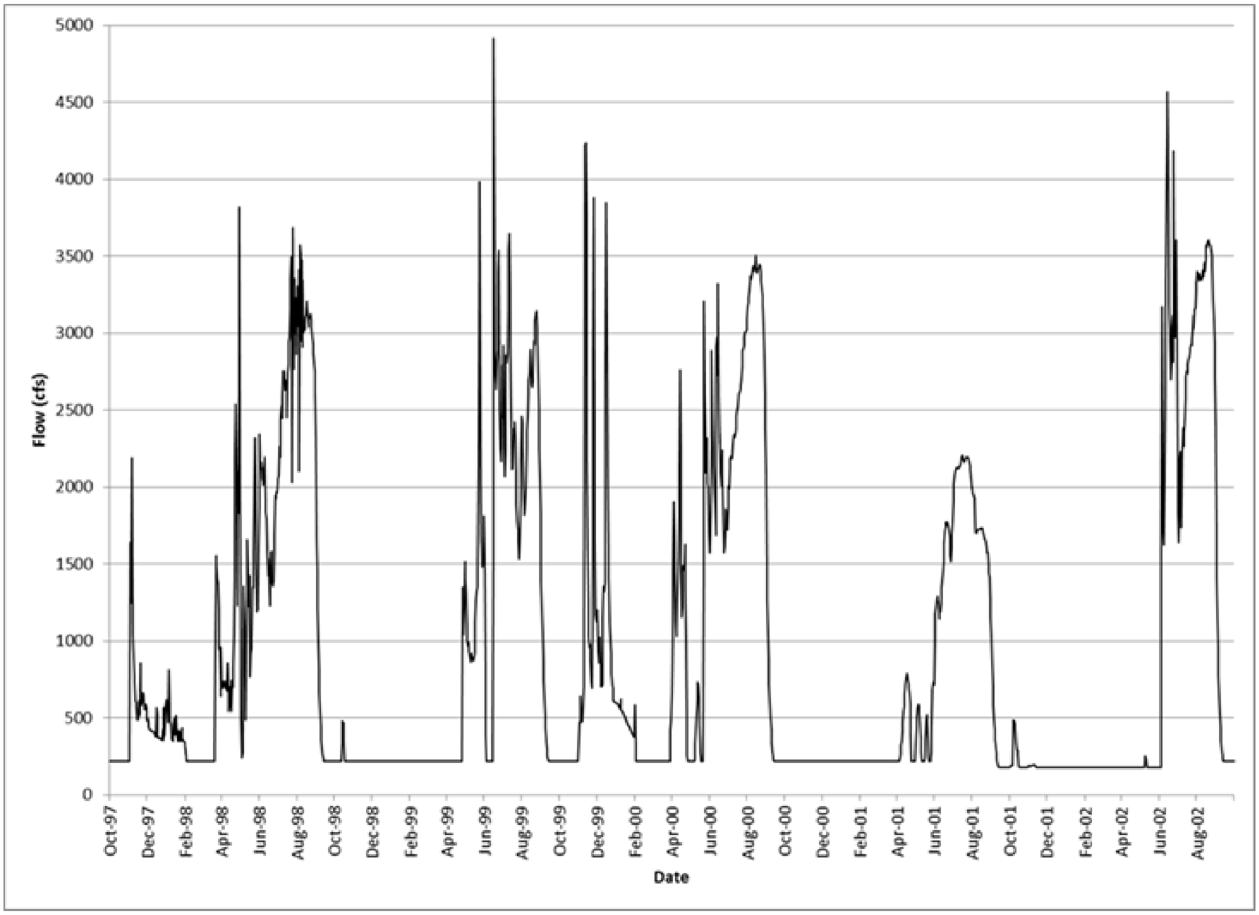


Figure 3-1. Cle Elum River below Cle Elum Reservoir Representative Hydrographs

As shown in Figure 3-1, the highest flows in the Cle Elum River occur during flood events in the winter and during spring when high snowmelt runoff flows into a full or nearly full reservoir. The lowest flows occur from mid-September to about April when the reservoir is discharging water to provide minimum flows in the Cle Elum River while also filling. In most years, Cle Elum Reservoir discharges only minimum flows during that time. Table 3-1 provides a summary of average flows by month in the Cle Elum River.

Table 3-1. Average Flow by Month in Cle Elum River

Month	Average Flow (cfs)
January	311
February	224
March	342
April	608
May	885
June	1,846
July	2,600
August	2,812
September	461
October	232
November	287
December	359
Annual	922

3.2.3 Reservoir Levels

Cle Elum Reservoir typically reaches its lowest elevation in October when the irrigation season ends. In winter months, water is released to meet instream flows on the Cle Elum River and to maintain flood control space. In the spring, water is stored in the reservoir to regulate downstream flows for flood control and to store water for irrigation demands later in the year. The highest reservoir elevations generally occur in the May-to-July period, depending on the annual water supply. Full pool is at elevation 2,240. Figure 3-2 illustrates the baseline condition water level in Cle Elum Reservoir for the period of October 1, 1997 to September 30, 2002. This series of years is representative of drought (2001), wet (1999), and normal (1998, 2000, 2002) runoff conditions. Reservoir pool levels fluctuated between approximately elevation 2,120 (20,000 acre-feet storage) and 2,240 (436,900 acre-feet storage) during this time (120-foot difference from low to full pool), with the lowest level occurring during the 2001 drought year. The outlet at the base of Cle Elum Dam has an invert elevation of 2,110.

During wet years, Cle Elum Reservoir remains at higher pool elevations during the late summer compared to average and drought years because of the high volume of runoff. The need to maintain flood control space of 126,000 acre-feet also creates the need to release more water the following winter.

3.2.4 Upper Cle Elum River and Tributaries to Cle Elum Reservoir

The Cle Elum River headwaters are in the Alpine Lakes Wilderness Area near Mount Daniel. Major tributaries include the Cooper and Waptus rivers. No dams are located on the river or its tributaries upstream of the reservoir. Small tributaries flow into Cle Elum Reservoir from both the east and west. Information is not available about the flow conditions in the tributaries, but generally, flows from the tributaries provide minimal contributions to the reservoir. The largest tributary is French Cabin Creek, which enters the reservoir at its northwest end. Other tributaries include Spring, Bear, Davis, Newport, Bell, Morgan, and

Dry Creek on the east side of the reservoir, and Branch and Para Creek on the west side of the reservoir. These tributaries contribute minor volumes of water to the reservoir, relative to the Cle Elum River, and Reclamation does not include those volumes in its calculation of TWSA.

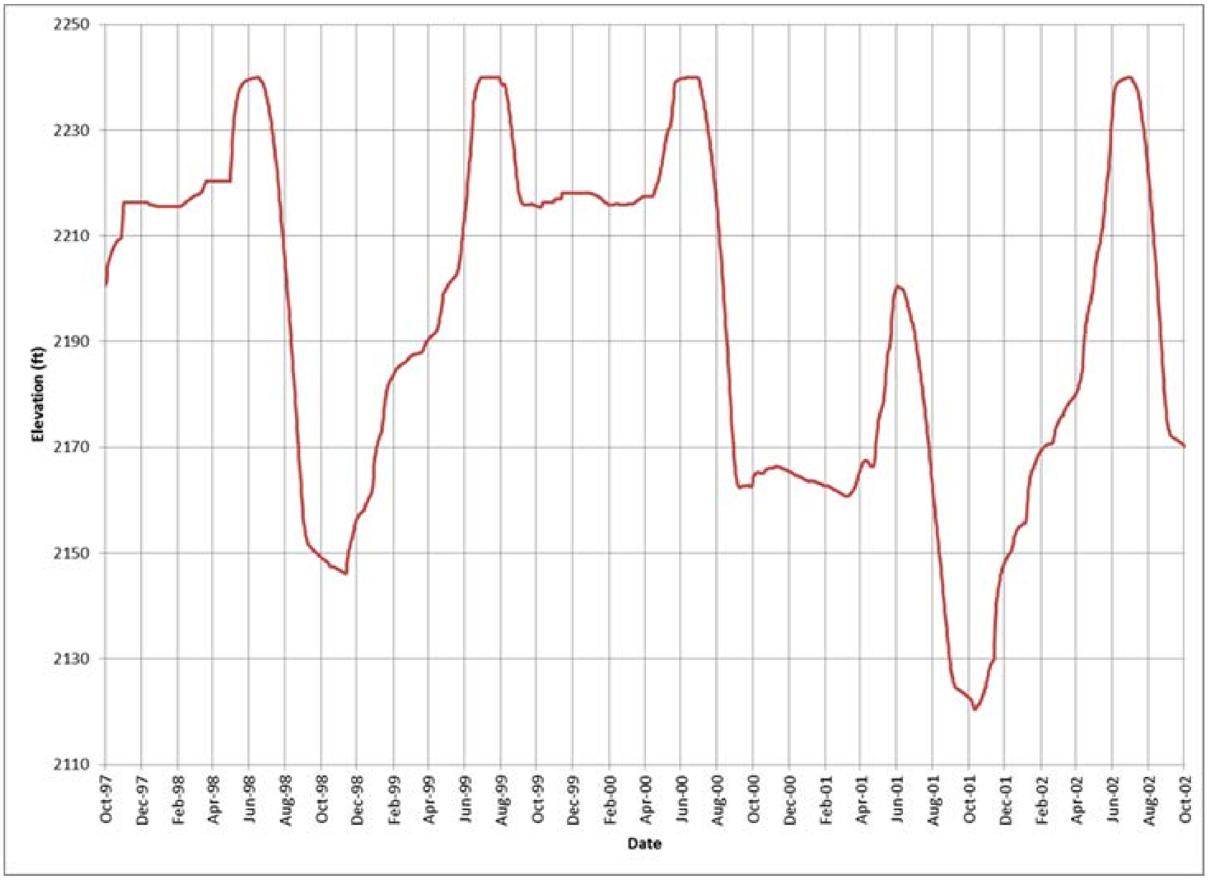


Figure 3-2. **Cle Elum Reservoir Elevation Fluctuation**

3.3 Earth Resources

"Earth Resources" refers to geology and soils. For the purposes of this EIS, the focus of the Earth Resources section is on the potential for erosion at the reservoir. The area of impact analysis is the shoreline of Cle Elum Reservoir and the banks of the Cle Elum River downstream from the reservoir.

Cle Elum Reservoir is located in the northwest portion of the Yakima River basin, in an area dominated by Mesozoic (252 to 66 million years ago) metamorphic rocks and Tertiary (65 to 1.8 million years ago) volcanic and sedimentary deposits. In the valley floor, basin-fill deposits consist predominantly of alluvial, lacustrine, and glacial deposits.

Cle Elum Reservoir is located in a U-shaped valley formed by multiple glacier advances during the Pleistocene period (2.5 million to 11,700 years ago). A moraine (accumulation of unconsolidated glacial debris) deposited by the last glacial advance blocked the valley and formed a natural dam, impounding a glacial lake. The river subsequently breached the moraine, and incised a deep channel through the moraine and outwash deposits, forming the outlet of the glacial lake. An earthfill dam constructed by Reclamation blocks the deep channel that had worn through the moraine materials (Kinnison and Sceva, 1963). The glacial materials near the dam range in size from rock flour to boulders. Geologists have not reached bedrock during investigations at the dam (Reclamation, 2014a).

Reclamation performed a reconnaissance of the west shoreline of Cle Elum Reservoir (Reclamation, 2014c) to establish a baseline of shoreline conditions, determine the extent of areas susceptible to erosion on the west shoreline, and make recommendations on whether to stabilize the shoreline as part of the Cle Elum Pool Raise Project. The reconnaissance determined that the west shoreline of Cle Elum Reservoir is predominantly sedimentary and volcanic bedrock with a thin soil covering. Exceptions occur in areas in the southwest corner of the reservoir composed of glacial drift and colluvium (loose sediment deposited at the base of hillslopes), and intermittent exposures of alluvium (loose sediment eroded by streams) at the mouths of tributary streams along the middle section of the west shoreline.

Reclamation observed three general types of shoreline:

- About 6,000 feet (12 percent) of eroding gravelly bluffs 10 to 15 feet high, partially stabilized by vegetation or driftwood, or both. These areas are primarily in the southwest corner of the reservoir. Discontinuous sections of this type of shoreline are also located in the middle third of the west shoreline. This type of shoreline has moderate potential for future erosion due to the pool raise.

- About 2,300 feet (5 percent) was eroding near-vertical soft sandstone banks. This type of shoreline was located just north of the first type of shoreline. This type of shoreline has moderate potential for future erosion due to the pool raise.

- About 39,600 feet (83 percent) of stable and heavily vegetated shoreline. In these areas, exposed rock was typical at the waterline with established vegetation above. This type of shoreline was located primarily in the northern two-thirds of the west shoreline. It has low potential for future erosion due to the pool raise.

Photo 3-13 to 3-15 show the three types of shoreline.

Photo 3-13. Shoreline on East Side of Reservoir Showing Eroding, Gravelly Banks

Photo 3-14. Shoreline on West Side of Reservoir Showing Near-Vertical Soft Sandstone Bank

Photo 3-15. Shoreline on West Side of Reservoir Showing Rock and Heavily Vegetated Bank

Shorelines on the east side of the reservoir have similar geologic conditions as the west side, but the east side is more exposed to wind waves and more susceptible to erosion. The southeast part of the shoreline (from the dam to about Wish Poosh Campground) consists of glacial drift and the shorelines have a moderate-to-high potential for erosion with higher reservoir levels. Further north along the shoreline are pockets of alluvium and colluvium with moderate-to-high potential for erosion. Reclamation and property owners have placed rock riprap at the toe of several slopes at the southeast end of the reservoir. Some of the riprap is effective at reducing or stopping wave erosion. However, the slopes are still steep and susceptible to further erosion from weathering. Photo 3-16 to 3-17 show shoreline areas on the southeast side of the reservoir.

There are two mass wasting deposits mapped around the reservoir. One is located along the southwest shoreline and one is located on the east shoreline near Wish Poosh Campground. There is no evidence of recent landslides.

Photo 3-16. Shoreline on Southeast Side of the Reservoir Not Protected by Rock Riprap

Photo 3-17. Shoreline on Southeast Side of the Reservoir Currently Protected by Rock Riprap

3.4 Surface Water Quality

This section describes the water quality of Cle Elum Reservoir and the Cle Elum River upstream and downstream of the reservoir, the water bodies the project is most likely to impact. Section 3.5 describes groundwater quality.

3.4.1 Regulatory Setting

3.4.1.1 Clean Water Act

The Clean Water Act (CWA) of 1972 aims to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters. The CWA also establishes the basic structure for regulating pollutant discharges to regulated waterways.

Ecology has established water quality standards to protect public health and welfare, to protect the quality of surface water in Washington, and to meet the requirements of the CWA. Section 303(d) of the CWA requires Washington to develop a list of water bodies that do not meet State water quality standards. When water quality fails to meet State water quality standards, Ecology determines the sources of pollutants and sets the maximum amount of pollutants that each source can discharge to a water body, called "Total Maximum Daily Loads" (TMDLs).

3.4.1.2 State Water Quality Assessment and 303(d) List

Section 303(d) of the CWA requires all states to prepare a water quality assessment and develop a list of surface waters (marine and freshwater) that are impaired. In Washington State, Ecology periodically prepares this list and submits it to the EPA for review and approval. Ecology currently submits these lists on a 2-year alternating cycle of the freshwater listing and the marine water listing. At the present time, Ecology is in the process of updating the freshwater listing with approval by the EPA expected in winter 2014-2015 (Ecology, 2014d). The Section 303(d) list identifies five categories of water quality impairments:

Category 1 – Meets Tested Standards for Clean Waters

Category 2 – Waters of Concern

Category 3 – Insufficient Data

Category 4 – Polluted Waters that do not require a TMDL limit of targeted pollutant(s) to enable achieving the surface water quality standards. The following are the three sub-categories of Category 4:

Category 4a – Has a TMDL

Category 4b – Has a pollution control program

Category 4c – Is impaired by a nonpollutant

Category 5 – Polluted Waters that Require a TMDL

The Cle Elum Reservoir is not listed on the State’s 303(d) list for any water quality impairments. The Cle Elum River is listed (Category 5 – Polluted Water) for water temperature at the following two locations: the inflow to the reservoir and the reservoir outflow. The State's 303(d) list includes the river as Category 2 (Waters of Concern) for temperature farther downstream and upstream at the outlet and for pH downstream of Hyas Lake (near the headwaters of the river).

3.4.1.3 Total Maximum Daily Load

The CWA requires states to establish TMDL programs for parameters not meeting applicable surface water quality standards as identified on Section 303(d) water quality impaired lists. A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet the water quality standards. A TMDL also identifies the sum of the allowable loads of a single pollutant from all point and nonpoint sources and determines a margin of safety to ensure protection of the waterbody in case there are unknown pollutant sources or unforeseen events that may impair water quality.

No TMDLs are currently in place for the Cle Elum Reservoir or Cle Elum River. Ecology has a TMDL for temperature in the upper Yakima River basin under development. However, the mainstem Yakima River, lower Kachess River, and lower Cle Elum River are not included in this TMDL because Ecology will be addressed them in later studies (Ecology, 2014d).

3.4.1.4 Washington State Antidegradation Policy

The CWA requires that State water quality standards protect existing uses by establishing the maximum level of pollutants allowed in State waters. The standards must also protect those waters that have existing water quality that is higher than the standards requirement. The antidegradation process helps prevent lowering of water quality, and provides a framework to identify water designated as an “outstanding resource” by the State of Washington. The State’s antidegradation policy (WAC 173-201A) follows federal regulation guidelines, and has three tiers of protection, with Tier III providing the highest level of protection. The three tiers are as follows:

- Tier I - Used to ensure existing and designated uses are maintained and protected and applies to all waters and all sources of pollution.
- Tier II - Used to ensure that waters of a higher quality are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities.
- Tier III - Used to prevent the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

All three tiers have provisions that protect and maintain existing and designated uses and do not allow water quality degradation to occur. If waters are not consistent with water quality standards, a permit applicant must correct problems to ensure meeting water quality criteria. If waters have water quality higher than assigned criteria, the applicant must take steps to ensure that there is no measureable degradation of water quality. If an action results in a measureable lowering of water quality, the applicant must conduct an analysis to determine whether it is in the overriding interest of the public.

3.4.2 Water Quality Use Designations in the Project Area

The Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A) state that the Cle Elum River and Cle Elum Reservoir are protected for the following Use Designations under WAC 173-201A: Core Summer Salmonid Habitat, Extraordinary Primary Contact, Domestic Water, Industrial Water, Agricultural Water, Stock Water, Wildlife Habitat, Harvesting Commerce/Navigation, Boating, and Aesthetics.

Table 3-2 lists the State's water quality standards for required conditions to meet the core summer salmonid habitat aquatic life use criterion.

Table 3-2. Core Summer Salmonid Habitat Aquatic Life Use Criterion Conditions

Pollutant	Condition(s) to be Met
Temperature	• Not to exceed 16°C (60.8° F) due to human activities. • When natural conditions exceed 16°C, the State allows no temperature increases that would raise water temperature by more than 0.3°C (32.5° F).
Dissolved Oxygen	• Not to drop below 9.5 milligrams per liter (mg/L). • When natural conditions lower the dissolved oxygen (DO) below 9.5 mg/L or within 0.2 mg/L of the criteria, human actions considered cumulatively may not cause DO to decrease more than 0.2 mg/L.
Turbidity	• Not to exceed 5 nephelometric turbidity units (NTU) over background when the background is 50 NTU or less; or a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas	• Not to exceed 110 percent of saturation at any point of sample collection. • Ecology may adjust the total dissolved gas criteria to aid fish passage over hydroelectric dams when consistent with an Ecology approved gas abatement plan.
pH	• Not to vary from the range of 6.5 to 8.5 on the pH scale, with a human-caused variation within the above range of less than 0.2 units.

The criterion for extraordinary primary contact recreational use requires meeting the following condition:

- Bacteria – Fecal coliform organism levels must not exceed a geometric mean value of 50 colonies per 100mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 100 colonies per100mL.

The use designations also require that toxic, radioactive, or deleterious material concentrations must be below those that have the potential, either singularly or cumulatively, to affect characteristic water uses adversely, cause acute or chronic conditions to the most sensitive biota dependent upon that water, or adversely affect public health. The presence of materials or their effects, excluding those of natural origin, must not impair aesthetic values, which offend the senses of sight, smell, touch, or taste.

3.4.3 Reservoir Water Quality

Ecology performed water quality surveys in the Cle Elum Reservoir in 1989 and 1990. The results showed that Cle Elum Reservoir is oligotrophic (nutrient poor and oxygen rich), but experiences high phosphorus from June to September. Dissolved oxygen levels in June and September were supersaturated and oxygen distribution in the fall was largely a function of temperature (Ecology, 1990). Ecology commented that the phosphorus concentration in September was troublesome, possibly indicating that a lower reservoir level may be exposing sediments that become entrained in the water column (Ecology, 1991).

Reclamation collected water quality data in the reservoir (100 meters upstream of the dam) during the months of June, July, and August at various depths throughout the water column. Based on data retrieved from STORET (the EPA database for water quality data) on August 21, 2014, these data were mostly collected from 2002 to 2012 with one data collection in June 1999. These sampling results indicate water quality in the reservoir is moderate to good. During sampling, reservoir waters were clear (average Secchi disk depth of 6.7 meters) with low average turbidity, low total suspended solids, low average fecal coliform counts, and an average pH of 7.4 (results for a depth of 1 meter). Summer peak water temperatures above the State surface water quality standard of 16°C (WAC 173-201A) were reported at depths of 1, 3, 5, and 7 meters. Reclamation recorded a peak water temperature of 20°C (68°F) in August 2012 at a depth of 1 meter. Water temperatures decreased with depth, indicating the presence of a summer thermocline within the reservoir. DO concentrations increased with depth; the average was 9.4 mg/L (average for the 1 meter depth) and increased at depth where Reclamation recorded an average of over 11 mg/L at 45 meters (based on two measurements). Reclamation recorded DO concentrations exceeding the State surface water quality standard (greater than 9.5 mg/L) at depths up to 19 meters.

Orthophosphate concentrations were low, with most readings at or below detection (0.003 mg/L). Total phosphorus concentrations ranged from below detection (less than 0.01 mg/L) to 0.016 mg/L, which are concentrations exceeding oligotrophic lake classification for the Columbia Basin Ecoregion in the State surface water quality standards (WAC 173-201A).

Reclamation conducted a limnological study of the Cle Elum Reservoir between September 2003 and October 2005 to improve the understanding of the physical, chemical, and biological conditions in the reservoir; to assess primary and secondary production; to determine if the present conditions would support introduced anadromous salmonids; and ultimately to determine to what extent anadromous fish could be restored in the basin (Lieberman and Grabowski 2007). Although the study was conducted 10 years ago, the results are still considered relevant because there have been few changes in the reservoir or its headwater areas. The study showed that water columns in Cle Elum Reservoir stratify twice each year (dimictic), with turnover occurring in or around April and October. Strong stratification occurs from July through September. The outlet works (elevation 2,110) for Cle Elum Dam drafts water from well below the full pool elevation of 2,240 feet; therefore water releases come from cooler levels of the reservoir. The maximum temperatures occurred in July, and exceeded 16°C (60.8° F) down to a depth of about 50 feet in Cle Elum Reservoir (Lieberman and Grabowski 2007). Surface temperatures ranged from 6.3 to 21.2°C (43.3 to 70.2°F) in the reservoir between September 2003 and October 2004, and from 5.2 to 18.4°C (41.4 to 65.1°F) from October 2004 to October 2005 (Lieberman and Grabowski, 2007). To date, no water quality models have been developed for the reservoir.

The reservoir has a warm surface layer (epilimnion) with lower DO concentrations than cooler, deeper layers. At the deepest stations monitored during the 2007 study, Cle Elum Reservoir had a middle thermal layer (metalimnion) with a maximum DO concentration. This is typically caused by oxygen produced by algal populations that build up at a density layer in the reservoir (Wetzel, 1983). The DO concentrations in Cle Elum Reservoir from October 2004 to October 2005 were typically high and remained above 9 mg/L from surface to bottom (Lieberman and Grabowski, 2007). The DO measured in Cle Elum Reservoir never dropped below 6.5 mg/L at the bottom between September 2004 and October 2005 (Lieberman and Grabowski, 2007).

Cle Elum Reservoir's major limiting factors for anadromous fish production are low nutrient levels, chlorophyll a concentrations, phytoplankton and zooplankton populations, and total organic carbon (TOC) concentrations. Before the dam was constructed, returning salmon spawning and dying likely contributed marine-derived nutrients to historic Cle Elum Lake (Cederholm et al., 2011). Since the dam blocked fish passage, those nutrients have been lacking, likely contributing to the unproductive nature of the reservoir. Recently, the Yakama Nation has been introducing sockeye and Chinook salmon above Cle Elum Dam, which may increase marine-derived nutrients into the Cle Elum River and reservoir as those runs become established.

3.4.4 Cle Elum River Water Quality

Cle Elum River is 303(d)-listed for water temperatures that are higher than the standard acceptable levels for fish immediately above the reservoir and immediately downstream from the reservoir (Ecology, 2014d). The 303(d) temperature listings were based on numerous samples where temperatures exceeded the applicable water temperature criterion as determined by the USFS in sampling efforts in 1993, 2000, 2001, and 2002 (Ecology, 2014d). The current 303(d) listings were carried over from the 2004 303(d) list. Ecology has not yet developed a TMDL for the temperature listings.

3.4.4.1 Upstream of the Reservoir

Much of the upper Cle Elum watershed lies within the Alpine Lakes Wilderness Area and, therefore, is not affected by forest practices. Both Thorp Creek and the Cooper River, tributaries to the upper Cle Elum River, are listed on the 303(d) list for temperature. The

2003-2005 limnological study (study of inland waters such as lakes and reservoirs) of the reservoir measured inflow and outflow temperatures to the reservoir in addition to water quality within the reservoir. Inflow temperatures ranged from 5.2 to 18.3°C (41.4 to 64.9°F) and 7.1 to 17.9°C (44.8 to 64.2°F) in the 2004 and 2005 sampling periods, respectively (Lieberman and Grabowski, 2007). Inflow to Cle Elum Reservoir had cooler minimum and maximum temperatures compared to reservoir surface temperatures in the 2004 study year, and minimum and maximum temperatures within the reservoir's surface temperature range in the 2005 study year.

In 2006, the U.S. Geological Survey (USGS) collected temperature data in Cle Elum River above Cle Elum Reservoir. In June, the minimum temperature was 4.7°C (40.5°F), the maximum was 13.3°C (55.9°F), and mean was 7.8°C (46.0°F) (USGS 2010). In August of the same year, the minimum temperature was 10.1°C (50.2°F), the maximum was 20.0°C (68.0°F), and mean was 14.9°C (58.8°F) (USGS, 2010).

3.4.4.2 Downstream from the Reservoir

Reclamation also measured outflow temperature from Cle Elum Reservoir in the 2003-2005 limnological study (Lieberman and Grabowski, 2007). Outflow temperatures ranged from 7.8 to 19.5°C (46.0 to 67.1°F) and 6.0 to 16.4°C (42.8 to 61.5°F) in the 2004 and 2005 sampling periods, respectively (Lieberman and Grabowski, 2007). Outflow had a warmer minimum temperature compared to reservoir temperature minimums and a maximum temperature that was within the reservoir's surface temperature range in study year 2004. In study year 2005, outflow minimum and maximum temperatures were within the reservoir's surface temperature range.

Reclamation collected water quality data in the Cle Elum River downstream from the dam during the months of June, July, and August. Based on data retrieved from STORET on August 21, 2014, these data were mostly collected from 2002 to 2012 with one data collection in June 1999. These sampling results indicate water quality in the river is good to excellent. During sampling the river was cool, well oxygenated with low turbidity, low total suspended solids concentrations, and low fecal coliform counts. The average pH was 7.35. Water temperatures exceeding the state surface water quality standard of 16°C (60.8°F) (WAC 173-201A) were not reported. During sampling, the average water temperature was 10.7°C (51.3°F). No violations of the state surface water quality standard for DO (greater than 9.5 mg/L) were reported. The average during sampling was 11.2 mg/L. Orthophosphate concentrations were low, with concentrations reported at or below detection (0.003 mg/L). Total phosphorus concentrations were all below detection (less than 0.01 mg/L) with the exception of one concentration of 0.018 mg/L measured in August 2012.

Ecology collected monthly water quality data in water year 2010 at a now inactive monitoring station on the Cle Elum River near the town of Rosyln. Based on the water year 2010 summary, Ecology concluded overall water quality at this station met or exceeded expectations and is of lowest concern (Ecology, 2014d). Temperature was the lowest rated parameter with a moderate water quality index rating. However, this monthly peak water temperature of 14.7°C (58.5°F) recorded in August 2010 met the State water quality standard of 16.0°C (60.8°F) (WAC 173-201A). DO concentrations ranged from 9.6 mg/L to 13.73 mg/L. In addition, turbidity, fecal coliform bacteria, and pH met the applicable State water quality standards (WAC 173-201A). Ecology noted in the 2002 TMDL report for the upper Yakima River that the Cle Elum River downstream from the reservoir is a large source of water but a low source of suspended sediment (Ecology, 2002).

The source of flow for the Cle Elum River below the dam is from the outlet works located at elevation 2,110. However, during spring, Reclamation may release water from the spillway gates (reservoir surface) into the Cle Elum River. Because this release is limited to the spring (before the reservoir summer thermocline is established), any detrimental impacts from increased temperature or low dissolved oxygen from a surface layer inflow are minimal. Peak surface water temperatures and lower dissolved oxygen concentrations in the reservoir occur during July and August when releases from the spillway do not occur.

3.5 Groundwater

The area of analysis for groundwater impacts is the area immediately around the reservoir where the higher reservoir pool could affect groundwater levels. The impact analysis area includes the drinking water wells and onsite septic systems (OSS) near the reservoir where changing reservoir and groundwater levels could be affected.

The primary groundwater resources in the Cle Elum Reservoir area are unconsolidated Quaternary-age aquifers, comprised of glacial outwash and alluvium, and bedrock aquifers. The Ecology online well database for drilling logs describes the geology around the reservoir. Water wells around the reservoir target a variety of water-bearing geologic formations, including (from youngest to oldest) the following:

- Quaternary-age glacial outwash
- Tertiary-age sandstone and basalt
- Cretaceous-to-Jurassic-age schist and phyllite

Some of the wells near the reservoir are in the unconsolidated glacial outwash, which can reach over 200 feet thick according to well logs. Static water levels in these wells are generally 50 to 150 feet below ground surface (bgs). Wells that are less than 100 feet deep can have static water levels as shallow as 10 to 20 feet bgs. The glacial outwash is likely an unconfined aquifer, in which case static water levels represent the water table, but could also contain perched groundwater based on the clay content indicated on some well logs. The relatively high permeability of the glacial outwash provides a potential hydraulic connection with the Cle Elum Reservoir, and wells installed in the glacial outwash could have water levels that fluctuate with the reservoir pool elevation. Many wells installed near the reservoir are in bedrock formations, with static water levels that are generally 50 to 100 feet bgs. The Tertiary-age Roslyn Formation contains sandstone members commonly targeted for domestic wells. Static water levels that are higher than the top of the respective formations are evidence of confined groundwater in the bedrock near the reservoir. Wells installed in confined bedrock aquifers are unlikely to respond to changes in the pool elevation of the Cle

Elum Reservoir due to a poor hydraulic connection expected between deep formations and the reservoir. Downstream from Cle Elum Dam, wells that target the alluvium and glacial outwash have static water levels that range from 10 to over 100 feet bgs, depending on proximity to Cle Elum River.

The State implemented groundwater management efforts to assess the availability and sustainability of groundwater in upper Kittitas County, including the Cle Elum Reservoir area. New groundwater withdrawals in the Cle Elum Reservoir area are subject to the upper Kittitas Ground Water Rule (WAC 173-539A), effective January 22, 2011. Under this rule, Ecology prohibits new groundwater withdrawals in upper Kittitas County unless Ecology has determined that the use is water budget neutral. "Water budget neutral" means that water withdrawals that impact streams must be offset by retaining an equivalent amount of existing water rights in-stream, generally through water rights purchases. Ecology deemed this level of groundwater management necessary until there is sufficient information about the potential effects of groundwater withdrawals on senior surface water rights and streamflow in the Yakima River basin. As a result, the USGS and Ecology began analyzing groundwater-surface water interactions in November 2010. They issued a report documenting their findings in July 2014 (Gendaszek et al., 2014). Ecology expects this report to inform future groundwater management in the Yakima basin.

There are no groundwater quality problems known to exist in the Cle Elum Reservoir area. Groundwater quality in the area is suitable for domestic consumption. A search of Ecology's Toxics Cleanup Program database included lists of leaking underground storage tanks, confirmed and suspected contaminated sites, sites requiring no further action, and regulated underground storage tanks at active facilities (Ecology, 2014c). None of the sites listed in the Toxics Cleanup Program databases are on a parcel that the Cle Elum Pool Raise Project would inundate. The nearest listed site is a no further action site located near the intersection of Salmon La Sac Road and White Fir Drive, approximately 1,865 feet from the reservoir.

3.5.1 Drinking Water Wells

The Ecology online well database indicates there are approximately 220 registered water wells located within 1 mile of Cle Elum Reservoir (Ecology, 2014e). Most of the wells are for domestic and community purposes, and all but two are east or south of the reservoir. Approximately 12 registered drinking water wells are located on parcels that the Cle Elum Pool Raise Project would inundate.

Table 3-3 summarizes construction details for these wells. When a well could be assigned parcel identification with confidence, Table 3-3 provides that parcel identification. Otherwise, Reclamation used information such as the tax identification, well owner name, and general well location to correlate the well with a specific property. Table 3-3 also contains the depth at which the driller first observed water. In some cases, the driller did not record groundwater observations. Words such as "water," "water bearing," "WB," "wet," and "saturated" in the well logs indicate the location where the driller observed groundwater. Other wells may exist on parcels that the project would inundate, but these could not be accurately located since many well logs lack parcel identification.

Many of the wells listed in Table 3-3 have static water levels that are higher than the formation of the well, indicating the aquifers are confined, and these wells are unlikely to have a direct hydraulic connection to the Cle Elum Reservoir. The depth at which water was first noted when drilling the well is the best available indication of the location of the water table, and wells that have open intervals near the water table are the wells most likely to see changes in the Cle Elum pool elevation. Based on the information in Table 3-3, it appears that well #504580 (installed in glacial outwash) and well #302874 (installed in bedrock) each have open intervals in shallow zones that could hydraulically connect to the Cle Elum Reservoir and could respond to the Cle Elum Pool Raise Project. It is unlikely that the remaining wells listed in Table 3-3 would respond to changes in pool height since the wells are in deeper formations.

Table 3-3. Registered Water Wells on Potentially Inundated Parcels

Well Log ID	Static Water Level (ft bgs*) (Date Measured)	Interval Well is Open to Aquifer (ft bgs)	First Water-Bearing Formation Noted (ft bgs)
504580	55 (11/5/2007)	60-71	54
386601	23 (6/23/2004)	104-163	153
384354	111 (7/20/2004)	138-198	144
390619	36.5 (10/11/2004)	75-115, 375-395, 535-555	93
525859	144 (2/14/2008)	260-360	39
302873	80 (9/1/1999)	420-520	not indicated on log
666402	19.5 (7/6/2010)	275-335	16
302874	1 (7/24/1999)	20-600	not indicated on log
482929	131 (5/18/2007)	217	not indicated on log
511469	152 (12/13/2007)	375-415	389
134081	100 (11/12/1993)	158	138
410667	50 (5/17/2005)	120-220	not indicated on log

Source: Ecology (2014e)
*ft bgs = feet below ground surface

3.5.2 Onsite Septic Systems

Onsite septic systems (OSS) are permitted and managed locally by the Kittitas County Department of Health in conjunction with guidance and oversight provided by the Washington State Department of Health and rules contained in WAC 246-272A, Onsite Sewer Systems. The OSS regulations include both horizontal and vertical location requirements. The horizontal requirement is that the OSS be located at least 100 feet horizontally from surface water bodies, measured from the Ordinary High Water Mark (OHWM). The Cle Elum Pool Raise Project would create a new OHWM approximately 3 feet higher than the current OHWM in some areas around the reservoir. Figures 2-3 through 2-7 indicate these new inundation areas. Kittitas County Department of Health records (2014) indicate there are 14 OSS on parcels that the Cle Elum Pool Raise Project could inundate. Examination of the OSS as-built drawings estimate the actual location of the

OSS in relation to the reservoir, and Table 3-4 summarizes this information. In some instances, the OSS as-built drawings do not specify the location of Cle Elum Reservoir, in which case comparison of drawings to Figures 2-3 through 2-7 and online Bing Maps aerial photographs estimate the distance from the OSS to the newly inundated areas.

Table 3-4. Onsite Septic Systems on Potentially Inundated Parcels

Parcel ID	Estimated Distance from OSS to New Inundation (feet)	As-built Date
766336	210	8/30/1991
306935	270	7/22/1987
15495	385	3/26/2003
15489	350	7/24/2002
15488	235	10/11/2001
15487	235	9/5/2002
797135	265	10/1/1985
796935	270	10/2/2007
12048	975	1/19/1999
435036	405	6/16/1994
11596	Unknown; poor quality as-built; house and OSS not on aerials	12/11/2002
18679	350	11/7/2006
18678	260	10/20/2003
519336	425	12/19/2000

Source: Kittitas County Department of Health (2014)

Table 3-4 indicates that each of the known OSS locations exceed the 100-foot minimum horizontal setback requirement from the higher reservoir pool. Vertical separation requirements for OSS are site-specific, and depend on the type of OSS (e.g., pressure, gravity), soil type, depth to the water table, and depth to the first clay layer, hardpan, or bedrock. The Kittitas County Department of Health determines vertical separation requirements for each OSS, and this information does not appear in the as-built records and permit applications provided by the county.

3.6 Fish

The impact area for fish species includes habitats in Cle Elum Reservoir and its tributaries, as well as the Cle Elum River and upper Yakima River downstream from the reservoir. The upper Cle Elum watershed supports resident fish species and historically supported anadromous spring Chinook salmon, summer Middle Columbia River (MCR) steelhead (summer steelhead), coho salmon, and sockeye salmon as well as bull trout (Haring, 2001). Cle Elum Dam is currently a barrier to naturally returning anadromous fish. However, sockeye, coho, and spring Chinook have been introduced upstream of the dam in recent years and utilize the interim downstream fish passage facilities on the dam. The Yakama Nation traps returning fish to the reservoir from the fish capture facilities at Roza Diversion Dam.

3.6.1 Resident Fish

Resident native salmonids in the Yakima River basin include the Columbia River Distinct Population Segment (DPS) bull trout, westslope cutthroat trout, rainbow trout, kokanee, mountain whitefish, and pygmy whitefish (Pearsons et al., 1998; Hallock and Mongillo, 1998). Section 3.9.1 discusses bull trout, a species federally listed as threatened. Resident species not native to the Yakima River basin include brown trout, Eastern brook trout, and lake trout (Pearsons et al., 1998; Wydowski and Whitney, 2003).

Thirty-seven resident nonsalmonid species are present in the Yakima River basin (Pearsons et al., 1998). The most abundant of these in the upper Yakima River basin are speckled dace, longnose dace, redside shiners, northern pikeminnow, and largescale suckers (Pearsons et al., 1998).

Table 3-5 describes resident fish species occurring upstream of Cle Elum Dam (Mongillo and Faulconer, 1980; Pearsons et al., 1998; Wydowski and Whitney, 2003; Reclamation and Ecology, 2011b). Accounts of habitat use by fish species upstream of Cle Elum Dam are generally limited to summaries of presence or absence and in some cases best professional judgment (e.g., Mongillo and Faulconer, 1980). The expected patterns of habitat use described in Table 3-5 rely on information collected throughout the regional distribution of the species (e.g., Edwards et al., 1983) as well as within basin data, where available (e.g., Wydowski and Whitney, 2003).

Cle Elum reservoir is an oligotrophic (unproductive) environment with low nutrient levels, chlorophyll a concentrations, phytoplankton biovolume, and zooplankton densities. The low densities of zooplankton may limit the reservoir’s capacity to support resident fish as well as introduced salmonids such as sockeye salmon (Reclamation, 2007). Benthic invertebrates, which also provide food for fish, are scarce in the reservoir (Mongillo and Falconer, 1982).

Table 3-5. Expected Habitat Use by Resident (Nonanadromous) Fish Species Inhabiting the Upper Yakima River Basin including Cle Elum Reservoir and Tributaries

Resident Fish Species	Shoreline Spawning	Tributary Spawning	Shallow Littoral Rearing	Open Limnetic Rearing	Deep Water/Benthic Rearing	Tributary Rearing
Kokanee	October to November	October to November	Prefers temperatures close to 50°F	Prefers temperatures close to 50°F	Diel vertical migrations between limnetic and deep water habitats	N/E
Mountain Whitefish	September to December	September to December	Yes	N/E	Yes	Typically in temperatures 48°F to 52°F
Pygmy Whitefish	From late summer to early winter, when temperature is from 32°F to 39°F	From late summer to early winter, when temperature is from 32°F to 39°F	Typically in temperatures less than 50°F (Hallock and Mongillo, 1998)	N/E	Typically in temperatures less than 50°F (Hallock and Mongillo, 1998)	Typically in temperatures less than 50°F (Hallock and Mongillo, 1998)
Cutthroat Trout	N/E	March to July typically in water temperatures around 50°F	Prefers water between 54°F and 59°F and less than 72°F (Hickman and Raleigh, 1982)	Prefers water between 54°F and 59°F and less than 72°F (Hickman and Raleigh, 1982)	Prefers water between 54°F and 59°F and less than 72°F (Hickman and Raleigh, 1982)	Prefers water between 54°F and 59°F and less than 72°F (Hickman and Raleigh, 1982)
Rainbow Trout	N/E	February to June	Typically in water where temperatures are less than 70°F	Typically in water where temperatures are less than 70°F	Move into deep water when surface temperatures exceed 70°F	Typically in water where temperatures are less than 70°F
Eastern Brook Trout (I)	August to December when water temperatures are between 40°F to 50°F at depths less than 5 feet deep	August to December when temperatures are between 40°F to 50°F and declining	Typically in water temperatures less than 68°F	Yes. Typically in water temperatures less than 68°F	Yes	Typically in water temperatures less than 68°F

Resident Fish Species	Shoreline Spawning	Tributary Spawning	Shallow Littoral Rearing	Open Limnetic Rearing	Deep Water/Benthic Rearing	Tributary Rearing
Lake Trout (I)	Middle October to early December at depths of 1-100 feet	N/E	Prefers habitats around 50°F	Prefers habitats around 50°F	Most commonly found in deeper water, prefers habitats around 50°F	N/E
Brown Trout (I)	N/E	October to December	Occupies warmer water habitats 65-75°F	N/E	Yes	Occupies warmer water habitats 65°F to 75°F
Longnose Dace	May to late August at temperatures of 53-66°F (Edwards et al., 1983)	May - July	Typically found shallow water (Edwards et al., 1983)	Pelagic fry (Edwards et al., 1983)	N/E	Yes
Leopard Dace	N/E	May - July	Observed in temperatures of 59°F to 64°F	N/E	N/E	Observed in temperatures of 59°F to 64°F
Speckled Dace	N/E	June - August	Typically from 32°F to 68°F	N/E	N/E	Typically from 32°F to 68°F
Chiselmouth	N/E	Late May - early July	Typically from 48°F to 81°F	N/E	N/E	Typically 48°F to 81°F
Redside Shiner	April - July	April - July	Typically 55° to 68°F	N/E	Typically 55-68°F but moves to deep water habitats when temperatures increase	Typically 55° to 68°F
Peamouth	Late May to June when temperatures range from 50°F to 59°F. Hatch in 7-8 days at 54°F	Late May to June when temperatures range from 50°F to 59°F. Hatch in 7-8 days at 54°F	Yes	N/E	Yes	Yes

Resident Fish Species	Shoreline Spawning	Tributary Spawning	Shallow Littoral Rearing	Open Limnetic Rearing	Deep Water/Benthic Rearing	Tributary Rearing
Northern Pikeminnow	Late May - Early August when temperatures range from 57°F to 65°F. Hatch in 7 days at 64°F	Late May - Early August when temperatures range from 57°F to 65°F. Hatch in 7 days at 64°F	Yes	Distributed throughout water column in summer	Typically benthic in winter	Yes
Largescale Sucker	N/E	Early April to July- observed spawning at depths of 8 inches to 9 feet	Primarily found in shallow water	Pelagic larvae and fry	Uses deep water thermal refugia in summer	Congregates in areas where streams enter lakes
Mountain Sucker	N/E	June - July at temperatures of 48°F to 66°F	Typically 55°F to 70°F	N/E	N/E	Typically 55°F to 70°F
Bridgelip Sucker	N/E	Mid April - Mid June at temperatures 46°F to 59°F	N/E	N/E	N/E	Yes
Burbot	Late winter through early spring when temperatures are about 35°F	Late winter through early spring when temperatures are about 35°F	Moves to shallow water during winter (Bonar et al., 2000)	Pelagic larvae	Summer distribution in deeper waters	N/E
Threespine Stickleback	May - August. Hatch in 7 days at 64°F	May - August. Hatch in 7 days at 64°F	Yes	Yes	Yes	Yes
Paiute Sculpin	May - June	May - June	Observed in warmer water ranging from 59°F to 77°F	N/E	Observed in warmer water ranging from 59°F to 77°F	Observed in warmer water ranging from 59°F to 77°F
Torrent Sculpin	April - June	April - June	Yes	N/E	N/E	Observed in temperatures ranging from 59°F to 72°F

Resident Fish Species	Shoreline Spawning	Tributary Spawning	Shallow Littoral Rearing	Open Limnetic Rearing	Deep Water/Benthic Rearing	Tributary Rearing
Mottled Sculpin	N/E	February - June in water ranging from 39°F to 59°F. Eggs hatch in 20 to 30 days at temperatures between 50°F and 60°F.	N/E	N/E	N/E	Yes

Table notes:

1. Nonnative, introduced species are identified by a parenthetic “I” following species name.
2. Not expected is denoted by “N/E”
3. Wydowski and Whitney (2003) provided the data presented in the table except where other sources are noted parenthetically within the table.

3.6.2 Anadromous Fish

Construction of a temporary, timber crib dam at Cle Elum Reservoir contributed to the extirpation (local extinction) of sockeye from the basin in the early 1900s. In 1935, Reclamation finished construction of Cle Elum Dam without fish passage facilities, effectively eliminating access to previously productive spawning and rearing habitat for sockeye salmon, coho salmon, spring Chinook salmon, and summer steelhead above the dam (Bryant and Parkhurst, 1950; Davidson, 1953; Fulton, 1970; Mullan, 1986). Pacific lamprey were also eliminated above the dam (Reclamation and Ecology, 2011b). The lack of passage has isolated local populations of bull trout as described in Section 3.9.1.

In spring 2005, Reclamation constructed an interim downstream fish passage facility at Cle Elum Dam. Reclamation has not installed upstream fish passage facilities, but the Yakama Nation captures sockeye and spring Chinook at Roza Dam and transports them by truck to Cle Elum Reservoir. The downstream interim fish passage facility has allowed the Yakama Nation to reintroduce coho, spring Chinook, and sockeye salmon above the dam. Since 2005, Reclamation has worked collaboratively with Ecology, WDFW, and the Yakama Nation to plan for construction of a permanent fish passage facilities at Cle Elum Dam and to solidify plans for fish reintroduction above the dam. Reclamation is currently developing the final designs of the fish passage facilities.

The following sections describe anadromous fish that are present in the Cle Elum River or Cle Elum Reservoir, or both. Summer steelhead and bull trout are also present in the area. These species are listed under the ESA and are described in Section 3.9.

3.6.2.1 Sockeye

Historically, sockeye salmon runs in the Yakima River basin were larger than any other fish runs in the Columbia River Basin (Reclamation, 2008a). Sockeye are dependent on lakes for juvenile rearing, and historic Cle Elum Lake was once an important habitat area for this species (Reclamation, 2007). The reintroduction of sockeye salmon into Cle Elum Reservoir began in 2009 with the release of 1,000 pairs of adult sockeye by the Yakama Nation. The Yakama Nation trapped the mixed Wenatchee and Lake Osoyoos stocks of sockeye at Priest Rapids Dam. Since 2009, the number of sockeye transported from Priest Rapids Dam to Cle Elum Reservoir has increased to 4,100 in 2010; 4,500 in 2011; 10,000 in 2012; 4,000 in 2013; and 10,000 in 2014 due in part to larger numbers of sockeye passing above Bonneville Dam (Yakama Nation Fisheries, 2014a). In addition, the Yakama Nation counted approximately 80,000 out-migrating sockeye smolts at Prosser Dam in 2011, the most recent year for which data are available.

In 2013, the first offspring of the adults originally transported to Cle Elum Reservoir returned to Roza Dam, where they were collected and transported to Cle Elum Reservoir (Yakama Nation Fisheries, 2014a). In total, 701 adult sockeye salmon returned to Roza Dam between July and October of 2013.

3.6.2.2 Coho

Factors such as construction of dams on the Columbia River and overharvest of wild stocks contributed to the extirpation of coho salmon endemic to the Yakima River basin in the early 1980s. However, natural reproduction of hatchery-reared coho is now occurring in both the Yakima and Naches rivers.

Currently, coho enter the Yakima River in the fall with about 10 to 20 percent of the adults reaching the upper watershed between Cle Elum and Easton in November and December. Spawning occurs soon afterward; the eggs incubate over the winter and hatch in the spring. After the fry emerge from the gravel, the juveniles rear in the stream until the following spring when they outmigrate as 1-year-old smolts (Reclamation, 2008a).

Coho salmon were reintroduced into Cle Elum Reservoir as part of the testing of the interim downstream passage facility. In 2005, the Yakama Nation released small test groups of Passive Integrated Transponder (PIT) tagged coho salmon smolts directly into the passage facility. PIT tagging is a method of tagging and tracking fish using microchips implanted in a smolt to monitor smolt survival and the number of returning adults. A large-scale test was conducted in 2006 with about 10,000 PIT tagged smolts released from net pens near Cle Elum Dam. The test was successful with 617 coho salmon detected passing the interim passage flume. WDFW concluded that nearly 10 percent of the smolts had survived and migrated the next spring. Currently, the Yakama Nation is releasing 500,000 spring fry and summer parr coho, in addition to smaller releases of smolts, in suitable habitats upstream of Cle Elum Reservoir (Reclamation and Ecology, 2011c).

3.6.2.3 Spring Chinook

An estimated 12 percent of the adult natural spring Chinook salmon that spawn in the upper Yakima River basin spawn in the 8-mile reach of the Cle Elum River downstream from the dam (Reclamation, 2008a). All Yakima River stocks of spring Chinook salmon exhibit an extensive downstream migration of presmolts in the late fall and early winter (Pearsons et al., 1996; Berg and Fast, 2001). Most juvenile spring Chinook salmon in the upper Yakima River basin migrate downriver during the fall and winter period and overwinter in the Yakima River between Roza and Prosser Diversion Dams (Berg and Fast, 2001).

Adult spring Chinook salmon return to the upper mainstem Yakima River beginning in May. Adults migrate close to the area where they will spawn and find a place to hold in cover (deep water with woody debris or undercut banks or both) until they spawn. Depending on water temperature, the peak of spawning activity for spring Chinook salmon in the upper mainstem Yakima River is from September 15 to October 1 (Fast et al., 1991). Adults that spawn in the upper reaches of tributaries typically move into the tributaries by the end of June or early July when flows are still high enough for them to traverse the lower reaches of the tributaries. Some migrating adult fish arrive early, prior to the time some tributary streams become intermittent in the summer. They remain until fall precipitation begins, allowing the fish to pass the parts of the streams that eventually go dry for a period. Variability in run timing is influenced by high and low flows. Run timing for spawning runs of all salmon and steelhead is delayed during years of high flow and accelerated in years of low flow (Reclamation, 2008a).

The Yakama Nation is currently reintroducing spring Chinook to habitats above Cle Elum Dam. Under this project, the Yakama Nation collects returning spring Chinook at Roza Dam and transports them to Cle Elum Reservoir. The Yakama Nation transported 132 adults and 7 jacks in 2012, and 140 adults and 93 jacks in 2013 (Bosch, 2014).

3.6.2.4 Pacific Lamprey

Pacific lamprey are rare in the Yakima River basin and little is known about their life history, historic distribution, or current limiting factors. The Yakama Nation is developing a long-term management and action plan specific to Pacific lamprey, and is considering reintroduction of the species in areas above Cle Elum Dam. The Yakama Nation is developing the plan in cooperation with local and regional government entities and other ongoing efforts conducted by the Nez Perce, Umatilla, and Warm Springs Tribes. The plan is consistent with the Columbia River Inter-Tribal Fisheries Commission Pacific Lamprey Tribal Recovery Plan, the Service Conservation Initiative, and the Lamprey Management Plans of Chelan County, Douglas County, and Grant County Public Utility Districts (Yakama Nation Fisheries, 2014b).

3.7 Vegetation and Wetlands

The impact analysis area for vegetation communities, wetlands, survey and manage, sensitive and invasive species includes the following areas: (1) the existing Cle Elum Reservoir up to elevation 2,240, (2) areas encompassed by the proposed maximum pool elevation up to 2,243 feet, (3) vegetation adjacent to the increased inundation zone landward of elevation 2,243, and (4) areas that would be impacted by proposed shoreline protection and other construction activities as described in Chapter 2. Visits to selected sites on the east side of Cle Elum Reservoir in November 2013 document general characteristics of vegetation and wetland communities in the analysis area. Reclamation has not conducted formal wetland delineations or a plant survey for this DEIS.

3.7.1 Vegetation

The Cle Elum Reservoir watershed is comprised of approximately 50 percent mature forest habitat within the western hemlock, Pacific silver fir, and mountain hemlock forest cover types (USFS, 1993; Service, 1997). The upper third of Cle Elum Reservoir is surrounded by these cover types. The forest cover type of moist grand fir surrounds the remainder of the reservoir, with the exception of a small area near Cle Elum Dam where ponderosa pine dominates (Service, 1997). Vegetation along the shoreline below the current maximum pool elevation of 2,240 is generally rocky and fluctuating water levels from reservoir operations affect shoreline vegetation. The west side of the reservoir is typically more steeply sloped with little vegetation established below elevation 2,240. With the exception of vegetation associated with inventoried wetlands (Section 3.7.2), the area below elevation 2,240 is mostly devoid of vegetation with the exception of patches of deciduous trees and shrubs, including black cottonwood, red alder, and willows. These vegetation communities are most common at the Cle Elum River delta in the northern portion of the reservoir and in patches along the eastern side of the reservoir where the reservoir shore is more gently sloped.

Vegetation communities vary in composition between elevation 2,240 and 2,243, which the proposed project would seasonally inundate. Near the existing dam and appurtenant structures, as well as developed recreational properties and facilities in the south and southeast portion of the reservoir, vegetation is sparse and mainly consists of scattered groundcover. A mature conifer forest landward of elevation 2,240 dominates less developed areas of the reservoir, including most of the west shoreline. The predominant tree species is Douglas fir, with lesser amounts of ponderosa pine, grand fir, and western red cedar (Service, 1997). Understory species include snowberry, serviceberry, hazelnut, bitterbrush, Oregon grape, kinnikinnick, balsamroot, lupine, strawberry, and a variety of native grasses (Service, 1997). The Cle Elum River Campground supports patchier stands of coniferous forest landward of elevation 2,240; areas of paved road and primitive campgrounds with patchy grass and herbaceous cover are common in this area.

Chapter 2 describes areas proposed for additional shoreline protection measures that also have variable vegetation cover. Several areas are relatively unvegetated or have had shoreline armoring previously installed, whereas other areas are characterized by alders, black cottonwood, Douglas fir, ponderosa pine, and understory vegetation.

3.7.2 Wetlands

Reclamation identified the extent of wetlands within the study area using the National Wetland Inventory (NWI) (Service, 2013). Most of Cle Elum Reservoir is a lacustrine (freshwater lake) feature, which is deepwater habitat that exceeds 20 acres in size and lacks trees, shrubs, or emergent vegetation (Cowardin et al., 1979). Landward of the areas inventoried as lacustrine, the NWI maps show approximately 188 acres of palustrine wetlands at or below the current maximum pool elevation of the reservoir, as shown on Figure 3-3. A "palustrine wetland" is a freshwater wetland dominated by rooted or nonrooted vascular and nonvascular plants, although some palustrine wetlands may also lack vegetation (Cowardin et al., 1979). The NWI maps noted areas around the reservoir shoreline mapped as lacustrine wetland that are actually palustrine wetlands with emergent and scrub-shrub vegetation communities (Service, 1997).

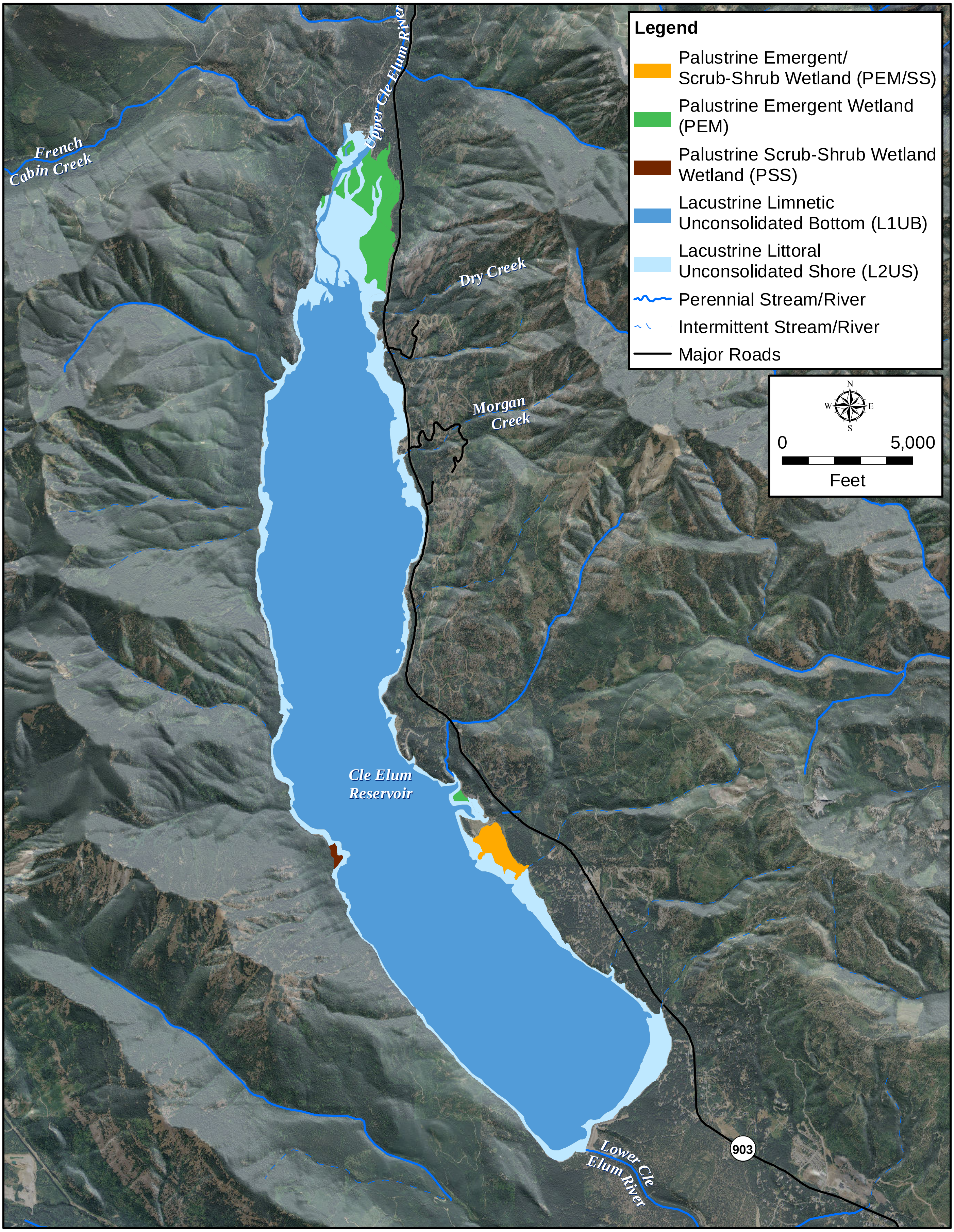


Figure 3-3. Wetlands

The location of the majority of the mapped palustrine wetlands (approximately 140 acres) is at the north end of the reservoir near Cle Elum River Campground. Mapped wetlands are also located at Wish Poosh Campground and a small area on the west side of the reservoir. The palustrine wetlands typically are on more gently sloped shoreline segments along the reservoir, and near the mouth of the Cle Elum River. Steep shoreline topography generally precludes the development of extensive vegetated wetland communities along the west side of the reservoir. The predominant wetland vegetation class in the area is emergent, and predominant plant species include numerous flood tolerant grasses, rushes, and sedges (Service, 1997). Several large stands of black cottonwood trees are interspersed among emergent vegetation communities at the north end of the reservoir. Small patches of palustrine scrub-shrub wetlands also are in the area. Dominant species in this vegetation community include scattered black cottonwood and alder saplings, willows, red-osier dogwood, vine maple, rose, and spirea.

The NWI mapped approximately 2 acres of palustrine wetlands in the area that the higher reservoir level would inundate. These wetlands are primarily in the north portion of Cle Elum Reservoir. The majority of these inventoried wetlands are emergent wetland; the remaining wetlands are freshwater forested and shrub wetland. None of the areas proposed for shoreline protection areas are in the NWI inventory as palustrine wetland.

3.7.3 USFS Survey and Manage and Strategic Species

The Okanogan-Wenatchee National Forest manages vascular plants, nonvascular plants, and fungi identified in the Survey and Manage standards and guidelines, which are a mitigation measure included in the 1994 Northwest Forest Plan. The USFS and Bureau of Land Management (BLM) adopted the Survey and Manage standards and guidelines to conserve rare and little known flora and fauna species thought to be associated with late successional and old growth forests within the range of the northern spotted owl. These standards and guidelines are applicable to USFS and BLM land within the geographic boundaries of the Northwest Forest Plan area (western Oregon, Washington, and northern California). The standards and guidelines require surveys for Survey and Manage species if proposed disturbance of late successional or old growth habitat is within the designated Northwest Forest Plan area. Some species require preproject surveys and prescribed management actions, if found.

Table D-1 in Appendix D provides a list of the USFS Survey and Manage vascular plant species either documented near the Cle Elum Reservoir or that could potentially occur within the reservoir study area.

3.7.4 Special Status Species

The USFS maintains a Regional Forester’s Special Status Species list, which includes federally listed, federally proposed, sensitive, and strategic species collectively referred to as “Special Status Species” (USFS, 2011b). Special Status Species in the Okanagan-Wenatchee National Forest include those species designated as endangered, threatened, or sensitive by the DNR Natural Heritage Program. Strategic species include those that are not federally listed or State sensitive whose distribution, habitat, threats or taxonomy are poorly known

(USFS, 2011b). Table D-2 in Appendix D lists identified sensitive and strategic species near the Cle Elum Ranger District and locations of potential suitable habitat in the impact analysis area.

The DNR (2014) Natural Heritage Program database documents western ladies'-tresses, Thompson’s chaenactis, and Canadian single-spike sedge in the Cle Elum Reservoir basin. Western ladies'-tresses grow along streams. The mapped location for this species in the Cle Elum River basin is near a headwater tributary of the Cle Elum River located approximately 2 miles from the river and 3 miles from the reservoir (DNR, 2014). The DNR mapped Canadian single-spike sedge in close proximity to the Western ladies'-tresses occurrence. It typically grows at elevations higher than the study area on rocky outcrops. Thompson’s chaenactis grows on dry rocky slopes and ridges. Because these species are not likely to be present in the reservoir area, they are not evaluated in this DEIS. Section 3.9 discusses federally listed species.

3.7.5 Invasive Species

A wide range of invasive plant species is present near Cle Elum Reservoir. Kittitas County lists some species as noxious weeds and the USFS Cle Elum Ranger District consider some as priority weeds. Documented occurrences of invasive species in the reservoir area include diffuse knapweed, St. Johns wort, Scotch broom, oxeye daisy, Canada thistle, common tansy, Dalmatian toadflax, and bull thistle (Lau, 2012). Table D-3 in Appendix D summarizes the invasive plant species that occur or may occur in the reservoir vicinity.

3.8 Wildlife

Wildlife habitats near Cle Elum Reservoir include mixed conifer forests, forested wetlands, and shrub dominated wetlands. For this DEIS, the impact analysis area for wildlife and wildlife habitat is similar to vegetation and wetlands (Section 3.7) and includes (1) the existing Cle Elum Reservoir up to elevation 2,240, (2) areas encompassed by the proposed maximum pool elevation up to 2,243, (3) wildlife and habitat adjacent to the increased inundation zone landward of elevation 2,243, and (4) areas that would be impacted by proposed shoreline protection and other construction activities as described in Chapter 2. It also includes areas around the reservoir that would experience increased noise or traffic associated with construction.

Conifer forests surrounding the reservoir are relatively undisturbed, situated on sloping terrain, and typically, have a multistoried canopy, downed wood, and a developed understory comprised of diverse shrubs, herbaceous species, and native grasses. Some areas lack an understory and have a denser shrub layer. In general, the surrounding forests provide high-quality connected habitats for a variety of native wildlife, including elk and deer, black bear, small mammals (e.g., beaver, martin, chipmunk), raptors, owls, grouse, woodpeckers, and a wide range of songbird species (Service, 1997). Wetlands located at the north end of the reservoir provide habitat for mammals, reptiles, and amphibians; and migratory birds such as grosbeak, swallows, sparrows, belted kingfisher, and warblers. The reservoir itself provides open water habitat for ducks and geese and other water birds (e.g., pied-billed grebe, goldeneyes), although fluctuating water levels from reservoir operations preclude suitable conditions for waterfowl nesting along much of the shoreline. The shoreline contains intermittent eroding bluffs, vegetated low areas, and gravelly as well as more stable banks.

3.8.1 State Species of Concern

The WDFW Priority Habitats and Species database identifies State Species of Concern, including species listed as threatened or endangered by the State (WDFW, 2014b). Table 3-6 lists the WDFW priority species with documented occurrences in the vicinity of Cle Elum Reservoir. Other State priority species, such as pileated and white-headed woodpecker, great blue heron, and common loon are likely to occur due to the presence of suitable habitat. The WDFW priority habitats in the project area include riparian, elk, white-tailed deer, and mountain goat habitat (WDFW, 2014b).

Table 3-6. State Listed Wildlife Species of Concern Documented Near Cle Elum Reservoir

Species	State Status
gray wolf	E
grizzly bear	E
Larch Mountain salamander	S
tailed frog	M
northern goshawk	C
bald eagle	S
northern spotted owl	E
wolverine	C

*E = Endangered, C = Candidate, M = Monitored, S = Sensitive.

Section 3.9 discusses federally listed species, including the gray wolf, grizzly bear, and northern spotted owl.

3.9 Federal Threatened and Endangered Species

The area of impact analysis for threatened and endangered species includes Cle Elum Reservoir, the Cle Elum River upstream and downstream from the reservoir, and land surrounding the reservoir that construction noise and traffic, habitat disruption, or operation of the project could impact. Table 3-7 lists the fish and wildlife species that are federally listed or proposed for listing as threatened or endangered species under the ESA and that have the potential to occur in the area of impact analysis. Table 3-7 also identifies those fish and wildlife species that have federally designated or proposed critical habitat in the analysis area. The Federal species lists were obtained from the Service and NMFS in June 2014.

Table 3-7. Species Federally Listed or Proposed for Listing that Potentially Occur Near Cle Elum Reservoir

Species	Federal Status	Critical Habitat
bull trout - Columbia River DPS	T	Yes
steelhead - Middle Columbia River DPS	T	Yes
gray wolf	E	No
grizzly bear	T	No
Canada lynx	T	No
marbled murrelet	T	No
northern spotted owl	T	Yes
yellow-billed cuckoo	PT	--
Ute ladies'-tresses	T	No

*E = Endangered; T = Threatened; PT = Proposed Threatened.

Federally listed species potentially affected by the Cle Elum Pool Raise Project would include all aquatic species and species that are unable to avoid rising pool elevations, may be using habitat for breeding purposes affected by the higher pool elevations, or would be affected by construction activities. The sections below provide a more complete description of each of these species. Some of the species identified in Table 3-7 do not have suitable habitat within the impact analysis areas or are highly mobile and would otherwise be unaffected by the Cle Elum Pool Raise Project construction activities or higher reservoir elevations. These species include grizzly bear, Canada lynx, gray wolf, yellow-billed cuckoo, and Ute ladies'-tresses. Section 3.9.4 provides additional information as to why this DEIS does not evaluate these species further.

3.9.1 Bull Trout

In June 1998, the Service listed the Columbia River Basin DPS of bull trout as threatened under the ESA (63 FR 31647). The Service at that time identified eight subpopulations in the Yakima River basin, which include isolated populations in Cle Elum Reservoir; this population appears to be very low in number. Bull trout require cold, clear water with stable channels and adequate cover (Thurow,1987; Ziller, 1992). The Service designated critical habitat for bull trout in 2005 (70 FR 56212). It includes the Cle Elum River from the confluence with the Yakima River upstream to the downstream side of the spillway at Cle Elum Reservoir, several small segments of the Cle Elum River above the reservoir, and some portions of Cle Elum River tributary streams above the reservoir. The Service revised the designated critical habitat for bull trout on October 18, 2010 to include Cle Elum Reservoir and additional habitat upstream of the reservoir (75 FR 200).

Bull trout occurred historically throughout most of the Yakima River basin. Today, however, they are fragmented into relatively isolated populations. Although bull trout were probably never as abundant as other salmonids in the basin, due in part to their requirements for cold, clear water, they were likely more abundant and more widely distributed than they are today (WDFW, 1998).

Three bull trout life history forms are present in the Yakima River basin: adfluvial (migrate to lakes), fluvial (migrate to rivers), and resident. Adfluvial and fluvial fish reside in lakes and mainstem rivers, respectively, during part of the year. Fry and juveniles rear in their natal streams for 1 to 4 years before migrating downstream into lakes or mainstem river systems. Adults migrate back into tributary streams to spawn, after which they return to the lake or river. The resident life history form resides in a particular stream for its entire life cycle.

Tributary spawning for adfluvial bull trout occurs in late August to late December when water temperatures drop below 48°F. Shallow littoral rearing, open limnetic rearing, and tributary rearing typically occur in habitats where temperatures do not exceed 59°F.

The lack of fish passage at Cle Elum Dam has isolated local populations of bull trout. The dam eliminated interconnectedness and the exchange of genetic material among populations, and prevented the recolonization of populations diminished by potential catastrophic natural events above the dam (Reclamation and Ecology, 2011b; Reiss et al., 2012). An adfluvial population could still be present in Cle Elum Reservoir. However, no spawning population has been documented in the upper Cle Elum basin since 2000 (Service, 2002; Reiss et al., 2012). Adfluvial bull trout may have been replaced by nonnative lake trout, which have been naturally reproducing in Cle Elum Reservoir since being stocked in the 1920s.

A fluvial bull trout population is present in the mainstem Yakima River although few bull trout have been recorded in the mainstem above Roza Diversion Dam. Bull trout are late summer and early fall spawners and most spawning activity in the Yakima River basin occurs from early September through early October. However, spawning may occur as early as August or as late as early November. For the migratory life history forms, spawning migration can begin as early as mid-July when adults move upstream to hold in deep pools, or it may occur just prior to spawning.

Bull trout do not spawn in the river below Cle Elum Dam (Easterbrooks, 2009). Fluvial juveniles and subadult bull trout may rear in the area, but this use has not been documented.

The primary downstream migration period for juvenile bull trout from their natal tributaries into lakes or rivers occurs from June through November. The early summer migration appears to be in response to increased flows and may correspond with a switch in prey from invertebrates to fish. The fall migration appears to be primarily in response to decreasing water temperatures and the need to find suitable overwintering habitat (Fraley and Shepard, 1989; Murdoch, 2002).

The highest severity threat to this population appears to be low abundance. It is uncertain whether bull trout are still present in the Cle Elum drainage as their presence was last documented in 2002 (Reiss et al., 2012). However bull trout may be present within Cle Elum Reservoir, given the presence of adequate habitat in the Cle Elum drainage and subsequent identification of the Cle Elum Reservoir as designated critical habitat, historic documentation of presence, and other anecdotal factors.

3.9.2 Middle Columbia River Steelhead

The steelhead population in the Yakima River basin is a component of the Middle Columbia River (MCR) Distinct Population Segment steelhead that was listed as threatened in 1999 (64 FR 14517). Four genetically distinct spawning populations of wild steelhead have been identified in the Yakima River basin, one of which spawns in the upper Yakima River and its tributaries (Phelps, et al., 2000). Critical habitat was designated for the MCR steelhead and includes the Cle Elum River downstream from Cle Elum Dam (70 FR 52630).

Adult MCR steelhead return to the upper Yakima River between September and June with the majority passing the Roza Diversion Dam in March and April (Karp et al., 2009). Generally, adult MCR steelhead migration into the Yakima River basin begins in late summer and peaks in late October. Another peak occurs starting in late February or early March, following a relatively inactive period during the coldest winter water temperatures. Typically, steelhead spawn earlier in the warmer water of lower elevation areas rather than in the colder water of higher elevation areas. Overall, most spawning occurs between March and May (Hockersmith et al., 1995), although WDFW personnel have observed steelhead spawning as late as July in the Teanaway River, a tributary to the upper Yakima River outside the project area.

An average of 169 wild steelhead entered the fish trap at Roza Dam from fall 2002 to spring 2006 en route to access potential spawning habitats in the upper Yakima River basin. This represents about 6.4 percent of the annual wild steelhead run to the Yakima River. Most of the trapped steelhead were 4 or 5 year olds—25.4 percent and 43.8 percent, respectively. At least 1.8 percent of the presumed spawners were repeat spawners (Karp et al., 2009).

Yakima River basin steelhead are tributary spawners, with most spawning occurring in the complex, multichannel reaches of tributaries that have a moderate gradient of about 1 to 4 percent (Berg and Fast, 2001). Using radiotelemetery to examine the distribution of spawning steelhead in the upper Yakima River, Karp et al. (2009) found 37.7 percent using habitats in the mainstem Yakima River and 62.3 percent using tributaries. The study found that 3.4 percent of the steelhead used the Cle Elum River for spawning. As noted in Section 3.6, Cle Elum Dam currently has no upstream fish passage to allow steelhead to spawn in habitats upstream of the dam.

The Karp et al. study estimated the number of wild spawners using the Cle Elum River (2009). Applying the assumption that 3.4 percent used the Cle Elum River and 37.7 percent used the mainstem Yakima River to the average total annual count of 169 steelhead entering Roza Dam suggests that an average of 6 wild steelhead spawners (range of 4 to 8 fish) used the Cle Elum River while 64 (range of 44 to 85 fish) used the mainstem Yakima River.

Juvenile steelhead emerge from the gravel between June and August and rear in the areas near where they were spawned for 1 to 4 years before migrating to the sea. Juvenile steelhead utilize tributary and mainstem reaches throughout the Yakima River basin as rearing habitat and use faster and deeper water as they grow. Some downstream movement begins in November, but the peak smolt outmigration occurs between mid-April and May (Reclamation and Ecology, 2011c).

3.9.3 Northern Spotted Owl

The northern spotted owl was listed as a threatened species by the Service in 1990, primarily due to widespread habitat loss and inadequate protective mechanisms. Northern spotted owls generally rely on older forested habitats because such forests contain the structures and characteristics required for nesting, roosting, and foraging. Features that support nesting and roosting typically include a moderate-to-high canopy closure (60 to 90 percent); a multilayered, multispecies canopy with large overstory trees (with diameter at breast height greater than 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (Thomas et al., 1990). Forested stands with high canopy closure also provide thermal cover (Weathers et al., 2001) and protection from predators. Spotted owls forage on wood rats, mice, bats, and occasionally small birds, moths, crickets, and large beetles.

The Service published a Final Revised Critical Habitat for the Northern Spotted Owl in 2008. That plan established a network of Managed Owl Conservation Areas (MOCAs) across the range of the northern spotted owl. As described in the Yakima River Basin Water Storage Feasibility Study EIS (Reclamation, 2008b), the northern half of Cle Elum Reservoir lies within a proposed MOCA and the southern half lies within a proposed Conservation Support Area (CSA) under the previous recovery plan (Service, 2008). However, the 2008 recovery plan was later remanded in 2008 due to a court challenge and investigation.

In 2011, the Service released the Revised Recovery Plan for the Northern Spotted Owl (Service, 2011a). The 2011 plan retains some elements of the 2008 version of the plan, including a strategy to assess and address threats from barred owls and support for forest restoration techniques. However, based on scientific peer review comments on the recovery plan, the Service is not incorporating the previously recommended MOCA network or Conservation Support Area and critical habitat designations into the revised recovery plan. The revised recovery plan states that in the interim, Federal land managers should continue to implement the standards and guidelines of the Northwest Forest Plan as well as fully considering other recommendations in the Revised Recovery Plan for the Northern Spotted Owl (Service, 2011a). The Service updated critical habitat designations to address new threats and to incorporate emerging science regarding habitat management in fire-prone areas as part of a rulemaking process published on December 4, 2012 (Service, 2012).

Despite Federal and State protections, results from population trend analysis in four areas in Washington, including the vicinity of Cle Elum Reservoir, indicate that northern spotted owl populations have continued to decline (Anthony et al., 2006; Forsman et al., 2011). Nesting northern spotted owl have been documented north and east of Cle Elum Reservoir. The closest currently occupied nest is approximately 1.5 miles northeast of the north end of the reservoir (Garvey-Darda, 2014). Designated critical habitat for the northern spotted owl includes the majority of forested habitats on the west and north side of Cle Elum Reservoir and much of the area between the reservoir and Kachess Reservoir (depicted by the Service online mapper available at http://ecos.fws.gov/crithab/).

3.9.4 Additional Species

The following sections briefly describe additional federally listed species that may occur in the analysis area, but are not likely to be affected by the project due lack of suitable habitat and specific life history traits.

3.9.4.1 Marbled Murrelet

The Service listed the marbled murrelet as a threatened species in 1992 due to a decline in abundance and habitat degradation in the southern portion of its range (Ralph et al., 1995). Marbled murrelets are marine birds that forage in nearshore environments from northern California through Alaska. They nest in mature coniferous forests west of the Cascade crest at low to moderate elevations (Smith et al., 1997). The Cle Elum Reservoir is located near the eastern extent of the breeding range for marbled murrelet. Less than 6 percent of marbled murrelet detections occur outside 40 miles of the marine environment and the most inland nest that has been documented in Washington is approximately 55 miles from the ocean (WDFW, 2013).

The Service has designated critical habitat for the marbled murrelet, but none is designated in the Cle Elum area. The closest block of habitat is approximately 16 miles northwest of the analysis area on the west side of Keechelus Reservoir (depicted by the Service online mapper available at http://ecos.fws.gov/crithab/). The WDFW Gap Analysis Program analysis for suitable habitat also concluded that suitable habitat for marbled murrelet is present in the northern half of Kachess Reservoir and all of Keechelus Reservoir (Smith et al., 1997). While it is possible that marbled murrelet occur in the project vicinity, the distance from foraging habitat likely precludes the analysis area from supporting suitable nesting habitat.

3.9.4.2 Grizzly Bear

Recent estimates indicate the North Cascade grizzly bear population is very small, likely less than 20 individuals (Service, 2011b). Few recent credible sightings and reports exist in the North Cascades recovery zone. Grizzly bears inhabit a relatively large home range (110 to 500 square miles) that varies in size and composition depending upon season, reproductive status, and environmental factors. Critical habitat, including mating and denning locations, is not present near Cle Elum Reservoir. In addition, the habitat immediately abutting Cle Elum Reservoir is not ideal for grizzly bears because the bears prefer habitat not affected by human disturbance, including vehicle traffic (Waller and Servheen, 2005).

3.9.4.3 Canada Lynx

Canada lynx may be present in the project area, but are uncommon or rare (WDFW, 2013). Lynx generally require habitat consisting of moist boreal forests with cold, snowy winters. In Washington, this habitat is generally located above 4,000 feet. The Cle Elum Reservoir is located at roughly elevation 2,200, and the surrounding area is unlikely to support lynx populations. Home ranges for lynx are relatively large, ranging from 12 to 83 square miles (Service, 2014). Lynx denning areas in Washington occur in old stands (less than 200 years old) of lodgepole pine, Engelmann spruce, and subalpine fir (Koehler and Brittell, 1990;

Koehler, 1990; Stinson, 2001). There is no federally designated critical habitat near the reservoir and it is unlikely that the project would affect this species.

3.9.4.4 Gray Wolf

Gray wolves are rare within the project area, as they typically avoid human activity. The majority of wolf packs in Washington are concentrated in the northeast corner of the State, with two packs located near the Cascade crest between Interstate 90 (I-90) and Highway 2 (Becker et al., 2014). The Teanaway pack occupies a range that may include portions of the impact analysis area, though the majority of the range is located east of Cle Elum Reservoir (Becker et al., 2014).

3.9.4.5 Yellow-billed Cuckoo

Yellow-billed cuckoo habitat includes large blocks (greater than 25 acres) of dense cottonwood and willow bottomlands with thick understory growth. The Cle Elum Reservoir is adjacent to large tracts of mixed age stands of coniferous forest with small amounts of scattered willows and cottonwoods along the reservoir margin and along the floodplain habitats of the upper Cle Elum River. It is unlikely that the yellow-billed cuckoo is present in the impact analysis area due to the small amount of suitable habitat and isolation from large contiguous blocks. In addition, the northern limit of the breeding range for western yellow-billed cuckoo is in California and potentially the southern portion of Oregon.

3.9.4.6 Ute Ladies'-tresses

Ute ladies'-tresses grow in moist soil near riparian areas, lakes, moderately moist (mesic) to wet meadows, river meanders, and perennial spring habitats. The first discovery of Ute ladies'-tresses in Washington State was in Okanogan County in 1997. At present, there are no known populations of Ute ladies'-tresses within the Cle Elum Ranger District (Lau, 2012) and, therefore, the species will not be further evaluated in this DEIS.

3.10 Visual Quality

This section describes the visual quality setting of the Cle Elum Reservoir area. Because the reservoir is located within the Okanogan-Wenatchee National Forest, this section describes visual quality in the context of USFS visual criteria. The area of potential impact for visual quality includes views of Cle Elum Dam and Reservoir and the surrounding shoreline.

3.10.1 Existing Visual Setting

Cle Elum Reservoir was originally a natural glacial lake located within the U-shaped glacial valley of the Cle Elum River. Damming the natural lake in 1933 changed the visual setting of the valley. Cle Elum Reservoir is larger than the natural lake and water levels fluctuate throughout the year as the reservoir is drawn down to meet downstream irrigation demands. The reservoir is generally full in late spring and early summer, but is drawn down starting in late spring. It does not refill until the following spring. The fluctuating water levels leave large areas of exposed shorelines from late summer through the winter. In dry years, the reservoir may not completely fill and the upper portions of the reservoir are exposed year-round.

The visual setting for Cle Elum Reservoir provides a perceived “natural” landscape with limited development along the shores. Viewers of the reservoir are primarily recreationists and seasonal residents. Middle ground views are of forested hillsides with some logged patches, valley walls, ridges, and mountains beyond (see Photos 3-1 and 3-2). Pine and Douglas fir trees dominate the vegetation. The landscape character is predominately a naturally appearing to slightly altered forested environment viewed in the foreground, middle ground, and background of the Cle Elum Reservoir viewshed.

The upper Cle Elum River flows through the valley bottom into the north end of the reservoir (see Photo 3-3). The river creates a delta area that is often exposed when water levels are low. Public views across the reservoir are generally unrestricted from the southwest shoreline and more restricted from the southeast shoreline. Because the reservoir is over 7 miles long, there are no public views of the full length of the reservoir.

Cle Elum Dam, located on the south end of the reservoir, is approximately 165 feet tall and 1,800 feet in length with a gated spillway. The full height of the dam and the spillway are only visible from the downstream side of the dam. Public views of the downstream side of the dam are limited by steep topography and restricted access. From the reservoir and shoreline, public views of the dam are mostly unrestricted, but only a few feet of the dam are visible above the water level (see Photo 3-9).

Development adjacent to the reservoir is generally limited to USFS facilities, including roads on the east and northwest shore, boat launches, campgrounds, and seasonal cabins (see Photos 3-2 to 3-10). Year-round residences and resorts are located south of the reservoir near the dam and are visible from the main road. Numerous residential areas are located along the east side of the reservoir, but are generally not visible from the road. Most of the west shore is inaccessible and undeveloped.

3.10.2 USFS Visual Criteria

The USFS manages the land around the reservoir principally as a scenic viewshed according to its 1990 Wenatchee National Forest Plan (USFS, 1990). The Wenatchee National Forest Plan has designated scenic quality objectives and recreation setting objectives for the Cle Elum Reservoir area. These designations include Scenic Travel 1, Scenic Travel 2, Recreational River Proposed, and Developed Recreation.

The USFS management direction for scenic viewsheds containing dams and reservoirs is described in terms of Visual Quality Objectives (VQOs). The VQOs are based on large-scale visual inventory and management process called the "Visual Management System" (VMS), which has been used by the USFS since the 1970s (USFS, 1974). The VQOs describe the degree of acceptable alteration of the undisturbed landscape. Higher-level VQOs, such as “Preservation,” protect the most highly visible and most frequently seen areas that have the greatest amount and variety of natural features and vegetation.

In 1995, the USFS adopted a new method of visual management, called the "Scenery Management System" (USFS, 1995). This method introduces the concept of Scenic Integrity as a measure of the degree to which people visually perceive a landscape as complete. Scenic Integrity corresponds to VQOs, thereby integrating scenic values and landscape aesthetics in Forest Plans. The USFS established Scenic Integrity for each Management Area ranging from Very High, meaning the landscape is unaltered, to Low, meaning moderate alterations are apparent on the landscape. Table 3-8 describes the relationship between VQOs and Scenic Integrity:

Table 3-8. Relationship between Visual Quality Objectives and Scenic Integrity [1]

VQO/Scenic Integrity	Condition	Perception, Degree of Deviation
Preservation/Very High	Unaltered	The valued landscape character is intact with only minute if any deviations.
Retention/High	Appears Unaltered	Not evident. Deviations may be present but must repeat form, line, color, and texture of characteristic landscape in scale.
Partial Retention/Moderate	Slightly Altered	Appears slightly altered. Noticeable deviations must remain visually subordinate to the landscape character being viewed.
Modification/Low	Moderately Altered	Appears moderately altered. Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings.
Maximum Modification/Very Low	Heavily Altered	Appears heavily altered. Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings.
Unacceptably Low (Not a management objective, used for inventory only)	Unacceptable Modification	Deviations are extremely dominant and borrow little if any form, line, color, texture, pattern or scale from the landscape character.

Source: USFS, 1995, 2-4.
[1] VQO and Scenic Integrity presented as allocated for Cle Elum Reservoir.

The USFS allocates the Cle Elum Reservoir foreground viewshed to the following scenic quality objectives and corresponding VQOs and Scenic Integrity:

- **Scenic Travel 1 –** Retention VQO/High. The goal is to retain or enhance the viewing and recreation experiences along scenic travel routes.

- **Scenic Travel 2 –** Partial Retention VQO/Moderate. The goal is to provide a near natural appearing foreground and middle ground along scenic travel corridors.

- **Recreational River Proposed –** Retention VQO/High. The goal is to preserve the Recreational River characteristics of the river and surrounding area, pending a decision on its legislation as part of the Wild and Scenic Rivers System.

- **Developed Recreation –** Retention VQO/High. The goal is to provide developed recreation in an Urban to Semi-Primitive Recreation Opportunity Spectrum setting.

The USFS determined that Cle Elum Reservoir meets the established VQO of Retention as viewed from Cle Elum Reservoir, County Road 903, Salmon La Sac Forest Road (FR) 4330, and developed recreation sites. In areas designated Retention VQO, a visitor would perceive all foreground landscapes as natural appearing and the landscape would have High Scenic Integrity. All other foreground viewsheds meet the established VQO of Partial Retention. In these areas, a visitor would perceive a natural appearing to slightly altered landscape viewed in foreground and middle ground areas and would have Moderate Scenic Integrity.

3.11 Air Quality

3.11.1 Air Quality Standards and Regulations

This section describes the air quality conditions of the Cle Elum Reservoir area and the air quality regulations applicable to the area. The impact analysis area for air quality is the area around the reservoir and areas downwind of construction projects that increased emissions or fugitive dust could affect.

Assessment of ambient air quality is in terms of whether concentrations of air pollutants are higher or lower than ambient air quality standards that have been set to protect human health and welfare. The EPA regulates air quality under the Federal Clean Air Act (CAA). In Washington State, Ecology and the local Clean Air Agency, where applicable, administer the CAA. There is no local Clean Air Agency for areas within Kittitas County; therefore, administration of air quality regulations resides with Ecology.

Under authority of the CAA, the EPA has established nationwide air quality standards, known as the National Ambient Air Quality Standards (NAAQS). These standards represent the maximum allowable atmospheric concentration of criteria pollutants. Pollutants for which standards have been set include carbon monoxide (CO), nitrogen dioxide (NO_2), suspended particulate matter less than 10 or 2.5 microns in aerodynamic diameter (PM_{10} and $PM_{2.5}$), ozone (O_3), sulfur dioxide (SO_2), and lead (Pb). The State of Washington has also adopted ambient air quality standards for these pollutants. Table 3-9 lists the current Federal and State NAAQS and violation criteria for each pollutant.

If the ambient air in a specified region meets the NAAQS, it is an attainment area. Conversely, if a region does not meet the NAAQS, it is a nonattainment area. Ecology makes determinations for attainment and nonattainment by analyzing air monitoring data. If an area does not have adequate air monitoring data to make a determination, it is designated unclassified and treated as an attainment area. All areas of Kittitas County (where the Cle Elum Reservoir is located) are designated as attainment or unclassified for all criteria pollutants (Ecology, 2014b) and Kittitas County is in attainment for all criteria pollutants.

Table 3-9. National Ambient Air Quality Standards

Criteria Pollutant	Averaging Period(s)	NAAQS		Violation Criteria	
		Washington	National	Washington	National
CO	1-hour 8-hour	35 ppm 9 ppm	35 ppm 9 ppm	If exceeded more than once per year	If exceeded more than once per year
NO_2	1-hour	100 ppb	100 ppb	If exceeded by the mean of annual 98th percentile of daily max values over 3 years	If exceeded by the mean of annual 98th percentile of daily max values over 3 years
	Annual	53 ppb	53 ppb	If exceeded	If exceeded
PM_{10}	24-hour	150 µg/m^3	150 µg/m^3	Not to be exceeded more than once per year averaged over 3 years	For 1997 nonattainment areas, if exceeded on more than 1 day per year. For other areas, if exceeded by the mean of annual 99th percentile values over 3 years
$PM_{2.5}$	24-hour	35 µg/m^3	35 µg/m^3	If exceeded by the mean of annual 98th percentile values over 3 years	If exceeded by the mean of annual 98th percentile values over 3 years
	Annual	12 µg/m^3	12 µg/m^3	If exceeded	If exceeded as a 3-year spatial average of data from designated stations
O_3	8-hour	0.075 ppm	0.075 ppm	If exceeded by the mean of annual 4th highest daily values for a 3-year period	If exceeded by the mean of annual 4th highest daily values for a 3-year period
SO_2	1-hour	75 ppb	0.075 ppm	If exceeded by the 99th percentile of 1-hour daily maximum concentrations over 3 years	If exceeded by the mean of annual 99th percentile of daily max values over 3 years
	3-hour	0.5 ppm	0.5 ppm	If exceeded on more than 1 day per year	If exceeded on more than 1 day per year
	24-hour	0.14 ppm	-----	If exceeded more than once per year	
	Annual	0.02 ppm	-----	If exceeded	
Lead (Pb)	Rolling 3 month	0.15 µg/m^3	0.15 µg/m^3	If exceeded	If exceeded

Sources: 40 CFR Parts 50, 53, and 58; EPA 2011; National Ambient Air Quality Standards (NAAQS); Ecology 2014a. Ambient Air Quality Standards in Washington State

Each State is also responsible for protecting air quality by developing a State Implementation Plan (SIP) to maintain or improve air quality. In their SIPs, states are required to address the EPA Prevention of Significant Deterioration (PSD) requirement. Under the PSD provisions, incremental increases of specific pollutant concentrations are limited above a legally defined baseline level for new or modified major stationary sources in attainment or unclassified areas. SIPs must also address visibility within federally designated Class I areas, where good air quality is deemed to be of national importance (Section 162 CAA, August, 1977, defines Class I areas). The closest Class I areas to Cle Elum Reservoir is the Alpine Lakes Wilderness Area, 3 miles north. Prevailing winds are generally from the west; therefore, air pollution from offshore (Pacific) and urban centers west of the Cascade Mountains contribute to visibility impairment. The State has not identified construction activities as contributing to visibility impairment in Class I areas in Washington (Ecology, 2010).

Ecology regulates construction activities as a source of air pollution under the jurisdiction of Ecology and local regulations. Projects that require earthwork or otherwise have the potential to create fugitive dust are required to use best management practices (BMPs) to control dust at the project site. According to WAC 173-400-300, fugitive air emissions are emissions that “do not and which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening.” These emissions include fugitive dust from unpaved roads, construction sites, and tilled land. Fugitive emissions are considered in determining the level of air quality permitting required only for a certain subset of sources, not including this type of proposed project. However, pursuant to WAC 173-400-040(8)(a): “The owner or operator of a source of fugitive dust shall take reasonable precautions to prevent fugitive dust from becoming airborne and shall maintain and operate the source to minimize emissions.”

3.11.2 Current Air Quality Environment

To measure existing air quality, Ecology maintains a network of monitoring stations throughout Washington State. Generally, these stations are placed where there may be air quality problems, and so they are usually in or near urban areas or close to specific air pollution sources. Other stations in remote areas provide an indication of regional air quality. No existing air quality monitoring sites are near the Cle Elum Reservoir. The closest monitoring station is located in Ellensburg, 30 miles east. Reclamation did not use data from this station as an estimate of existing air quality in the project area because Ellensburg is in an urban and suburban area. The actual ambient air quality at Cle Elum Reservoir most likely is much better than in Ellensburg because of the lower population density and lack of significant emission sources.

Because of the sparse population and rural nature of most of the county, existing sources of air pollution are minimal. Sources of existing air pollutants in the project area are generally limited to vehicle emissions. The nearest major freeway, I-90, is located 3.5 miles southwest of the reservoir area. State Route 903 on the eastern side of the reservoir is the nearest major paved road adjacent to the reservoir. Fugitive dust and combustion emissions are generated in the area by vehicles traveling on gravel or dirt roads, construction, and other activities that disturb the soil and utilize combustion engines. Wood fires from cabins and campfires are a source of carbon monoxide, formaldehyde, nitrogen oxides, and particulates. Forest fires are occasionally a source of air pollution. Since prevailing winds are generally from the west, air pollution from urban centers west of the Cascade Mountains can enter the Cle Elum River valley during certain weather conditions.

3.12 Climate Change

Global climate change has the potential to impact water resources in the Cle Elum watershed and the Yakima River basin. Scientists predict that increasing atmospheric CO_2 concentrations will produce significant changes in atmospheric circulation, resulting in increases in global air temperature and increases and decreases in average precipitation. Potential climate change impacts from the Cle Elum Pool Raise Project would include substantial increases in CO_2 emissions caused by construction or operation of the alternatives, and changes in future temperatures and precipitation patterns, with resulting implications for stream runoff volume and timing, water temperatures, and reservoir operations. The area of impact analysis for climate change is the Yakima River basin and the Cle Elum River basin.

The Cle Elum Pool Raise Project has the potential to alter how water resources are affected by climate change. The Integrated Plan PEIS evaluated potential effects to the Yakima River basin associated with climate change at a programmatic level (Sections 3.13 and 3.14 in Reclamation and Ecology, 2012). For this DEIS, Reclamation and Ecology conducted project-level hydrologic modeling studies of potential changes associated with climate change. The results of these studies are presented in the 2014 Hydrologic Modeling Report (Reclamation and Ecology, 2014b) and discussed below and in Section 4.12 of this DEIS.

3.12.1 Climate Change Predictions for the Yakima River Basin

The water supply source in the Yakima River basin is a mix of direct runoff from fall rain and spring snowmelt. Wetter and colder winters tend to accumulate more snowpack in the highest elevation portions of the watersheds above the five existing Yakima basin storage reservoirs. Colder springs tend to retain more accumulated snowpack longer, producing snowmelt runoff that occurs within the irrigation season. Warmer and drier winters and springs tend to accumulate less snowpack and tend to produce snowmelt runoff that occurs before the start of the irrigation season. When snowmelt runoff occurs during the irrigation season, Reclamation can meet a larger portion of the irrigation demand with stored runoff rather than supplying irrigators out of water previously stored in the reservoirs. This leaves the reservoirs fuller, and better able to supply late season irrigation demands.

Simulations predict that climate change would most affect this type of watershed (Mantua et al., 2010). The watershed areas above the Yakima basin reservoirs are not high in altitude; therefore, a relatively small increase in winter and spring temperature could cause winter precipitation to fall as rain rather than snow, or could initiate earlier melting of the snowpack. Recent climate change studies to assess risks to water supply in the Yakima River basin include those conducted by the Climate Impacts Group (CIG) at the University of Washington. The study results were included in Addendum A to the Yakima River Basin Study, Proposed Integrated Water Resource Management Plan (Reclamation and Ecology, 2011a).

Climate change effects were modeled for this DEIS, using the Yakima Project RiverWare model. The model used two scenarios to analyze climate change effects. The first scenario, called "Baseline," uses historic hydrologic conditions developed from stream gaging. The CIG used the other scenario to model future climate specific hydrologic modeling. The second scenario uses assumptions about future greenhouse gas emissions that are relatively central, when compared with the range of available climate change scenarios (RMJOC, 2010). This means that the assumptions about average change in temperature and precipitation that are included in the scenario are smaller than some, but larger than others. These assumptions are near the middle of (or central to) the range of predicted climate changes. Reclamation and Ecology selected a central scenario because it would provide a reasonable basis for making water resources planning decisions. The global climate modeling assumed the "B1" emissions pathways as the basis for this scenario.[1] The selected scenario represents an "Adverse" climate change condition that may occur during the 2040s (Reclamation and Ecology, 2011d). Table 3-10 summarizes the climate change scenarios.

Table 3-10. Summary of Climate Change Scenarios

Scenario	Climate Model Used	Descriptive Label	Average Temperature Change	Average Precipitation Change	Average Annual Inflow to Five Reservoirs (1,000 Acre-Feet)
Historically-based Baseline	None	Baseline	0	0	1,660
Adverse (Selected scenario)	HADCM (B1 Emissions pathway)	2040s Central Change	1.7 ºC (35.1 ºF) average increase	3.7% increase	1,480

Source: Reclamation and Ecology, 2011d (page 42).

The following sections present changes to water supply under the selected climate change scenario as related to the Yakima River basin.

3.12.1.1 Changes in Snowpack

Snowpack is the so-called "sixth reservoir" in the Yakima River basin because runoff that comes from melting snowpack meets most demands in the spring and early summer. Only about 30 percent of the average annual total natural runoff above the Parker stream gage can be stored in the current Yakima River basin reservoirs (Reclamation and Ecology, 2011f).

[1] The B1 scenarios assume that the world is more integrated and more ecologically friendly than other emissions pathways. The scenarios include rapid economic growth and rapid change toward a service and information economy. Global population is assumed to rise to 9 billion in 2050 and then to decline. Other assumptions include reductions in material intensity and the introduction of clean and resource efficient technologies, with an emphasis on global solutions to economic, social and environmental issues (Intergovernmental Panel on Climate Change, SRES SPM (2000), "Summary for Policymakers," Emissions Scenarios: A Special Report of IPCC Working Group III).

Therefore, the water supply of the Yakima River basin is susceptible to changes in snowpack caused by climate change.

In addition, increased air temperatures from climate change would cause more precipitation to fall as rain rather than snow in the Cascade Mountains, which would reduce snowpack in the headwaters of the Cle Elum River. Higher air temperatures would cause snowpack to melt earlier than under current conditions (Reclamation and Ecology, 2011a). Studies have shown that the Yakima River basin is likely to have a 12 percent decrease in snowmelt volume given a 1ºC (33.8ºF) rise in air temperature, and a 27 percent decrease in snowmelt volume given a 2ºC (35.6ºF) rise (Vano et al., 2010).

3.12.1.2 Changes in Quantity and Timing of Runoff

To analyze changes in runoff caused by climate change, the model compared the total inflow into Cle Elum Reservoir predicted by the Baseline and Adverse climate change scenarios discussed above. Figure 3-4 compares the modeling results of runoff into Cle Elum Reservoir with the increased storage capacity under historically based Baseline conditions and under Adverse (HADCM model) conditions.

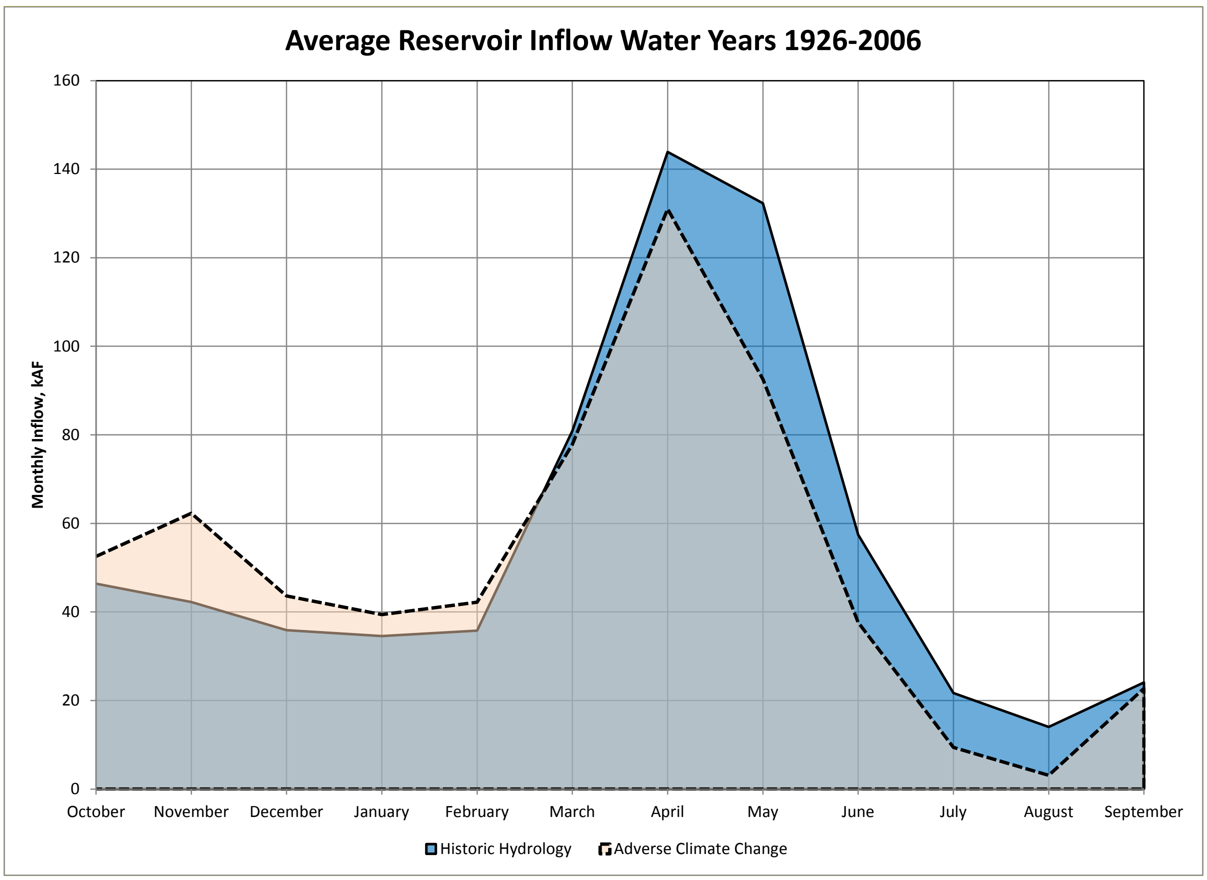


Figure 3-4. Comparison of Average Monthly Reservoir Inflows of Historical Baseline and Adverse Scenario
(Source: Reclamation and Ecology, 2014b)

Table 3-11 compares the Baseline and Adverse climate change scenarios for seasonal inflow into Cle Elum Reservoir from the model results.

Table 3-11. Comparison of Average Seasonal Inflows into Cle Elum Reservoir for the Climate Change Scenarios (Results in Thousands of Acre-Feet)

Scenario	Fall (October-December)	Winter (January-March)	Spring (April-June)	Summer (July-September)	Total
Baseline (Existing or Historical)	125	151	334	60	669
Adverse (HADCM B1)	158 (+27%)	160 (+5%)	260 (-22%)	35 (-41%)	613 (-8%)

Based on the model results, Reclamation expects changes in runoff in the Cle Elum River basin caused by climate change to be substantial. For the scenario modeled as part of the Yakima River Basin Study (Reclamation and Ecology, 2011e), the average annual change in reservoir inflow decreases by 8 percent compared to the existing or historically based scenario. The model predicts spring runoff to decrease by an average of 22 percent, and summer runoff to decrease by 41 percent. The model predicts that fall and winter runoff would increase by an amount ranging from 5 to 27 percent of existing runoff.

The shifts in runoff quantity and timing shown in the model results would cause substantial risks to water supply. Fall and winter inflow would increase, but the reservoir may not be able to refill completely before spring. The model predicts that agricultural demand will be higher than under historical conditions in the low inflow period of the summer. A decrease in spring and summer flow would cause depletion of water stored in Cle Elum Reservoir at a faster rate to meet demand. The combined effects would likely cause a decrease in overall supply during the high demand period. Figure 3-5 compares simulated existing Cle Elum Reservoir water surface elevation under the historic and Adverse climate scenarios. The model predicts the existing reservoir to be 16 feet lower, on average, under the Adverse climate change scenario.

The Adverse climate change scenario causes lower simulated water surface elevations and results in the existing Cle Elum Reservoir filling less frequently. This effect may mean that the enlarged storage capacity provided by the Cle Elum Pool Raise Project would be available less often, compared with that under historical hydrologic conditions, as discussed in the following section. On the other hand, under the Adverse climate change scenario, water demands would tend to increase both water demands and the need for additional storage to meet water supply needs and minimum instream flow targets during the summer, when runoff is lower, compared with historic conditions.

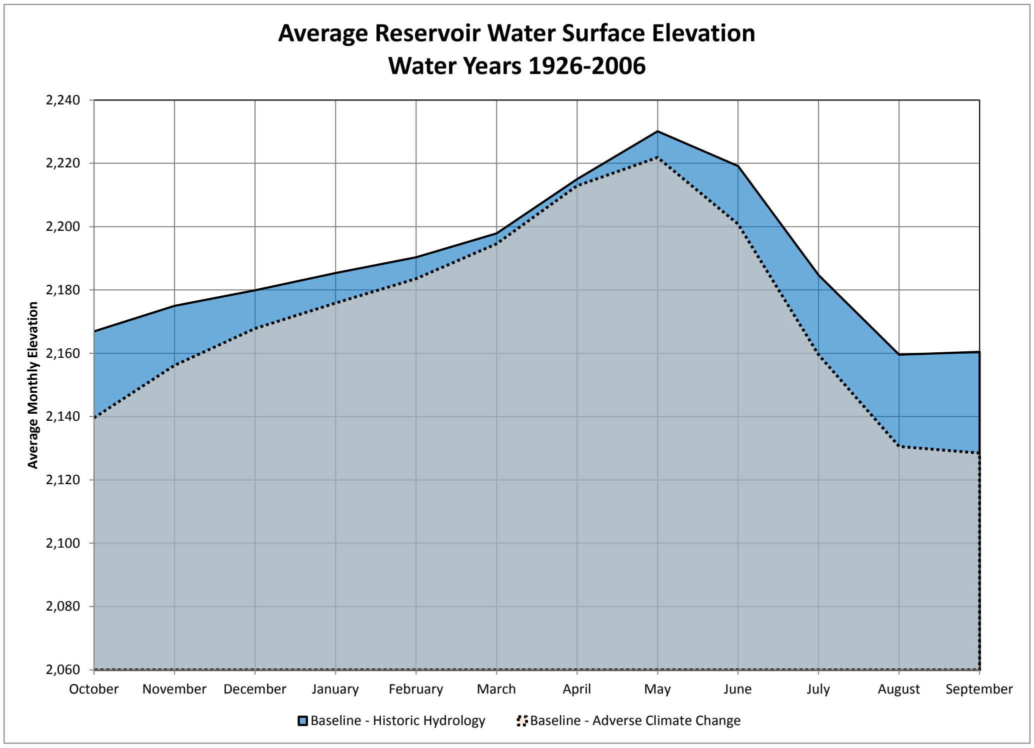


Figure 3-5. Comparison of Average Monthly Cle Elum Reservoir Water Surface Elevation of Historical Baseline and Adverse Scenario
(Source: Reclamation and Ecology, 2014b)

3.13 Noise and Vibration

This section describes the existing noise conditions at Cle Elum Reservoir, expected noise and vibration levels from likely construction equipment for the project, and regulations related to noise and vibration. The area of impact analysis is the areas around the reservoir that increased noise, especially those areas with sensitive receptors, would affect (Section 3.13.2).

There are several ways to measure noise, depending on the source of the noise, the receiver, and the reason for the noise measurement. A decibel (dB) is the unit used to describe the amplitude of sound. Noise levels are stated in terms of decibels on the A-weighted scale (dBA). This scale reflects the response of the human ear by filtering out some of the noise in the low- and high-frequency ranges that the ear does not detect well. The A-weighted scale is used in most noise ordinances and standards.

Noise effects in humans can be physical or behavioral. The mechanism for chronic exposure to elevated sound levels leading to hearing damage is well established. Elevated sound levels cause trauma to the cochlear structure in the inner ear, which leads to irreversible hearing loss. Hearing loss can begin to occur with prolonged exposure at 85 dB. For context, normal conversation is approximately 60 dB, and the noise from heavy city traffic can reach 85 dB. Motorcycles, firecrackers, and small firearms, all emit sounds from 120 to 150 dB (NIDCD, 2008). Noise pollution also constitutes a significant factor of annoyance and distraction.

Construction activities have the potential to produce vibration levels that may be annoying or disturbing to humans and cause damage to nearby structures. Peak particle velocity (PPV) is the measurement of vibration. The PPV is the maximum velocity experienced by any point in a structure during a vibration event. It is an indication of the magnitude of energy transmitted through vibration. PPV is an indicator often used in determining potential damage to buildings from stress associated with blasting and other construction activities.

3.13.1 Noise Standards and Regulations

State, county, and local noise regulations specify standards that restrict both the level and duration of noise measured at any given point. The maximum permissible environmental noise levels depend on the land use of the property that contains the noise source (i.e., industrial, commercial, or residential) and the land use of the property receiving the noise.

Cle Elum Reservoir and Dam are located in Kittitas County, which has no noise regulations; therefore, the Washington State regulations apply to the project. WAC 173-60 establishes limits on the levels and duration of noise crossing property boundaries. These levels are based on the Environmental Designation for Noise Abatement (EDNA), which is defined as an area or zone (environment) within which maximum permissible noise levels are established. There are three EDNA designations (WAC 173-60-030), which generally correspond to residential, commercial and recreational, and industrial and agricultural uses:

Class A: Land where people reside and sleep (such as residential)

Class B: Land requiring protection against noise interference with speech (such as commercial and recreational)

Class C: Land where economic activities are of such a nature that higher noise levels result (such as industrial and agricultural)

Table 3-12 summarizes the maximum permissible levels applicable to noise received at the three EDNAs. Noise sensitive areas in the project vicinity include Class A and Class C EDNA.

Table 3-12. Maximum Allowable Noise Levels

Environmental Designation for Noise Abatement of Noise Source	Environmental Designation of Noise Abatement of Receiving Property		
	Class A (dBA)	Class B (dBA)	Class C (dBA)
Class A (residential/recreational)	55	57	60
Class B (commercial)	57	60	65
Class C (industrial)	60	65	70

WAC 173-60-050 identifies noise sources or activities that are exempt from the noise limits described in the Table 3-12:

- Sounds created by traffic on public roads.
- Sounds created by warning devices (i.e., back-up alarms).
- Sounds from blasting and from construction equipment are exempt from the standards during the day (7:00 a.m. to 10:00 p.m. weekdays and from 9:00 a.m. to 10:00 p.m. on weekends) in rural and residential districts.

No State, regional, or local regulations relate to vibration. The potential effects from vibration on people and buildings are evaluated using U.S. Department of Transportation guidelines for vibration levels from construction (FTA, 2006).

Construction equipment can cause ground-borne vibration, also measured in a decibel notation (VdB). Unlike noise, vibration is not a phenomenon that most people experience every day. The threshold for human perception of ground-borne vibration is around 65 VdB. However, human response to vibration is not usually significant unless the vibration exceeds 70 VdB. The level of background vibration velocity in residential areas is typically 50 VdB or lower. Heavy construction equipment, such as large bulldozers and loaded trucks, can generate between 85 and 87 VdB at 25 feet. Vibration levels greater than 100 VdB can potentially cause minor damage to fragile historic buildings.

3.13.2 Noise Setting

Cle Elum Reservoir is located in a relatively remote forested area that is sparsely populated and is considered a Class A area. Sensitive noise receptors at Cle Elum Reservoir include several parcels of private land with houses or cabins located below (southeast) and across (northeast) the reservoir from the dam and along the east shore of the reservoir and upper river. Some of these receptors are within close proximity to the project area and proposed construction zones. Recreational boaters, fishers, campers, hunters, and skiers are common in the project area.

Typical background noise levels in coniferous recreational settings range from 35 to 45 dBA in the summer daytime and 30 to 35 dBA in the winter daytime (USFS, 2007). Current sound levels at Cle Elum Reservoir are not uncharacteristic for the type of land uses found there, as vegetation and winter snowpack absorb human-caused noise. The exception to this is noise at the shore or on the reservoir surface. At these locations, noise tends to amplify and travel farther because of a lack of features to serve as sound barriers or to absorb sound. Major noise sources include traffic on local roads and recreational uses of the reservoir, including motor boating and jet skis. Noise levels are lower in the winter as recreational uses and traffic levels on Salmon La Sac Road decline.

3.14 Recreation

This section describes the existing recreational facilities and activities in the Cle Elum Reservoir area. The area of impact analysis for recreation is the Cle Elum Reservoir and Cle Elum River where water-oriented recreation occurs and the project could affect. Water-oriented recreation includes both water-dependent recreational activities, such as boating, water skiing, fishing, and swimming, and activities such as camping and picnicking that do not depend on water access, but being near water enhances the experience.

Primary recreational activities include camping, picnicking, fishing in the reservoir and rivers for cold water species, boating and kayaking, whitewater rafting, motorized boating, and other related activities, such as swimming, hiking, hunting, and wildlife viewing. In the winter, recreational activities include cross-country skiing, snowshoeing, and snowmobiling. Recreational opportunities are largely found along the east shore of Cle Elum Reservoir and both downstream and upstream of the reservoir along the Cle Elum River and its tributaries.

The Cle Elum River has regionally acclaimed whitewater rafting. The rapids are rated as Class IV-V by the American Whitewater Association from Scatter Creek to Salmon La Sac Creek (China Gorge), and as Class II from Salmon La Sac Creek to Cle Elum Reservoir and from Cle Elum Dam to the river’s confluence with the Yakima River. Rafters use the NF-4308 Bridge upstream of the reservoir as a take-out point (American Whitewater, 2014). In the spring, whitewater kayakers also use this stretch of the Cle Elum River for recreational events.

Recreational areas for activities such as camping and boating are primarily managed by the USFS out of its Cle Elum Ranger District. The larger, developed campgrounds along the reservoir and along the upper Cle Elum River include Wish Poosh and Cle Elum River (see Figure 3-6). Salmon La Sac Campground is located approximately 3.5 miles north of the reservoir outside the area of impact analysis. These campgrounds experience about 25,000 to 30,000 visitors each summer season. Visitors who camp at areas further from the reservoir often recreate on the reservoir and there are many day-use visitors to the area. These campgrounds and other recreational facilities sometimes exceed capacity on summer weekends and typically on holiday weekends. Other USFS facilities along the reservoir include the Wish Poosh Boat Launch and Speelyi Boat Launch and Day Use site (see Photos 3-10 and 3-11). The WDFW manages the Bell Memorial Boat Launch. Table 3-13 includes information about the facilities available at the recreational sites.

Dispersed recreation occurs outside of areas of built recreational facilities (see Photo 3-12). It is common in the reservoir area, particularly during the summer when developed campsites are full and lower water levels in Cle Elum Reservoir increase access to shorelines. The USFS has documented over 100 large, dispersed camp spots on and around the reservoir. Many of these areas accommodate groups of 10 or more campers.

Public use, such as off-highway vehicle (OHV) riding, also increases as mud flats develop and additional reservoir areas are accessible. A Forest Order restricts OHV use on the lakebed to ingress and egress to the shoreline and does not allow it at all in some areas. The USFS prohibits recreational use of OHVs around the lakebed.

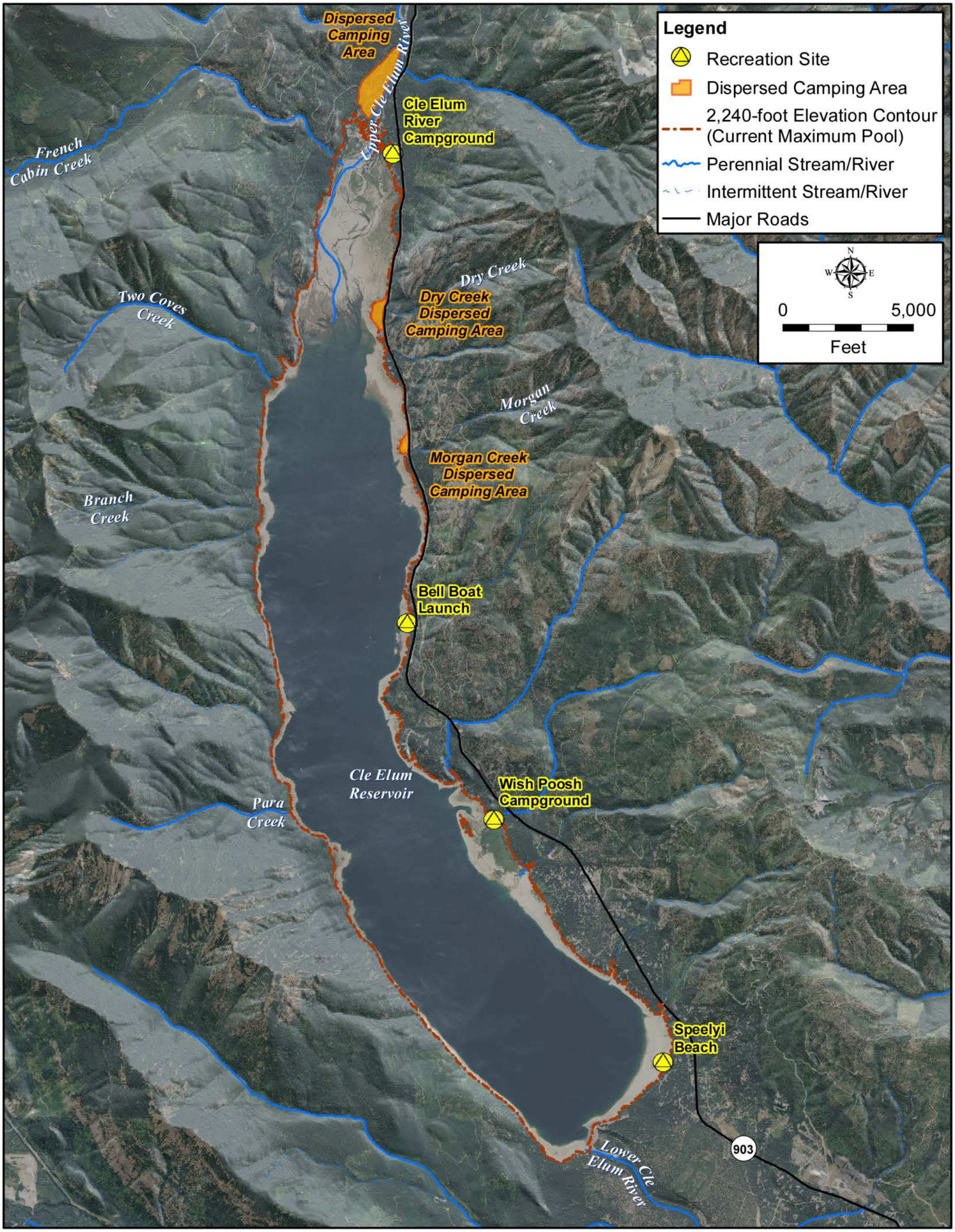


Figure 3-6. Recreation Sites Along Cle Elum Reservoir and River

Table 3-13. Recreation Sites on Cle Elum Reservoir and Cle Elum River

Facility	Facilities	Use
Wish Poosh Campground and Day Use / Boat Launch	• 29 single campsites and 5 double campsites, each with a table, fire ring, and parking spur • 3 flush toilet buildings • Paved roads • Potable water supplied to water hydrants from a well, generator, pump, and storage tank • Day use area with 6 tables, 4 water hydrants, and 1 large double unit wood toilet building with flush toilets • Three-lane concrete boat launch (only paved public boat launch on the lake) • Day use site island known as Picnic Island with a single unit cement vault toilet, 4 tables, ¼ mile of primitive trail, and 3 pedestal grills	• Campground typically open from the Thursday before Memorial Day through late September • Approximately 6,000 campers each summer • Boat launch typically open from mid-May until the reservoir level is too low • Boat launch receives approximately 850 vehicle visits per summer, depending on the length of the season • Picnic Island available by gravel road when the reservoir is drawn down
Cle Elum River Campground	• 8 single campsites and 6 double campsites, each with a table, fire ring/grill stove, and parking spur • Cle Elum River Group site, with a capacity of 100 people, 7 tables, 9 fire rings, 3 benches, 1 wood vault toilet, and 1 cement vault toilet • 2 cement vault toilets • Gravel roads • Direct access to the lake to launch canoes and kayaks • Potable water supplied by hand pump from a well	• Typically open from the Thursday before Memorial Day through late September • Approximately 4,500 campers each summer
Bell Boat Launch	• 1 toilet • Primitive boat launch	—
Speelyi Beach	• Free day use site • 1 cement vault toilet • Driving access to the shoreline	—

3.15 Land and Shoreline Use

Cle Elum Reservoir is located within the Okanogan-Wenatchee National Forest. While there is private ownership of properties on the east side of the reservoir, the majority of the adjacent land to the west, north, south, and immediately along the reservoir shoreline is federally owned (Figure 3-7). The USFS administers Federal land pursuant to specific authorities granted by Congress to the Secretary of Agriculture and pursuant to the public land laws. The area for impact analysis for land and shoreline use is the land directly adjacent to Cle Elum Reservoir, particularly public and private land that the Cle Elum Pool

Raise Project would inundate, the sites of shoreline protection measures, and the sites of construction activities.

Reclamation operates Cle Elum Reservoir under authorization from Congress. This authorization allows Reclamation to operate the reservoir and reservoir levels as needed to meet the needs of the Yakima Project. In addition to the reservoir itself, Reclamation manages the Cle Elum Reclamation Zone, an area of land withdrawn from the National Forest on the south end of the reservoir, encompassing the dam facilities.

Cle Elum Reservoir is located within a largely forested area. The east side of the reservoir has several developed recreational areas, as described above in Section 3.14. The DNR owns and manages a section of land on the east side of the reservoir. The east side of the reservoir also has numerous areas of private ownership with residential development. Portions of these private properties are located within the inundation area of the Cle Elum Pool Raise Project. The west side of the reservoir is relatively undeveloped and remains forested.

The communities of Ronald, Rosyln, and Cle Elum are located to the south and various residential and commercial developments are located to the east and south of the reservoir. Suncadia, a major resort development, is located on a 7,400-acre site along the lower Cle Elum River approximately 3.5 miles southwest of Cle Elum Dam.

3.15.1 Federal Plans and Policies

Management of Cle Elum Reservoir and the surrounding land is guided by a number of Federal, State, and local plans and policies. Because Cle Elum Reservoir is located within the Okanogan-Wenatchee National Forest, Reclamation and the USFS share jurisdiction for much of the affected Federal land and resources. Reclamation is exercising its primary authority as delegated by Congress to implement the Cle Elum Pool Raise. Therefore, Reclamation will adhere to the laws and regulations that govern its own actions in implementing the proposal.

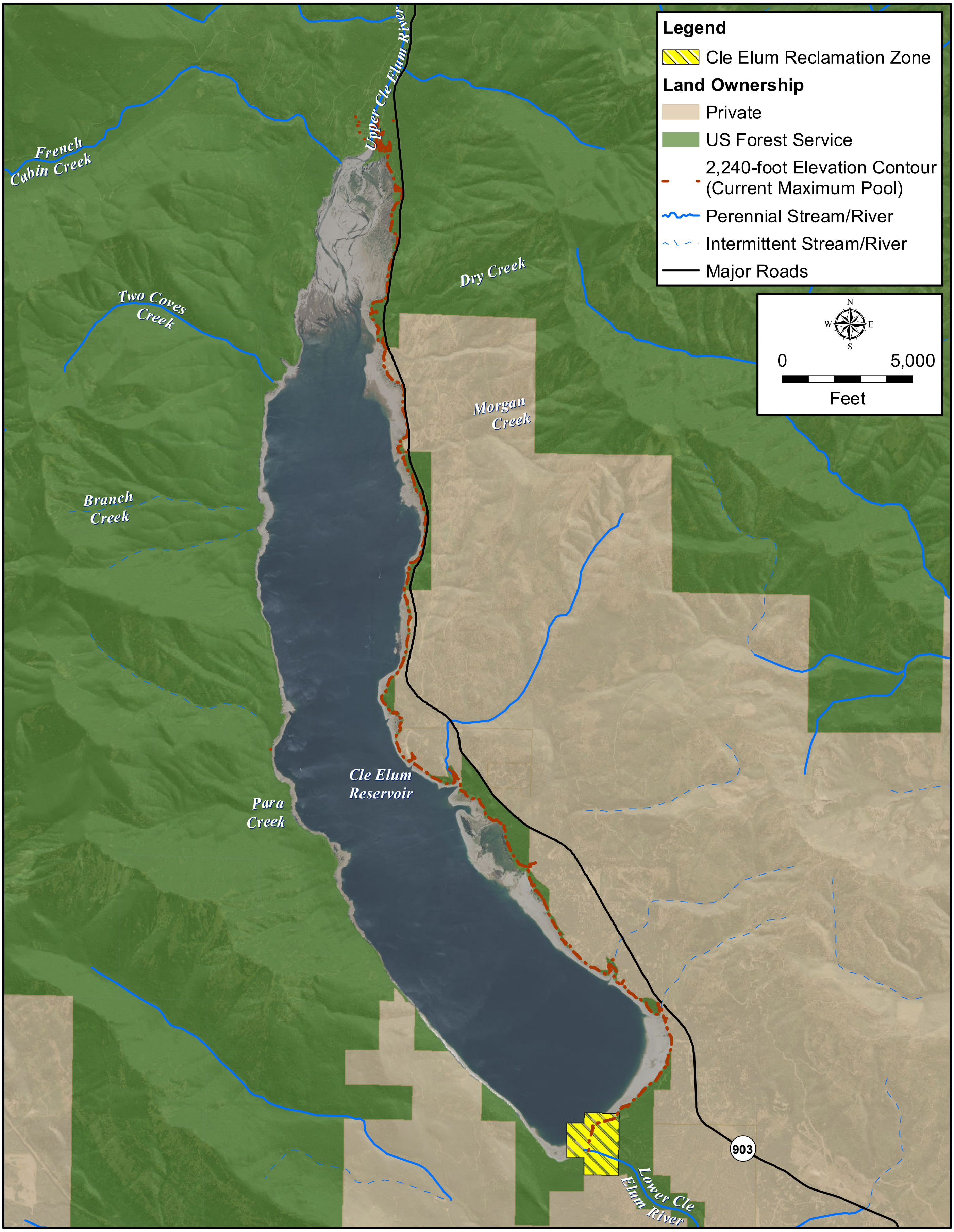


Figure 3-7. Land Ownership

3.15.1.1 1987 Master Interagency Agreement with the Forest Service

Reclamation and the USFS cooperatively manage land in the Yakima Project under the 1987 Master Interagency Agreement (Master Agreement) between the two agencies, which provides guidance at a national level. The Master Agreement covers all Federal land nationwide that are within the National Forest System Lands and Reclamation Project Lands in the West. The Master Agreement establishes procedures for planning, developing, operating, and maintaining Reclamation water projects within or affecting land within the National Forest System, including facilitating coordination and cooperation with the USFS regarding areas of mutual interest or responsibility, or both. In addition, a Project Supplemental Agreement for Cle Elum Reservoir guides local interaction between the agencies.

The two agencies executed project supplemental agreements for the Yakima Project reservoirs. These local agreements identify what Federal land will be under the primary administration of Reclamation, referred to as the "Reclamation Zone." Reclamation retains control for construction, operation, maintenance, and protection of the project as identified in the Master Agreement and the project supplemental agreement. Pursuant to the YRBWEP legislation (Public Law 96-162) and the Reclamation Act of June 17, 1902, Reclamation has authority to perform feasibility study activities within the Yakima Project.

3.15.1.2 Northwest Forest Plan

The USFS and BLM adopted the Northwest Forest Plan in 1994, in response to the ESA listing of the northern spotted owl. The Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (USFS and BLM, 1994a) and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USFS and BLM, 1994b) include the policies of the Northwest Forest Plan. The plan designates a number of conservation measures and allocated land (including the Riparian Reserves discussed below) designed to comprise a comprehensive ecosystem management strategy for forest areas throughout the Northwest.

3.15.1.3 Wenatchee National Forest Plan

The USFS adopted the Wenatchee National Forest Plan in 1990 (USFS, 1990). The plan set management goals, objectives, and standards and guidelines for management of the forest. Currently, the USFS is developing an updated Okanogan-Wenatchee National Forest Plan and released the Proposed Action for Forest Plan Revision, Okanogan-Wenatchee National Forest, in June 2011 (USFS, 2011a). [2] USFS will prepare an EIS on the proposed Forest Plan revision. The Proposed Action for Forest Plan Revision includes recommendations for

[2] The USFS administratively combined the Okanogan and Wenatchee National Forests in 2000. The USFS changed the administrative name to Okanogan-Wenatchee National Forest in 2007.

establishment of new management areas, including Wilderness Areas and Wild and Scenic Rivers.

3.15.1.4 Riparian Reserves

The USFS maintains Riparian Reserves along the shoreline of Cle Elum Reservoir; along all streams, including the Cle Elum River; and around wetlands, seeps, and springs. The Riparian Reserve along the reservoir has a 150-foot buffer, and the Riparian Reserve along the Cle Elum River has a 300-foot buffer. The USFS requires meeting the Aquatic Conservation Strategy Objectives defined in the Northwest Forest Plan within the Riparian Reserves. Appendix E lists the nine Aquatic Conservation Strategy Objectives. Within Riparian Reserves where physical and biological processes are determined to be fully functional, the requirement is to maintain those functions. Within Riparian Reserves where those processes have been degraded, they must be restored (USFS and BLM, 1994b).

3.15.1.5 Wilderness Areas

The Wilderness Act (16 U.S.C. §§1131-1136) established the National Wilderness Preservation System. Wilderness Areas preserve “areas where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain….” Each agency administering any Wilderness Area is responsible for preserving the area's wilderness character. There are eight congressionally designated wilderness areas in the Okanogan-Wenatchee National Forest, including the Alpine Lakes Wilderness Area. The southwestern corner of the Alpine Lakes Wilderness Area, which is largely located in Chelan County with portions in Kittitas County, is approximately 3.5 miles north of the project area. The headwaters of the Cle Elum River are within the Wilderness Area.

3.15.1.6 Wild and Scenic Rivers

The Wild and Scenic Rivers Act (16 U.S.C. §§ 1271-1287) establishes a National Wild and Scenic Rivers System for the protection of rivers that have important scenic, recreational, fish and wildlife, and other resources. The system protects the designated river and an adjacent corridor of land. The classifications of rivers are wild, scenic, and recreational. The Act contains procedures and limitations for control of land by Federal agencies within the system.

There are currently no designated Wild and Scenic Rivers near Cle Elum Reservoir. However, the Wenatchee National Forest Plan recommends designation of the Cle Elum and Waptus rivers (USFS, 1990). The Forest Plan recommends wild classification for the Waptus River. The plan recommends wild classification for the Cle Elum River within the Alpine Lakes Wilderness Area, scenic between the Wilderness Area and Tucquala Lake, and recreational from Lake Tucquala to Cle Elum Reservoir. The Forest Plan states: “Rivers and streams recommended for classification under the Wild and Scenic Rivers Act will be protected to retain their attributes at the highest possible classification.” As mentioned in Section 3.15.1.3, the Proposed Action for Forest Plan Revision, Okanogan-Wenatchee National Forest recommends designation of the Cooper River, a tributary of the Cle Elum River (USFS, 2011a). The USFS proposed Cooper River, a tributary to the upper Cle Elum

River, for designation as a Wild and Scenic River for its outstandingly remarkable values in scenery, recreation, and ecological values.

The Integrated Plan includes recommendations for Wild and Scenic River designation for several rivers in the Yakima River basin, including the upper Cle Elum, Waptus, and Cooper rivers. The upper Cle Elum River recommendation presented in the Integrated Plan would exclude the area of the Cle Elum River that the Cle Elum Pool Raise project would inundate.

3.15.1.7 Snoqualmie Pass Adaptive Management Area

Cle Elum Reservoir is within the Snoqualmie Pass Adaptive Management Area (SPAMA), established under the Northwest Forest Plan. The SPAMA includes 212,700 acres of National Forest land. The USFS established management goals for the SPAMA in 1997 in the Snoqualmie Pass Adaptive Management Area Plan Final Environmental Impact Statement (WSDOT, 2008). Within the SPAMA, the USFS focuses on ecosystem management, primarily restoration of late-successional forests, and connection of wildlife habitat. The USFS is actively decommissioning roads within the SPAMA and allows timber harvest only where it benefits restoration (WSDOT, 2008).

3.15.2 Mountains to Sound Greenway

Land around Cle Elum Reservoir is part of the Mountains to Sound Greenway National Scenic Byway, designated as a Washington State Scenic Byway. This designation is based on the route’s outstanding scenic character and environmental experiences. The Mountains to Sound Greenway runs from Ellensburg to Seattle. The Greenway is managed by the Mountains to Sound Greenway Trust in accordance with the Mountains to Sound Greenway Implementation Plan, developed by WSDOT in 1998.

3.15.3 Local Land Use Planning

Kittitas County land use and zoning requirements apply to privately owned and State owned properties, primarily located to the east of the reservoir. Land along the eastern shore of the reservoir site is zoned “forest and range” and “rural recreation” (Kittitas County Board of County Commissioners Ordinance No. 2013-001). The forest and range zone is intended “to provide for areas of Kittitas County wherein natural resource management is the highest priority and where subdivision and development of land for uses and activities incompatible with resource management are discouraged.” The rural recreation zone is intended “to provide areas where residential development may occur on a low density basis or in residential clusters” with a primary goal to “promote rural recreation residential development associated with the many natural amenities found within Kittitas County” (Kittitas County Code Title 17).

Much of the land surrounding the reservoir to the west, east (beyond the immediate shoreline), and north is zoned Commercial Forest. The Commercial Forest zone is intended to “provide for areas of Kittitas County wherein natural resource management is the highest priority and where the subdivision and development of lands for uses and activities incompatible with resource management are discouraged consistent with the commercial forest classification policies of the comprehensive plan."

Other Kittitas County regulations, including the Critical Areas Ordinance (CAO) and Shoreline Master Program (SMP), described below, apply to private land around the reservoir. These regulations do not apply to Federal land.

3.15.3.1 Critical Areas

Land under the jurisdiction of Kittitas County is subject to the Kittitas County CAO adopted in 1994 (Kittitas County Code Title 17A). The county is updating the CAO and expects adoption of the updated Ordinance in 2015. The CAO establishes buffers around wetlands and riparian habitat. It also regulates development in frequently flooded areas, geologically hazardous areas, big game winter range areas, and aquifer recharge areas.

3.15.3.2 Shoreline Management

Cle Elum Reservoir is a Lake of Statewide Significance (lakes over 1,000 acres in area) under the State Shoreline Management Act (SMA). The Cle Elum River from the National Forest boundary downstream to the confluence with the Yakima River is a Shoreline of the State. Under the Kittitas County SMP adopted in 1975, much of the shoreline of Cle Elum Reservoir and the Cle Elum River is within a Conservancy shoreline environment designation. The intent of this designation is to sustain natural resource development while maintaining the natural character of the shoreline area. Under the SMP, the county only permits shoreline protection measures (called "shoreline works") in a Conservancy designation where they "do not substantially change the character of that environment." Projects are not permitted "if the possibility that downstream properties and natural river systems will be adversely affected by any such development" (Kittitas County, 1975).

Kittitas County released a final draft of its updated SMP in January 2014. Under the draft SMP, the majority of Cle Elum Reservoir would be designated Rural Conservancy, with the portion of the southeastern side of the reservoir in private ownership designated Shoreline Residential. In both shoreline environment designations, the county would permit bioengineered shoreline stabilization measures. The county would designate all other shoreline stabilization measures as conditional uses. The county would allow structural stabilization measures when necessary to protect an existing primary structure, and requires geotechnical analysis to document that the structure is in danger from shoreline erosion (Kittitas County, 2014a).

3.16 Utilities

A number of utilities serve the Cle Elum Reservoir area. Section 3.5, Groundwater, describes the OSSs and water wells in the area. The area of impact analysis for utilities is the area around the reservoir served by electric or solid waste utilities.

Electric power within Kittitas County is provided by Kittitas County Public Utility District (PUD) and Puget Sound Energy. Puget Sound Energy delivers power to the left end of Cle

Elum Dam with a 12.5-kilovolt (kV) line which is transformed to 240-volt, 3-phase power at the dam. There is also a 30-kilowatt (kW), 240-volt, 3-phase backup generator at the dam.

Power lines to residential and recreation areas around the reservoir are located parallel to Salmon La Sac Road. No powerlines are located in the reservoir shoreline.

The project area lies within unincorporated Kittitas County and curbside solid waste collection is voluntary. Waste Management of Ellensburg provides collection under contract with Kittitas County (Kittitas County, 2011). Solid waste collection occurs along SR-903.

3.17 Transportation

This section describes the road system around Cle Elum Reservoir and access to the reservoir. The area of impact analysis includes the roads used to access the dam and reservoir area and roads near the reservoir that are used to access residential and recreational areas along the reservoir and upper Cle Elum River. The closest major highway to the Cle Elum Reservoir area is I-90. Regional and local access from I-90 to Cle Elum Reservoir and the upper Cle Elum River is via SR-903 (Salmon La Sac Road), a two-lane roadway extending northwest from the town of Cle Elum to Forest Service Road 4330 (NF-4330) (Figure 3-8). SR-903 is the only access road to residences and recreational facilities along the east side of Cle Elum Reservoir.

The west side of Cle Elum Reservoir is generally inaccessible to vehicles – no roads. Access to the upper Cle Elum River is provided by NF-4330 (also known as Cle Elum Valley Road or Salmon La Sac Road). Access to the right abutment of the dam is provided by SR-903 and County Road 25010 (Lake Cle Elum Dam Road). Access to the left abutment of the dam is from SR-903 and Lake Cabins Road. NF-4303-000 crosses the Cle Elum River downstream of the dam and connects to NF-4303-201.

Snowmobile usage is high during the winter months in this area. A snowmobile trail (bladed shoulder) runs along Salmon La Sac Road between White Fir Drive (14254 Salmon La Sac Road) and NF-4330. In addition, recreational snow parks are located off Salmon La Sac Road at NF-4305, in the southeast portion of the project area. Salmon La Sac Road is also open to, and meets State requirements for, wheeled all-terrain vehicles along the east side of Cle Elum Reservoir.

The Kittitas County Long Range Transportation Plan includes plans to construct a new bridge over the Cle Elum River downstream from the dam and a new road to access developments on the western side of the river (Kittitas County, 2008). The county currently has no funding for these projects and construction is not scheduled. There are no public works projects planned within the vicinity of the project area that fall under the Kittitas County Six Year Transportation Improvement Plan (Kittitas County, 2014b).

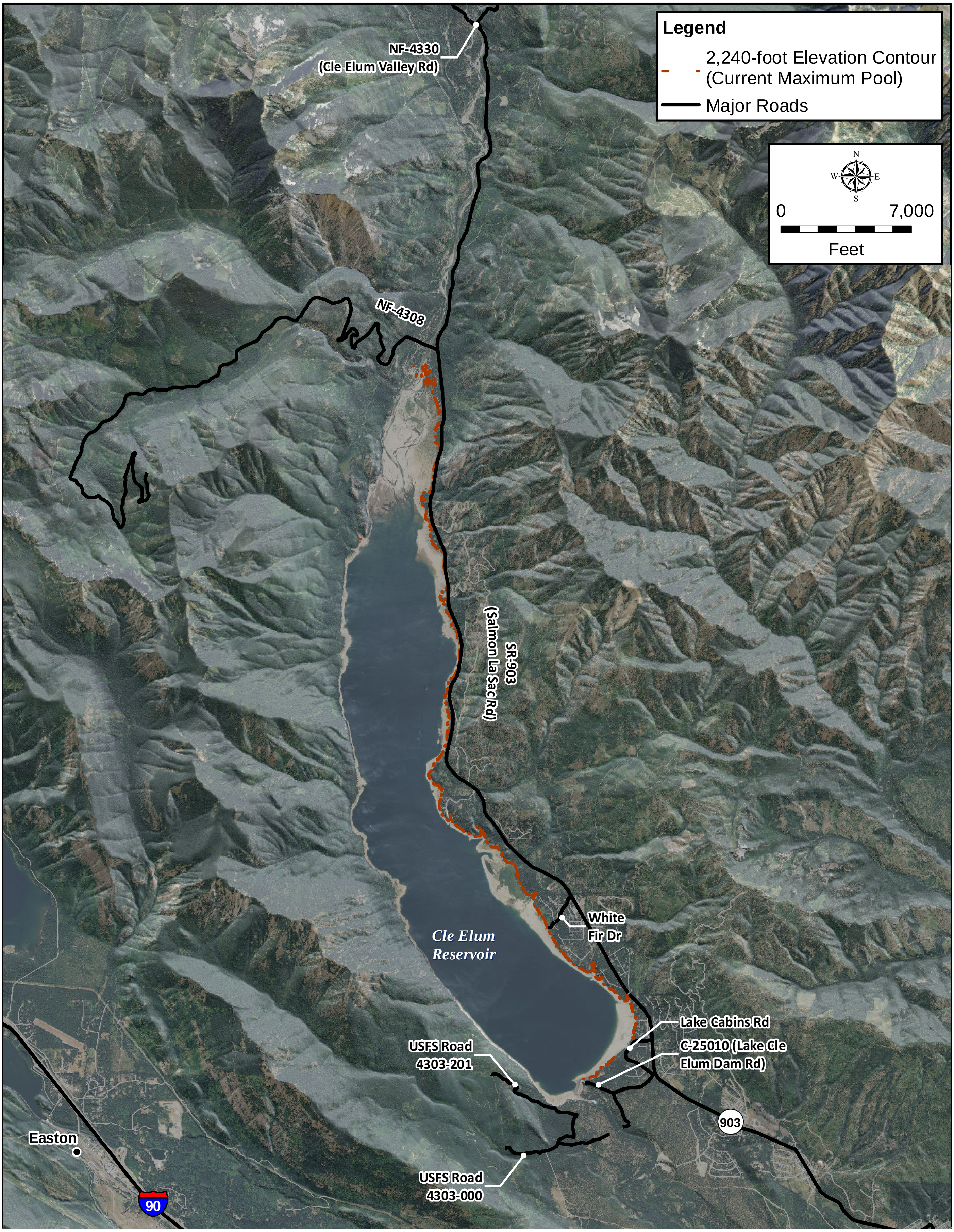


Figure 3-8. Transportation Facilities in Project Area

3.17.1 Road Conditions

Most of the major transportation routes mentioned above are paved county roads, with the exception of NF-4330 and NF-4303, which are unpaved. In addition, on the east side of Cle Elum Reservoir are various private roads, predominantly graveled in the southeast portion and paved in the northeast portion. During the winter, the county plows SR-903 up to Salmon La Sac Campground (WSDOT, 2004).

3.17.2 Traffic Data

Average daily traffic volumes, based on actual traffic counts, for I-90 and SR-903 are included in WSDOT’s 2013 Annual Traffic Report. Traffic volumes on I-90 at Cle Elum are 29,082 vehicles per day. For SR-903, from Cle Elum to the National Forest boundary, traffic volumes are 930 to 6,800 vehicles per day. The Kittitas County Long Range Transportation Plan (2008) lists none of the project area roads or intersections as high accident locations. (High accident locations are defined as corridors and intersections that had three or more accidents during the 2004-2006 analysis period.)

3.17.3 Roadway Standards

The Kittitas County Road Standards provides standards for roadway design that must also meet WSDOT and American Association of State Highway and Transportation Officials (AASHTO) standards. Table 3-14 describes the major components of the county road design standards and access spacing requirements.

Table 3-14. Roadway Design Standards

Average Daily Traffic	Functional Classification	Lane Width (feet)	Shoulder Width (feet)	Total Pavement Width (feet)
0-399	Local	11	1	24
400-749	Local or Collector	11	2	26
750+	Local or Collector	11	3	28

3.18 Socioeconomics

Reclamation selected the study area or “region” for assessing socioeconomic impacts based on the location of the Cle Elum Pool Raise Project and the areas where most of the direct impacts resulting from the project concentrate, which includes affected agricultural areas. Based on these factors, Reclamation defined the impact analysis area for the socioeconomic analysis as the Yakima River basin region, encompassing Kittitas, Benton, Yakima, and Franklin Counties in the State of Washington (referred to here as the "4-county study area").

Key parameters of socioeconomic conditions used in this DEIS include commonly applied regional economic measures of industry output, personal income, and jobs (employment).

- Output is the broadest measure of economic activity and represents the value of production. Output includes intermediate goods plus the components of value added (including personal income), so the two measures (output and personal income) are not additive.

- Personal income consists of personal income and business income. Personal income represents wages and salaries, as well as other payroll benefits such as health and life insurance, retirement payments, and noncash compensation. Business income (also called proprietor's income) represents the payments received by small business owners or self-employed workers.

- Jobs are full- and part-time. In some instances, this analysis refers to "job years," which represents the equivalent of one full-time job for 1 year. Ten job years, for example, could refer to 1 job for 10 years, 5 jobs for 2 years, 10 jobs for 1 year, and so forth.

This analysis uses IMPLAN (Impact Analysis for PLANning) modeling software to examine the baseline conditions and economic impacts of the project. IMPLAN is an input-output (IO) model that works by tracing how spending associated with a specific project circulates through the defined impact area. Input-output models measure commodity flows from producers to intermediate and final consumers. Purchases for final use (final demand) drive the model. Industries produce goods and services for final demand and purchase goods and services from other producers. This buying of goods and services (indirect purchases) continue until leakages from the region (imports and value added) stop the cycle. These indirect and induced effects can be derived mathematically by using a set of multipliers. The multipliers describe the change of output for each regional industry caused by a $1 change in final demand for any given industry.

Reclamation compiled IMPLAN data files from a variety of sources for the study area, including the U.S. Bureau of Economic Analysis, the U.S. Bureau of Labor, and the U.S. Census Bureau. Input-output models are static; they measure impacts based on economic conditions at any given point in time. The input-output models for this study were based on 2012 IMPLAN data, the most recent data available.

Table 3-15 displays the latest output, personal income, and jobs information as generated by the IMPLAN model based on 2012 data for the combined economy of the 4-county study area, aggregated into eight major industry sectors. In 2012, the 4-county study area generated $38.9 billion in output, $11.8 billion in personal income, and 275,402 thousand jobs. While the ranking of the five most important industry sectors within the economies of Kittitas, Benton, Yakima, and Franklin Counties vary based on the regional economic measure considered, the following four major economic sectors consistently fall within the top five: 1) agriculture, 2) trade, 3) service, and 4) government. Looking at the employment measure, these sectors represented about 84 percent of the total employment within the 4-county study area in 2012.

Table 3-15. Baseline Data for the 4-County Study Area – Output, Personal Income, and Jobs

Aggregate Industry Sector	Industry Output (million $)	Percent of Total	Personal Income (million $)	Percent of Total	Jobs	Percent of Total
Agriculture	$4,110	10.56	$995	8.46	36,130	13.12
Mining	$282	0.72	$7	0.06	1,636	0.59
Construction	$2,054	5.28	$621	5.27	13,114	4.76
Manufacturing	$6,959	17.88	$880	7.47	16,228	5.89
Transportation, Information, Utilities	$2,111	5.42	$580	4.92	12,699	4.61
Trade	$3,996	10.26	$1,260	10.70	37,022	13.44
Service	$15,851	40.72	$4,941	41.97	115,551	41.96
Government	$3,566	9.16	$2,490	21.15	43,021	15.62
Total	$38,929		$11,773		275,402	

3.19 Cultural Resources

Cultural resources, the physical or other expressions of past human activity, are finite, nonrenewable, and often fragile. These resources encompass a broad range and can include specific places associated with traditional ceremonies, practices, artifacts, structures, archeological sites, objects, buildings, and landscapes associated with a period of time, a person, or historic movements. They also include Native American human remains and funerary offerings. Federal agencies are required to identify and evaluate the significance of cultural resources located within the area of potential effects (APE) of any Federal undertaking.

3.19.1 Cultural Resource Regulations

A number of Federal laws and regulations require Federal agencies to consider and protect cultural resources. In particular, the NHPA of 1966, as amended, and its implementing regulations for Section 106, set out the requirements and process to identify and evaluate historic resources, assess effects to these resources, and mitigate effects to significant resources which occur as a result of the agency's permitted undertaking. Under Section 110 of the NHPA, the responsibility of the Federal agency that owns or formally manages land includes identifying and managing the historic resources on that land, even when there is no new undertaking. The NAGPRA, the American Indian Religious Freedom Act, Executive Order 13007 Protection of Native American Sacred Sites, and other Federal, State, or Tribal laws and policies, where applicable, also protect cultural resources.

For cultural resources, an effect occurs when the proposed project would disrupt or impact a prehistoric or historic archeological site or a property of historic interest or cultural significance to a community or ethnic or social group. These impacts are adverse if they would occur to cultural resource sites that are listed, or eligible for listing, on the NRHP.

Other adverse impacts would include disturbance to graves and cultural items protected under NAGPRA and destruction of, or preventing access to, Indian sacred sites protected under Executive Order 13007. Examples of the types of impacts that could result from the proposed action include construction of radial gates or shoreline protection, reservoir operation, and higher reservoir levels resulting in the destruction, disturbance, disassociation, or alteration of a protected resource.

The State of Washington also regulates cultural resources through SEPA, which requires identification of cultural resources within a proposed project area. The State requires that agencies propose measures to reduce or control impacts on these resources. Under SEPA, the Washington DAHP provides formal opinions on the significance of sites and the impact of proposed projects on sites. Other State laws governing historic resources protect Native American graves (RCW 27.44), abandoned historic cemeteries (RCW 68.60), and archaeological sites (RCW 27.53). These laws contain clauses regarding the inadvertent discovery of cultural resources during activities such as construction. Washington State Governor's Executive Order 05-05 requires State agencies to review capital projects with the DAHP and the affected Tribes, conduct appropriate surveys, and take reasonable actions to avoid, minimize, or mitigate adverse effects to historic properties. Because the Proposed Action is subject to Section 106 of the NHPA, Executive Order 05-05 does not apply.

3.19.2 Archaeological and Historical Overview

A historical overview of the project area is included in the Draft Investigation of the Yakima Basin Integrated Plan: Keechelus Lake, Kachess Lake, Cle Elum Lake Section 106 report and summarized below (Yakama Nation Cultural Resources Program, 2014).

Archaeological evidence of occupation of indigenous groups in the area of Cle Elum Reservoir dates to at least 12,000 years before present, based on the discovery of a Paleo-Indian Clovis point found at the southern extent of Cle Elum Lake. From 11,000 years before present and extending to 4,500 years before present, indigenous groups in the area had a predominately-mobile lifestyle. From 4,500 to 250 years before present, indigenous groups shifted toward a less mobile lifestyle. An increase in semi-subterranean dwellings and food storage occurred during this period.

The project area is within the territory of the Sahaptin-speaking Kittitas or upper Yakama Tribes. The Kittitas occupied the lowland Kittitas and Yakima valleys and the headwaters of the Yakima River. The project is also within the traditional territory of the Wenatchi, one of the Confederated Tribes of the Colville Reservation (Colville Tribes). The Cle Elum River was a particularly popular berry picking, and summer home area at the headwaters of the Cle Elum River annually. One winter village was located near glacial Cle Elum Lake, and a large summer encampment (*Tle'lam)* and fish traps were located at the southern end of the lake. There is documentation of several winter villages near Cle Elum Reservoir. Historic records also indicate Indian trails extended between historic Kachess and Cle Elum lakes and from Cle Elum Lake to the fisheries and berry gathering areas on the upper Cle Elum River.

The first documented Euro-Americans in the area were fur traders of the Northwest Company in 1814. In 1853 and 1854, Territorial Governor Isaac Stevens sent George McClellan to find a route for a wagon road over what is now Snoqualmie Pass.

In 1855, the Tribes and Bands officially known today as the Confederated Tribes and Bands of the Yakama Nation (which include the Kittitas) signed the Treaty of 1855, ceding over 6 million acres to the U.S. Government. The Treaty gave the Yakama Nation a reservation set aside for the sole use and benefit of the Yakama people. The Yakama Nation retained the exclusive rights to hunt, fish, and gather on the ceded land, which includes the Cle Elum Reservoir area.

Passage of the Homestead Act in 1862 and construction of a wagon road over Snoqualmie Pass in 1865 brought about an increase in Euro-American activity throughout the project area. Early interest focused on mineral resources, including coal, gold, and iron. In 1867, the Northern Pacific Railroad sent surveyors to the Snoqualmie Pass area to establish access routes across the Cascade Range. There was an increase in commercial interests in the project area, including coal mining and timber harvesting, in the late 1800s and throughout the 1900s. In 1886, coal was discovered in the east Cascades. The coalmines, including those in the Roslyn and Ronald area, supplied the trains of the Northern Pacific Railroad.

Congress authorized Reclamation's Yakima Project in 1905, which led to construction of an extensive water storage and irrigation system, including Cle Elum Reservoir. The Union Gap Irrigation Company constructed the first crib dam at the southern end of glacial Cle Elum Lake. In 1907, Reclamation constructed a replacement crib dam, creating 26,000 acre-feet of storage. In 1933, Reclamation completed construction of the 165-foot-high dam, increasing the water storage capacity to 436,900 acre-feet.

3.19.3 Known and Reported Historic Resources

Section 4.16.2 of the Cle Elum Dam Fish Passage Facilities and Fish Reintroduction Project Final Environmental Impact Statement (Reclamation and Ecology, 2011b) describes known and reported historic resources in the area of Cle Elum Dam. The Fish Passage EIS made particular note of a prehistoric Clovis-style projectile point as well as Cle Elum Dam. A recreationist discovered the projectile point in 1984, on a terrace along the reservoir, during an unusually low drawdown year. . During subsequent cultural resource investigations for the fish intake structure, additional cultural resource materials dating to the early prehistoric period were identified (Steinkraus, 2013), possibly indicating that the Clovis Point does not represent an isolated occurrence.

Cle Elum Dam was determined to be eligible for inclusion in the NRHP in 2011 (Houser, 2011). It is eligible under NRHP Criterion A for its association with Reclamation's Yakima Project and early Depression Era Federal work projects. It was the last dam built in the Yakima Project's Storage Division. It assured the successful operation of the Roza and Kennewick irrigation divisions, which then Reclamation could build to complete the Yakima Project.

Cle Elum Dam is composed of three major features – embankment, outlet tunnel, and overflow spillway. A character-defining feature of the overflow spillway is the five 37-foot-by-17-foot radial gates, also known as "Tainter Gates," that were installed in 1935 and 1936. These gates increased the capacity of the reservoir from 356,000 acre-feet without spillway gates to 436,000 acre-feet with them (Doncaster, 2011).

Yakama Nation staff conducted a preliminary cultural resources survey in late 2013 in the area of Cle Elum Reservoir shoreline that the Cle Elum Pool Raise Project would inundate. The Yakama Nation conducted the survey as part of the Section 106 Report (Yakama Nation Cultural Resources Program, 2014) and included research from the DAHP database, which lists 49 previously recorded archaeological sites within 1 mile of the APE. Of the total 49 sites, 21 sites are historic; 7 are multicomponent, having both historic and precontact elements; and 21 are precontact.

According to the Draft Investigation of the Yakima Basin Integrated Plan (Yakama Nation Cultural Resources Program, 2014), the historic Cle Elum Lake has spiritual and ceremonial associations to the Yakama Nation. The Yakama Nation Cultural Resources Program suggests that the lake and associated precontact archaeological resources may qualify as Traditional Cultural Properties (TCPs). Further, the report states that there may be a direct link of precontact habitation and resource procurement sites at Cle Elum Reservoir to the occupation of the ethnographic village of *Tle'lam*, which was located near the mouth of the natural Cle Elum Lake.

The Cle Elum Pool Raise Project APE consists of approximately 300 acres, with survey corridors located on the eastern, northern, and western shores of the reservoir (Figure 3-9). Yakama Nation staff surveyed approximately 88 percent of the APE for the Section 106 Report. Areas that have not been surveyed at the time of this writing include proposed project features that were not identified at the time the survey was conducted, and areas which were inaccessible due to steep terrain, lack of road access, or lack of permission to enter private property. The preliminary survey documented 10 newly recorded sites, 7 newly recorded isolates, and 1 previously recorded site (45FS1458).

3.20 Indian Sacred Sites

Executive Order 13007, Indian Sacred Sites (May 24, 1996), directs Federal agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites on Federal land. The Executive order further directs agencies to provide reasonable notice for proposed land actions or policies that may restrict future access to or ceremonial use of, or adversely affect the physical integrity of, sacred sites. The Executive order defines a sacred site as a "specific, discrete, narrowly delineated location on Federal land that is identified by an Indian Tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion."

Sacred sites may include ceremonial areas and natural landmarks that are religious or symbolic representations. Sacred sites are typically identified during the Section 106 portion of the NHPA survey, or during Government-to-Government consultation. Further, staff from the Yakama Nation Cultural Resources Program prepared a draft Cultural Resources Report for the project (Yakama Nation Cultural Resources Program, 2014). To date, no sacred sites have been identified in the project area.

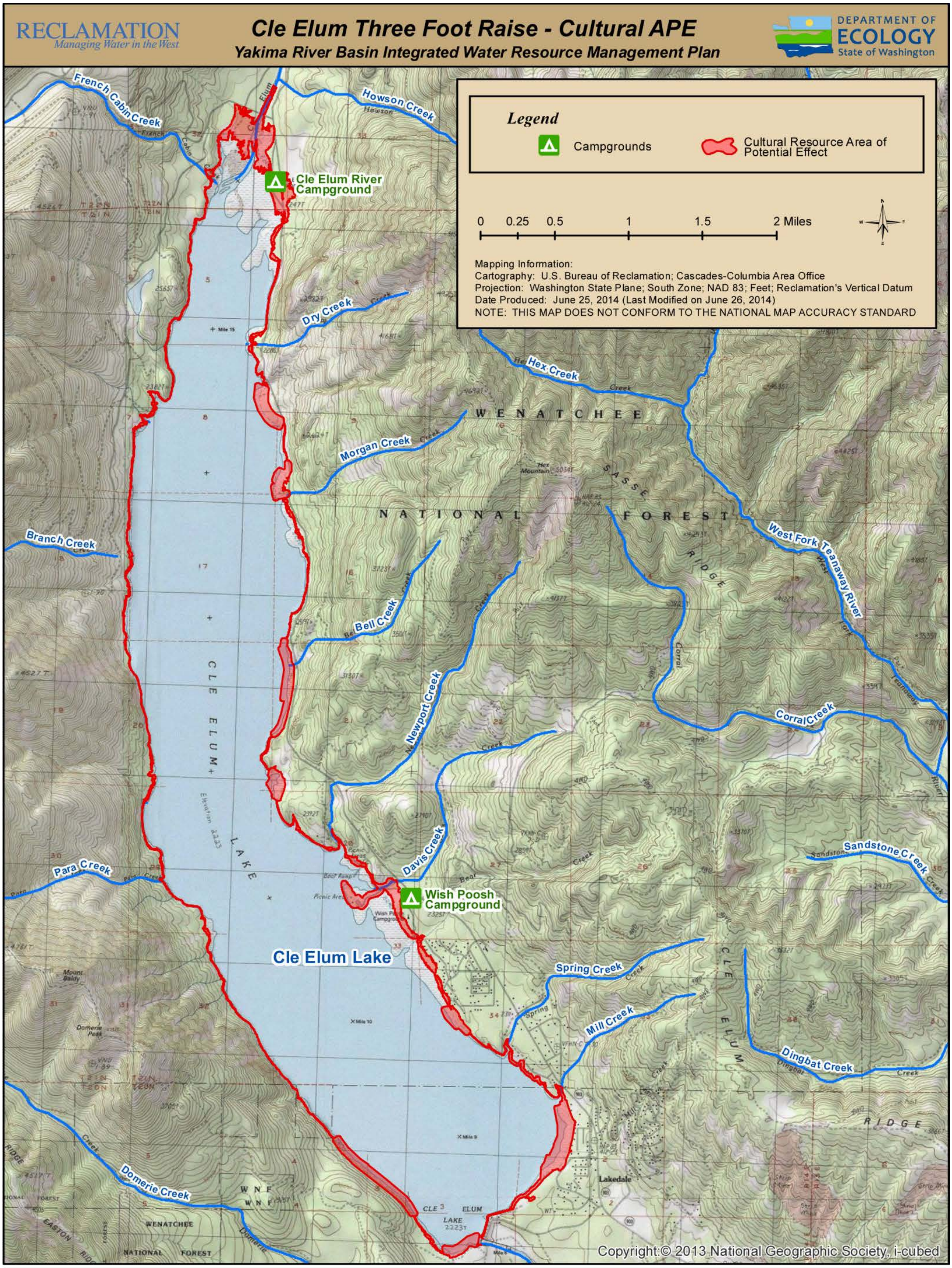


Figure 3-9. Cultural Resources APE

3.21 Indian Trust Assets

ITAs are legal interests in property held in trust by the United States for federally recognized Indian Tribes or individual Indians. ITAs may include land, minerals, federally reserved hunting and fishing rights, federally reserved water rights, and instream flows associated with trust land. The General Allotment Act of 1887 allotted land to some Tribes, while others were allotted land through treaty or specific legislation until 1934 when further allotments were prohibited. These allotments are ITAs.

Federally recognized Indian Tribes with trust land are beneficiaries of the Indian trust relationship. The U.S. acts as trustee. No one can sell, lease, or otherwise encumber ITAs without approval of the U.S. Government.

As stated in the 1994 memorandum, Government-to-Government Relations with Native American Tribal Governments, Reclamation is responsible for the assessment of project effects on Tribal trust resources and federally recognized Tribal Governments. Reclamation is tasked to actively engage and consult federally recognized Tribal Governments on a Government-to-Government level when its actions affect ITAs.

The U.S. Department of the Interior Departmental Manual Part 512.2 delegates the responsibility for ensuring protection of ITAs to the heads of bureaus and offices (Department of the Interior, 1995). The Department is required to "protect and preserve ITAs from loss, damage, unlawful alienation, waste, and depletion" (Department of the Interior, 2000). Reclamation is responsible for determining if a proposed project has a potential to affect ITAs.

While the majority of ITAs are located on-reservation, ITAs can also occur outside reservation boundaries. Consequently, several Tribes have a historical presence or cultural interest in the project area. These include the Yakama Nation, the Colville Tribes, and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR).

The project area lies within land ceded in the Yakama Treaty of 1855. The treaty established the Yakama Reservation, which lies to the south of the project area, and reserved the following:

> The exclusive right of taking fish in all the streams, where running through or bordering said reservation, is further secured to said confederated tribes and bands of Indians, as also the right of taking fish at all usual and accustomed places, in common with the citizens of the Territory, and of erecting temporary buildings for curing them: together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land.

The Yakama Nation is a major partner in the development and implementation of the Integrated Plan. The Yakama Nation has been involved in all aspects of the Integrated Plan, including the Cle Elum Pool Raise Project.

Reclamation contacted the Bureau of Indian Affairs (BIA), Yakima Office, to identify the presence of ITAs or trust land (allotments) in the project area. BIA personnel indicated that there are no allotments in the Cle Elum Reservoir area. Reclamation also contacted personnel at the BIA Colville Tribal Office, who also indicated that there is no trust land in the project area (Wolf, 2014).

Reclamation has determined that the project area does not include land held in trust by the United States for Tribes or individual allottees, nor does the project area include trust land or allotments.

3.22 Environmental Justice

Environmental justice addresses the fair treatment of people of all races and incomes with respect to actions affecting the environment. Fair treatment implies that no group should bear a disproportionate share of negative impacts. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, dated February 11, 1994, requires agencies to identify and address disproportionately high and adverse human health or environmental effects of their actions on minorities and low-income populations and communities, as well as the equity of the distribution of the benefits and risks. The impact analysis area for environmental justice is Kittitas County Census Tract 9751, which includes Cle Elum Reservoir and the entire project area.

Table 3-16 provides the numbers and percentages of population by racial category for this census tract, Yakima River basin counties, and the State of Washington. The information is based on the 2008-2012 U.S. Census American Community Survey, the most recent consistent source of information for the basin. The data have likely changed since the survey was taken, but this information is a reliable indicator of population percentages.

Table 3-16. Race and Ethnicity

	Study Area Number (%)	Kittitas County Number (%)	Yakima County Number (%)	Benton County Number (%)	State of Washington Number (%)
Total Population	5,733 (100)	40,954 (100)	242,454 (100)	175,424 (100)	6,738,714 (100)
One race	5,625 (98.1)	40,021 (97.7)	234,123 (96.6)	170,055 (96.9)	6,427,398 (95.4)
White	5,439 (94.9)	36,731 (89.7)	180,685 (74.5)	143,741 (81.9)	5,304,864 (78.7)
Black or African American	7 (0.1)	311 (0.8)	1,888 (0.8)	2,437 (1.4)	238,255 (3.5)
American Indian and Alaska Native	50 (0.9)	340 (0.8)	9,741 (4.0)	1,787 (1.0)	93,416 (1.4)
Asian	34 (0.6)	1,074 (2.6)	2,397 (1.0)	4,710 (2.7)	484,047 (7.2)
Native Hawaiian and Other Pacific Islander	2 (0.0)	2 (0.0)	145 (0.1)	206 (0.1)	39,246 (0.6)
Some other race	93 (1.6)	1,563 (3.8)	39,267 (16.2)	17,174 (9.8)	267,570 (4.0)
Two or more races	108 (1.9)	933 (2.3)	8,331 (3.4)	5,369 (3.1)	311,316 (4.6)
Racial Minority	294 (5.1)	4,223 (10.3)	61,769 (25.5)	31,683 (18.1)	1,433,850 (21.3)
Hispanic or Latino (of any race)	204 (3.6)	3,164 (7.7)	108,920 (44.9)	32,471 (18.5)	754,366 (11.2)
Minority[1]	405 (7.1)	5,760 (14.1)	126,631 (52.2)	44,681 (25.5)	1,853,452 (27.5)

Source: US Census Bureau, 2012
[1] Population for the “Minority” category includes the U.S. Census categories “Nonwhite, not Hispanic or Latino” and “Hispanic or Latino”.

In comparison to the State of Washington and Kittitas County, the local project area has a smaller percentage of total racial minority and ethnic (Hispanic or Latino) populations. Additional potentially affected minority populations include members of the Yakama Nation and downstream Indian Tribes. While census data are available for recognized Indian reservations, specific data for Tribal members are not. Tribal members may be affected regardless of whether they reside on their reservations. Members of the Yakama Nation and other Tribes outside the immediate geographic area may currently use natural resource in the Cle Elum Reservoir area and may do so in the future. They may use these resources disproportionately to the total population. The subsistence use of renewable natural resources (such as fish, wildlife, and vegetation) by Tribes or other populations in the reservoir area has not been quantified. Recreational users of the area could potentially include minority populations. The majority of recreationists visiting Cle Elum Reservoir are from the greater Seattle area or from the local area, but no information is available on their demographics.

Table 3-17 provides income, poverty, unemployment, and housing information for the same census tract. Low-income populations are identified by several socioeconomic characteristics. As categorized by the 2008 to 2012 U.S. Census American Community Survey, specific characteristics include income (median family and per capita), percentage of the population below poverty (families and individuals), unemployment rates, and substandard housing. Median family income and per capita income for the project area is greater than Kittitas County, but less than the State. The project area has a lower percentage of families and individuals below the poverty level than the State and county.

Table 3-17. Income, Poverty, Unemployment, and Housing

	Study Area	Kittitas County	Yakima County	Benton County	Washington
Income					
Median household income	$44,360	$41,739	$44,256	$60,300	$59,374
Per capita income	$27,971	$22,542	$19,610	$28,171	$30,661
Percent below poverty level					
Families	7.4	11.0	17.2	9.4	8.7
Individuals	11.8	21.8	22.3	12.9	12.9
Percent unemployed	12.5	9.9	10.8	6.7	8.9
Percent of Housing					
1.01 or more occupants per room	0.9	2.4	7.0	2.5	2.7
Lacking complete plumbing facilities	0.6	0.3	1.0	0.1	0.5

Source: US Census Bureau, 2012

Other measures of low income, such as unemployment and substandard housing, characterize demographic data in relation to environmental justice. The unemployment rates for the study area are higher than those for the State and county. Substandard housing units are overcrowded and lack complete plumbing facilities. The percentage of housing units lacking complete plumbing facilities in the study area was greater than the State and county. The percentage of occupied housing units with 1.01 or more occupants per room in the study area was lower than the percentages for the county and State.

Chapter 4

ENVIRONMENTAL CONSEQUENCES

CHAPTER 4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

This chapter assesses environmental consequences or impacts that would result from implementation of the Proposed Action and alternatives described in Chapter 2. This chapter documents direct, indirect, and cumulative impacts that could occur because of implementing each of the alternatives. It considers the impacts of short-term uses, such as construction, and the impacts that would occur over the longer-term operation and maintenance period. It also identifies mitigation measures that could avoid or reduce adverse impacts, and summarizes the residual and unavoidable adverse impacts on an issue-by-issue basis.

Sections at the end of the chapter describe how the Cle Elum Pool Raise Project relates to the Integrated Plan, the unavoidable adverse impacts that the Proposed Action could cause the relationship between short-term and long-term productivity, and irreversible and irretrievable commitments of resources. The chapter also describes Reclamation's environmental commitments for the projects.

4.1.1 Types of Effects

The Cle Elum Pool Raise Project could have direct, indirect, and cumulative effects and this DEIS evaluates those for each resource. The terms "effects" and "impacts" as used in this document are synonymous and could be beneficial or detrimental.

For NEPA purposes, the Council on Environmental Quality (CEQ) regulations define direct effects as effects "…which are caused by the action and occur at the same time and place" and indirect effects as effects "…which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable" (40 CFR 1508.8(a)-(b)). Indirect effects may include growth-inducing effects, changes in land use, changes in population density, or changes in growth rate and related effects on natural systems. SEPA defines environmental impacts as "effects on the elements of the environment" (WAC 197-11-752). SEPA does not separate direct and indirect impacts. This document combines the discussion of direct and indirect impacts.

CEQ regulations define a cumulative effect as "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions" (40 CFR 1508.7). Section 4.24 discusses cumulative impacts for resources impacted by the project and for the Proposed Action as a whole.

4.2 Surface Water Resources

4.2.1 Methods and Impact Indicators

This section describes the impacts of the project on water storage in the reservoir and flows in the Cle Elum and Yakima rivers, which are the aspects of surface water resources most directly affected by the project. Section 4.4 describes surface water quality.

Reclamation evaluated the amount of increased shoreline inundation and area that would occur with the Cle Elum Pool Raise Project by comparing the area of inundation at 2,240 feet (existing maximum elevation) to that at 2,243 feet (proposed maximum elevation). Reclamation used its Light Detection and Ranging (LiDAR) topographic data to map the inundation lines. Two different sets of LiDAR data exist—a data set completed in 2014 covers the east shoreline of the reservoir and a data set completed in 2000 covers the remainder of the reservoir.

Reclamation evaluated potential effects on reservoir levels, releases, downstream flows, operations of the Yakima Project, and water supply using the RiverWare hydrologic model. Section 2.4.1.2 and Section 5.3 of the Integrated Plan PEIS (Reclamation and Ecology, 2012) provide a description of the RiverWare model. The RiverWare model provides a simulation on a daily time step for the period of 1926 to 2009 of reservoir levels in Cle Elum Reservoir and other Yakima Project reservoirs, streamflow in the Cle Elum River below Cle Elum Reservoir and other river reaches in the Yakima basin, and water deliveries to water users along the Yakima and Naches rivers. Table 4-1 summarizes impact indicators and significance criteria for surface water.

Table 4-1. Surface Water Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Additional shoreline inundation	An increase in inundated area
Increased frequency and duration of inundation	Increase in frequency and duration of inundation
Change in instream flows in the Cle Elum and Yakima rivers	An increase or decrease in flow in the Cle Elum River over or below the minimum level of 180 cfs in the winter A change in overwintering habitat for salmonids An increase or decrease in winter flows in the Yakima River An increase or decrease in spring flows in the Cle Elum or Yakima rivers when the additional stored water is stored in spring
Change in water supply in terms of TWSA and deliveries to proratable water users	Change in TWSA or deliveries to proratable water users

4.2.2 Summary of Impacts

Under the No Action Alternative, no additional stored water would be available. Water supplies for proratable irrigators would continue to fall below 70 percent of entitlements level during drought years. Instream flow conditions in the Cle Elum River would not change and fish survival and productivity in the Cle Elum River would remain relatively low.

Under the action alternatives, the additional pool level would result in the same amount of additional shoreline inundation under Alternatives 2 through 5. The area of inundated shoreline would increase by approximately 46 acres to a total acreage of approximately 4,914 acres. Alternatives 2 and 3 would have a slightly shorter period of additional inundation on average (39 days) than Alternatives 4 and 5 (40 days). Under Alternatives 2 and 3, the reservoir would reach full pool level in an estimated 52 percent of the years the project is under operation versus 53 percent of the years with Alternatives 4 and 5.

Alternatives 2 and 3 would improve instream flow in the Cle Elum River during winter by an average of 36 cfs for 6 months while Alternatives 4 and 5 would likely use the water for a different purpose, to increase TWSA and improve water supplies during drought years. There would be no change to TWSA or deliveries to proratable water users with Alternatives 2 and 3. Alternatives 4 and 5 would increase prorationing levels during drought years by up to 1.6 percent. Reclamation, in consultation with the SOAC, would manage the use of water for all the alternatives adaptively.

4.2.3 Alternative 1 – No Action Alternative

Under the No Action Alternative, Reclamation and Ecology would not implement the Cle Elum Pool Raise Project. There would be no increased inundation of the reservoir shoreline and no installation of shoreline protection measures, and reservoir levels would continue to fluctuate as currently occurs. No construction would occur under the No Action Alternative; therefore, no construction related impacts would occur.

Modeling results indicate that during drought years, water supplies for proratable irrigators would continue to be inadequate to avoid economic losses. Water supplies for proratable irrigators under current conditions fall below 70 percent of entitlements level during drought years, which proratable irrigators have stated is the minimally acceptable level to prevent severe economic losses (Reclamation and Ecology, 2012, Section 1.3). If drought conditions continue at current levels, or increase due to climate change, water supplies for proratable irrigators could fall below 70 percent of entitlements more frequently. As described in Section 4.6.3, fish survival and productivity in the Cle Elum River would remain relatively low. Modeling for climate change impacts indicates that the No Action Alternative provides very limited flexibility to respond to increasingly dry years, and that the reservoir would take longer to refill during these periods.

Because it does not address water supplies for instream flows or proratable irrigators, the No Action Alternative does not meet the Purpose and Need for the project of addressing water supply and aquatic ecosystem needs in the upper Yakima River basin. This alternative does not increase the capacity of the reservoir nor improve aquatic resources for fish habitat, rearing, and migration in the Cle Elum and upper Yakima rivers, and as such, is not consistent with the Record of Decision for the Integrated Plan.

4.2.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.2.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Modification of the spillway gates on Cle Elum Dam would occur when the reservoir is drawn down near the end of the irrigation season in September or October. Reclamation would not be releasing water from the reservoir through the spillway gates during that time; therefore, construction would not affect operation of the spillway gates or water storage and water releases from the dam.

Operation

Once completed, the radial gate modifications would increase reservoir storage by 3 feet and allow an additional 14,600 acre-feet of water to be stored.

Increased Reservoir Pool

Operation

The additional stored water would represent an increase of 3.3 percent over the existing 436,900 acre-feet of active storage capacity of Cle Elum Reservoir. The reservoir surface area would increase by approximately 46 acres to a total of approximately 4,914 acres, an increase of about 1 percent. The reservoir level typically fluctuates by about 75 to 100 feet from spring to fall each year from a possible range of full pool at elevation 2,240 to the lowest possible level at the outlet of the reservoir at elevation 2,110. Under Alternative 2, the fluctuation would remain the same although the high and low water levels would increase by the amount of additional storage captured in most years. That difference would be 3 feet at full pool and about 5 feet at lower reservoir levels when the reservoir is drawn down. In drought years, the reservoir would not fill to elevation 2,240, so no additional storage would occur and the reservoir fluctuation would remain the same as existing.

The additional storage would occur in spring when high flows from snowmelt fill the reservoir. Reclamation would allow the reservoir to fill to the higher level in years when additional water is available. Currently, Reclamation discharges flows in excess of the existing capacity of the reservoir to the Cle Elum River in late April to late June. While the reservoir is filling up to elevation 2,240, Reclamation releases minimum flows of 180 to 220 cfs. Those minimum flows would continue until the reservoir receives the additional storage, if sufficient water supply is available. A decrease in flows would occur in the Cle Elum and Yakima rivers relative to the No Action Alternative after the reservoir reaches the current full pool level of elevation 2,240 up to the time the reservoir fills to elevation 2,243. This reduction would be short-term and flow releases would increase the following winter under this alternative. The reduction in flows would occur in spring when higher flows are present in the Yakima River (averaging 3,500 to 5,000 cfs from April to June) and the additional stored water would be a small percentage of that flow.

Figure 4-1 illustrates the reservoir pool elevation in a typical sequence of years (water years 1998 to 2002) for this alternative, assuming Reclamation would use the additional stored water to improve winter instream flows in the Cle Elum River. Reclamation selected this sequence of years for modeling because it contains years with average volumes of inflow to Cle Elum Reservoir (1998, 2000, and 2002), a year with a high volume of runoff (1999), and a severe drought year (2001).

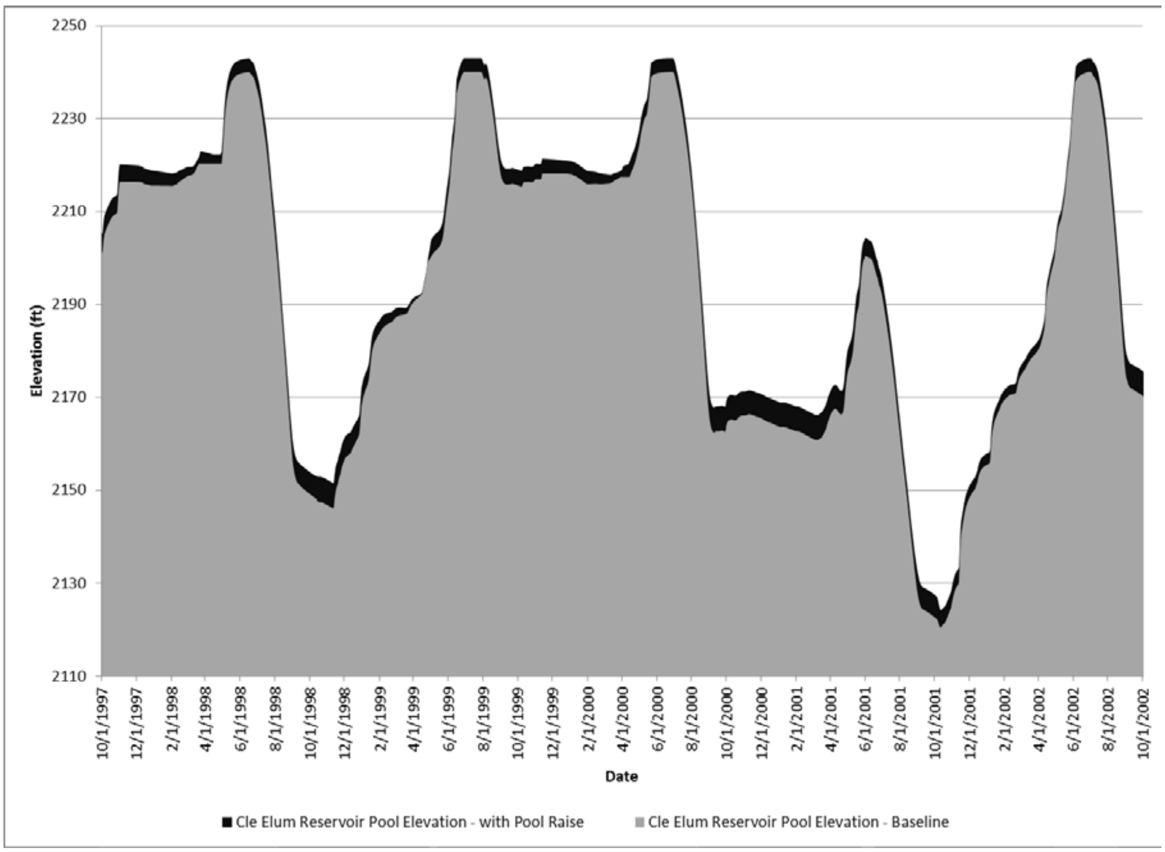


Figure 4-1. Cle Elum Pool Elevation – No Action Compared to Alternative 2

Hydrologic modeling indicates that the existing full reservoir elevation of 2,240 feet would be exceeded in about 72 percent of the years modeled and the proposed reservoir elevation of 2,243 feet would be reached in about 52 percent of the years modeled. On average, reservoir levels would exceed 2,240 feet on June 2 and stay above that level until July 10 in the years when sufficient runoff occurs to fill the reservoir above elevation 2,240. The average extent of time the reservoir elevation would be above 2,240 feet under Alternative 2 is about 39 days in the years when sufficient runoff occurs. Table 4-2 lists the starting and ending dates that the additional storage would occur.

Table 4-2. Starting and Ending Dates for Additional Storage, Alternative 2

Reservoir Level	Date		
	Average	Earliest	Latest
When reservoir level exceeds 2,240 feet	June 2	April 21	June 25
When reservoir level drops below 2,240 feet	July 10	May 29	August 11

4.2.4.2 Water Used for Instream Flows

Reclamation anticipates that use of the additional stored water for instream flows may change annually and over time due to improved knowledge of instream flow needs and specific flow needs identified in any one year. For that reason, Reclamation would manage the additional storage with the advice of SOAC to maximize benefits to instream flows. The following sections describe two scenarios for how Reclamation would use the additional stored water for instream flows, based on hydrologic modeling results.

Winter Flows Scenario

For this scenario of instream flow use, the additional stored water would be released during fall and winter (October to March) to increase instream flow in the Cle Elum River and increase overwintering habitat. The additional stored water would provide instream flows of approximately 36 cfs for 6 months. The current minimum release during winter from Cle Elum Reservoir is 180 cfs. The additional release of 36 cfs represents a 20 percent increase in winter instream flows when releases are at the minimum level. The additional instream flow would be released in 59 percent of the years modeled. Reclamation may release water equal to the increased volume stored at Cle Elum Reservoir at other times of the year at varying rates and from other Yakima Project reservoirs in lieu of releases from Cle Elum Reservoir, as stated in Section 1205(b) of 108 Stat. 4526 USC. However, Reclamation does not anticipate this would occur outside existing operational ranges of those other reservoirs. Figure 4-2 illustrates the outflow from Cle Elum Reservoir (equal to flow in the Cle Elum River) in a typical sequence of years (water years 1998 to 2002) for this scenario.

The primary benefit of increased winter instream flow would be for salmonid overwintering habitat in the Cle Elum River. The increased flow would also accrue to the Yakima River from its confluence with the Cle Elum River to its mouth. However, flows in the Yakima River during winter are much higher than in the Cle Elum River (average flow at Parker gage in winter is about 3,000 cfs) and the difference in flow (about 1 percent) would not be measurable in the Yakima River.

Reclamation would be able to manage the flow releases for instream flows in the Cle Elum River because potential water demands from the Cle Elum River between Cle Elum Dam and the Yakima River are small in the wintertime. Therefore, the additional flow released from Cle Elum Reservoir would flow to the Yakima River without being withdrawn. Downstream along the Yakima River, the additional water is a small potential increase in flows (about 1 percent) and Reclamation would not be able to manage that small quantity of water.

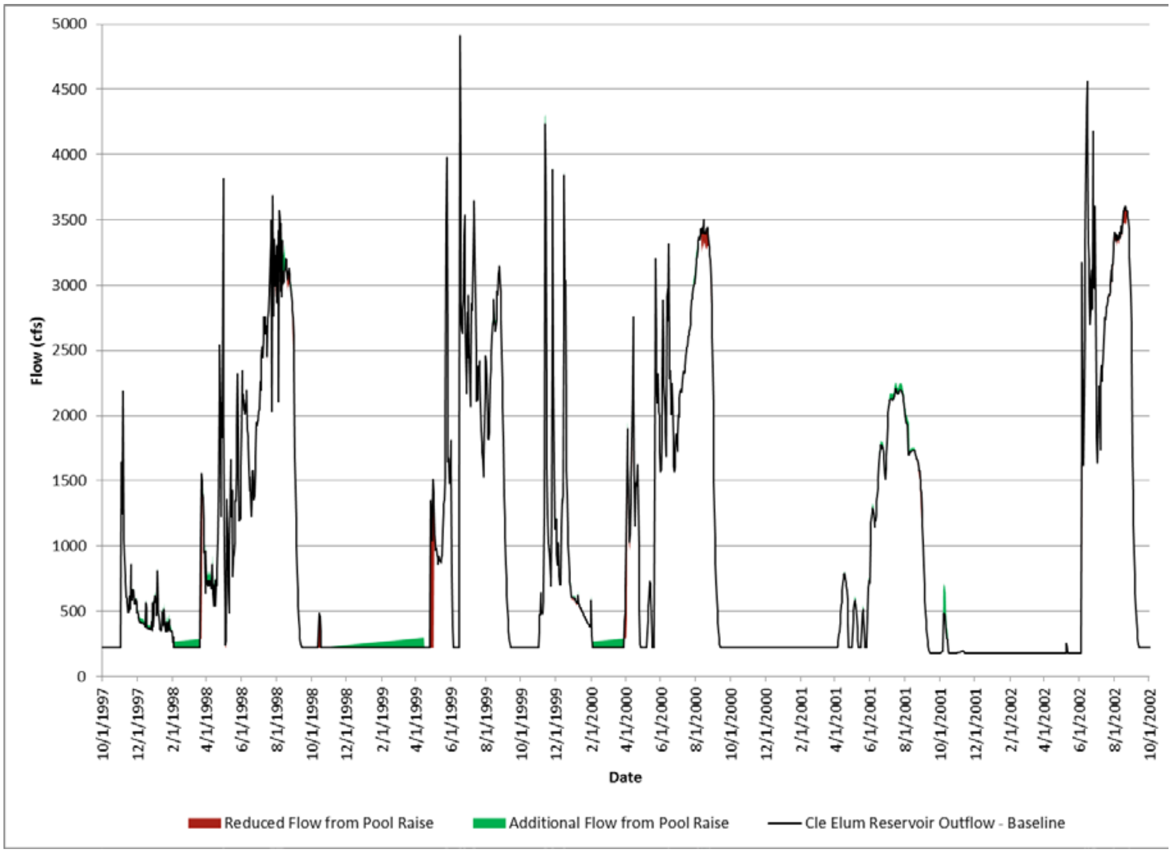


Figure 4-2. Outflow from Cle Elum Reservoir – No Action Alternative Compared with Alternative 2

Carry Over for Fish Passage Scenario

For this scenario of instream flow use, Reclamation would retain the additional stored water in the reservoir and not release it for instream flows (a process called "carry over storage"). The retained water would provide a higher reservoir level when out-migrating juvenile salmon are using the proposed Cle Elum fish passage facilities. Using the additional stored water for carry over storage could benefit fish passage at the future fish passage facilities in two ways. First, the higher reservoir level would increase the duration of time that out-migrating salmon could use the proposed fish passage facilities because the reservoir would fill to the level at which the fish passage facilities operate sooner than without the additional stored water. Second, the higher reservoir level would reduce the cost of the fish passage facilities because Reclamation could construct the outlet at a slightly higher elevation. The design of the fish passage facilities is ongoing and Reclamation has not yet determined the benefits of using the additional stored water for carry over storage.

4.2.4.3 Rock Shoreline Protection

Construction

Construction activities for shoreline protection would not affect reservoir storage or releases because Reclamation would complete the work when the reservoir is drawn down, typically in the fall. During that period, reservoir levels are typically elevation 2,150 to 2,200, which is 40 to 90 feet in elevation below the work area.

Operation

The completed shoreline protection would not affect reservoir storage or releases because the radial gates control the operation of the reservoir. The volume of rock and fill placed below elevation 2,243 for this activity is included in the estimated increase in storage of 14,600 acre-feet.

4.2.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Construction activities for the work proposed to increase freeboard and protect the saddle dikes and the right dam abutment would not affect reservoir storage or releases because Reclamation would complete the work when the reservoir is drawn down, typically in the fall. During that period, reservoir levels are typically elevation 2,150 to 2,200, which is 40 to 90 feet in elevation below the work area.

Operation

The completed work at the saddles dikes and right dam abutment would not affect reservoir storage or releases because these facilities are located above the reservoir pool level. Reclamation would place the rock and fill for this activity above elevation 2,243 so as not to affect volume.

4.2.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

Construction activities for shoreline protection would not affect reservoir storage or releases because Reclamation would complete the work completed when the reservoir is drawn down, typically in the fall. During that period, reservoir levels are typically elevation 2,150 to 2,200, which is 40 to 90 feet in elevation below the work area.

Operation

The completed shoreline protection to Federal recreation facilities and access would not affect reservoir storage or releases. The volume of rock and fill placed below elevation 2,243 for this activity would not affect the estimated increase in storage of 14,600 acre-feet.

4.2.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.2.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.2.4.1).

4.2.5.2 Additional Stored Water Used for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.2.4.2).

4.2.5.3 Hybrid Shoreline Protection

Construction

Construction activities for shoreline protection would not affect reservoir storage or releases as Reclamation would complete the work when the reservoir is drawn down, typically in the fall. During that period, reservoir levels are typically elevation 2,150 to 2,200, which is 40 to 90 feet in elevation below the work area.

Operation

The completed hybrid shoreline protection would not affect reservoir storage or releases because the volume of fill placed below elevation 2,243 for this activity is included in the estimated increase in storage of 14,600 acre-feet.

4.2.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.2.4.4).

4.2.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.2.4.5).

4.2.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.2.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.2.4.1).

4.2.6.2 Increased Reservoir Pool

Operation

The volume and surface area of Cle Elum Reservoir from the increased reservoir pool would be the same as for Alternative 2. The reservoir level fluctuation would be similar; the difference is that Reclamation would retain the additional stored water in the reservoir until needed for water supply purposes under Alternative 4. For that reason, Reclamation would maintain higher water levels in the reservoir until drought years by the amount of additional stored water. That difference would be 3 feet at full pool and about 4 feet at lower reservoir levels when the reservoir is drawn down. The additional storage would fill in the spring the same as described for Alternative 2. In the spring of years when the reservoir fills, a slight reduction of flow from the reservoir would occur compared to the baseline condition. This reduction would be short-term until the reservoir fills. When Reclamation releases water from storage, flow releases would increase in drought years to provide additional downstream water supply.

Hydrologic modeling indicates that the existing full reservoir elevation of 2,240 feet would be exceeded in about 71 percent of the years modeled and the proposed reservoir elevation of 2,243 feet would be reached in about 53 percent of the years modeled. On average, reservoir levels would exceed 2,240 feet on June 1 and stay above that level until July 10 in the years when sufficient runoff occurs to fill the reservoir above elevation 2,240. The average extent of time the reservoir elevation would be above 2,240 feet is about 40 days in the years when sufficient runoff to fill the pool above that elevation occurs. Table 4-3 lists the starting and ending dates when the additional storage would occur. The additional storage would fill above elevation 2,240 earlier, by one day on average, compared to Alternative 2. Reclamation would hold the reservoir level above elevation 2,240 for 0 to 2 days longer under Alternative 4 than under Alternative 2. Figure 4-3 illustrates the reservoir pool elevation in a typical sequence of years for this alternative, assuming Reclamation would use the additional volume for TWSA.

Table 4-3. Starting and Ending Dates for Additional Storage, Alternative 4

Reservoir Level	Date		
	Average	Earliest	Latest
When reservoir level exceeds 2,240 feet	June 1	April 21	June 24
When reservoir level drops below 2,240 feet	July 10	May 31	August 11

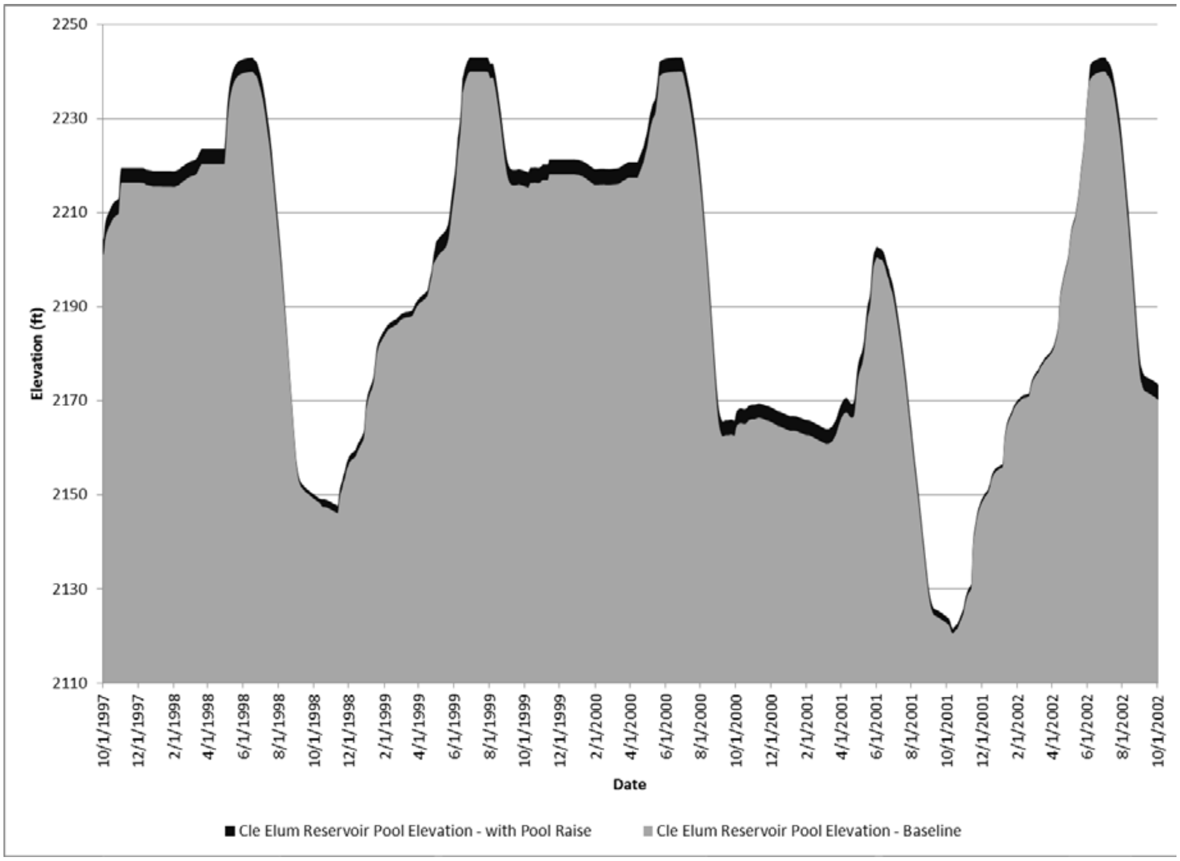


Figure 4-3. Cle Elum Pool Elevation – No Action Alternative Compared to Alternative 4

4.2.6.3 Additional Stored Water Used for TWSA

For Alternative 4, Reclamation would manage the additional stored water as part of TWSA. As part of TWSA, the additional water supply could provide water for proratable irrigation districts and for instream flows. Reclamation anticipates that the primary use of the additional water supply would be to supply proratable irrigation districts during drought years.

If Reclamation manages the additional stored water to increase TWSA, RiverWare modeling predicts an increase in water supply measured at September 30 prorationing levels during drought years of up to 1.6 percent compared to the No Action Alternative. The September 30 prorationing level is a measure of the percentage of water right entitlements supplied to proratable irrigation districts during the irrigation season, which ends in early October. A goal of the Integrated Plan is to provide a water supply of 70 percent of entitlements to proratable irrigation districts during drought years. Table 4-4 provides the estimated increase in prorationing levels modeled for the most recent drought years of 1992 to 1994, 2001, and 2005.

Table 4-4. Increase in Prorationing Levels during Drought Years – TWSA Scenario

Water Year	September 30 Prorationing Level		
	No Action Alternative (Modeled) (%)	With Cle Elum Pool Raise (%)	Difference (%)
1992	67.2	68.8	1.6
1993	58.6	59.0	0.4
1994	26.3	26.4	0.1
2001	39.6	40.8	1.2
2005	45.0	45.9	0.9

The proratable water users that would benefit from an increase in water supply provided by this project include the Kittitas Reclamation District, Roza Irrigation District, Wapato Irrigation Project, and to a lesser extent, the Kennewick Irrigation District. The increased water supply would increase reliability for irrigators in these districts; however, it would not fully meet the Integrated Plan goal of 70 percent of entitlements for proratable irrigation districts during droughts. As indicated in Table 4-4, the proratable districts would still be below that level. Water supply improvements would also provide some flexibility to adapt to climate change as described in Section 4.12.

Hydrologic modeling indicates the increase in TWSA would occasionally trigger an increase in target instream flows at Parker gage and Prosser Dam per the requirements of the YRBWEP legislation (108 Stat. 4526 USC Section 1205). The increase would occur in average to wet years during summer and the increased release from Cle Elum Reservoir into the Cle Elum River would be up to about 150 cfs for a short period of time, typically less than two weeks. The increase would be a small proportion of the total release during that time, which typically ranges from 3,000 to 3,500 cfs.

Figure 4-4 illustrates the outflows from the reservoir in a typical sequence of years for baseline conditions and with the Pool Raise Project, assuming that Reclamation uses the additional stored water for TWSA. The figure shows slightly reduced flows in the spring when the reservoir is filling and slightly increased flows during the summer when Reclamation releases the additional stored water for instream flow or for water supply for proratable irrigation districts.

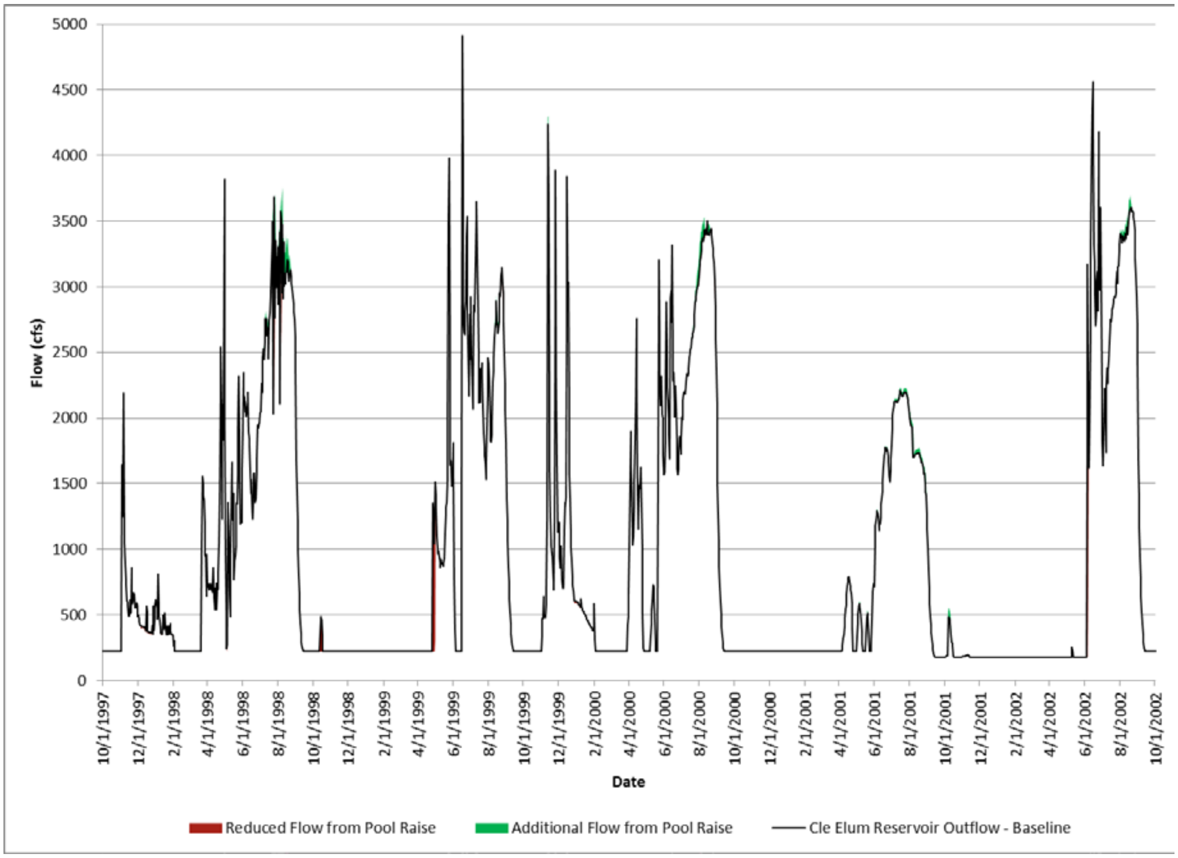


Figure 4-4. Cle Elum Reservoir Outflow – No Action Alternative Compared with Alternative 4

4.2.6.4 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.2.4.3).

4.2.7 Alternative 5 – Additional Stored Water Used for TWSA with Hybrid Shoreline Protection

4.2.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.2.4.1).

4.2.7.2 Additional Stored Water Used for TWSA

Impacts would be the same as for Alternative 4 (Section 4.2.6.3).

4.2.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.2.5.3).

4.2.8 Mitigation Measures

The proposed project and its alternatives would not negatively impact water releases or water supply during construction. Implementation of the project would have a positive impact on instream flow and water supply, which is consistent with the goals of the project. Therefore, there is no need for mitigation.

4.3 Earth Resources

4.3.1 Methods and Impact Indicators

Reclamation evaluated potential impacts from the alternatives by reviewing shoreline areas and existing erosion characteristics in the field and analyzing potential wave action on shorelines. Reclamation also estimated how the higher reservoir pool and wave action would affect shoreline slopes. Reclamation conducted a reconnaissance of the reservoir shoreline and used information from that study to determine potential erosion problems (Reclamation, 2014c). Section 4.4, Water Quality, describes the potential for erosion causing increases in sedimentation or turbidity.

Table 4-5 shows earth impact indicators and criteria for determining impact significance. Reclamation measured impacts relative to the No Action Alternative.

Table 4-5. Earth Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Erosion during construction	Erosion that best management practices (BMPs) cannot control and sediment control measures or construction areas exposed to inundation or wave erosion before shoreline protection is complete, causing sediment entrainment in the reservoir. Shoreline erosion that would affect infrastructure, private property, or increase scour for spawning redds.
Potential for shoreline erosion around Cle Elum Reservoir	Shoreline erosion that would affect infrastructure, private property, or increase scour for spawning redds.
Potential for erosion in Cle Elum River	More erosion in the Cle Elum River than would occur compared to the No Action Alternative.

4.3.2 Summary of Impacts

With the No Action Alternative, shoreline erosion would continue as it does under existing conditions.

Under the action alternatives, short-term impacts to earth would occur from erosion of sediments exposed to rainfall or wind during construction. Potential long-term impacts to earth would be an increase in shoreline erosion, primarily on USFS-managed land on the west shoreline.

4.3.3 Alternative 1 – No Action Alternative

Construction

Under the No Action Alternative, the only construction proposed in the Cle Elum Reservoir area is reconstruction of the interim fish passage facilities. The project would not cause increased erosion because construction would take place on the existing dam spillway and no earth would be disturbed.

Operation

Under the No Action Alternative, existing shoreline erosion would continue unless Reclamation or other property owners install shoreline protection. In its shoreline reconnaissance, Reclamation noted that shoreline erosion currently occurs in many areas around the perimeter of the reservoir, including many near vertical slopes (Reclamation, 2014c). Rock riprap protects some shorelines along the east side of the reservoir, but no shoreline stabilization is located on the west side of the reservoir.

The rock riprap on shorelines on the east side of the reservoir appears to have mostly stopped erosion from inundation and waves. In some areas with rock riprap placed at the toe of the banks, the banks are steeper than a natural, stable slope and are not vegetated. Those slopes would continue to erode slowly from weathering under the No Action Alternative. As part of the No Action Alternative, Reclamation would continue to implement its existing monitoring and maintenance program of shoreline erosion as described in Section 2.4.3.5.

The No Action Alternative does not address the Purpose and Need for the Cle Elum Pool Raise Project; continued shoreline erosion would not address habitat issues or aquatic ecosystem needs within the reservoir.

4.3.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.3.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

There are no anticipated short-term impacts on earth from modifying the existing radial gates of Cle Elum Dam to raise the reservoir level. All work to modify the radial gates would take place on the existing dam and no soil disturbance would occur.

Operation

Operation of the radial gates would not affect earth or increase erosion at Cle Elum Dam because the gates are situated on a reinforced concrete spillway that is erosion resistant.

Increased Reservoir Pool

Operation

Increasing the pool elevation at Cle Elum Reservoir by 3 feet would increase shoreline erosion in some areas as the new shoreline is established. The estimated additional inundated area is approximately 46 acres, measured using LiDAR data. To reduce bank erosion and protect infrastructure and private property, Reclamation proposes shoreline stabilization along approximately 3 miles of shoreline, primarily on the east shore of the reservoir. Section 2.4.3 describes the locations and types of erosion protection proposed. The areas proposed for protection have a western exposure, have a fetch length (length across the reservoir where there is no wind obstruction) of more than 2 miles, and are subject to wind-driven waves. Reclamation would extend erosion protection to elevation 2,246 (above the high water level of elevation 2,243) to provide a 3-foot zone of additional protection against waves. Reclamation determined that the additional 3 feet of protection would be adequate, based on both wind-wave analyses and review of existing erosion patterns above the current high water level of elevation 2,240.

In areas around the reservoir where no shoreline stabilization is proposed, erosion of shoreline banks is expected. These are federally-managed lands, primarily on the west side of the reservoir. The predominant wind pattern during the period of inundation above elevation 2,240 is from west to east and the east side of the reservoir is much more susceptible to erosion from wind driven waves than the west side.

In its reconnaissance of the west shoreline, Reclamation identified about 8,300 feet of shoreline that would be susceptible to additional erosion based on fetch length and site conditions (Reclamation, 2014c). That length is approximately 17 percent of the total west shoreline. Reclamation estimated that with the Cle Elum Pool Raise Project approximately 2 to 5 acres of area would be lost and 17,000 to 34,000 CY of material could erode into the reservoir over a 50-year period. Those quantities are less than the potential disturbance required to install shoreline protection on those same slopes, which Reclamation estimated would be 15 to 17 acres of disturbance and 34,000 CY of soil disturbance. For that reason, Reclamation would protect only 5,000 feet of private property in the southwest corner of the reservoir.

The classifications of surface sediments around much of the reservoir are glacial till and glacial drift, containing ash, loam, and material ranging in size up through cobbles. Eroded material would contain those types of material as well as trees and vegetation. The eroded material would travel into nearshore areas where the coarsest material, such as cobbles and large gravel, would form an armor layer on the newly eroded shoreline. Finer material, such as loam, ash, and silt, would be carried farther away from the shoreline and either deposit in deeper areas or be carried as suspended sediment out of the reservoir. Sand and small gravel would likely form part of a sub-armor layer below the cobble and large gravel armor layer or be carried away from the shoreline to areas not subject to major erosion, below the reservoir's low operating level, which ranges from elevation 2,130 to 2,170.

The rate of erosion that would occur along unprotected shorelines is unknown; however, reviewing existing shorelines that have been subject to inundation and wave erosion over the 80-year operating life of the reservoir provides an indication of erosion rates. Future shoreline conditions above elevation 2,240 would likely be similar to existing shorelines if left unprotected. Reclamation assumed a conservative (high) estimate of the rate of erosion for the purposes of this EIS. The assumption is that all of the erosion predicted by Reclamation would occur in the first 50 years of operation of the Cle Elum Pool Raise Project. The rate of erosion may be higher in the first years after raising the reservoir level as looser topsoil and trees would erode first, exposing underlying sediments that are more densely consolidated and more erosion resistant, slowing the rate of erosion. However, the reservoir would fill above the current high water elevation of 2,240 feet in about 72 percent of the years and remain above 2,240 feet elevation for about 40 days. The short duration of higher inundation would limit the rate of erosion.

Reclamation would monitor the areas with the potential for increased erosion as part of its existing annual survey as described in Section 2.4.3.5. If erosion is identified that would affect private property or infrastructure or increase turbidity in the reservoir beyond acceptable limits, Reclamation would coordinate with the property owners to implement appropriate slope stabilization or erosion control measures.

4.3.4.2 Water Used for Instream Flows

Operation

There are two scenarios for how Reclamation would use the additional stored water for instream flows. The first scenario would release the additional stored water during fall and winter (October to March) to increase instream flow in the Cle Elum River and increase overwintering habitat. The additional releases would augment low flows in the Cle Elum River by an average of 36 cfs during the 6-month-long winter period. Using additional stored water for instream flow would not increase the amount of erosion that occurs in the Cle Elum River downstream of the dam because the releases would not occur at the same time as channel erosion occurs, which is during high spring flows or during winter floods. The increased winter flows (low flows would increase to approximately 220 cfs when the additional storage is available) are well within the range of existing flows in the Cle Elum River below Cle Elum Dam during winter.

For the second scenario, Reclamation would retain the additional stored water in the reservoir and would not release it for instream flows. Reclamation would retain the additional stored water to maintain a higher reservoir level when out-migrating juvenile salmon are using the proposed Cle Elum fish passage facilities. This scenario would not increase instream flows or affect channel erosion in the Cle Elum River.

4.3.4.3 Rock Shoreline Protection

Construction

Short-term impacts on earth such as erosion could occur related to clearing and vegetation removal, construction of access routes and staging areas, soil compaction, excavation, filling, hauling, and placement of rock on shoreline banks. Impacts to earth associated with these projects would be temporary and Reclamation would restore disturbed areas following construction. In addition, Reclamation would utilize BMPs to reduce potential erosion during construction. Reclamation does not expect impacts to be significant. Construction of shoreline protection measures would occur when the reservoir is drawn down and water does not cover the work areas to reduce potential erosion. Reclamation would not increase the reservoir level until all proposed shoreline protection measures are completed.

Operation

The proposed rock shoreline protection includes bank reshaping, and stabilization with rock riprap and revegetation. The rock shoreline protection would reduce erosion wherever installed; therefore, there would be minimal long-term impacts of increased erosion in those areas.

In other areas of shoreline around the reservoir, erosion would occur as described for the increased reservoir pool. Reclamation would continue to implement its existing monitoring and maintenance program for shoreline erosion as described in Section 2.4.3.5. This program may require repairs to existing rock shoreline protection or installation of new rock shoreline protection to protect private property or infrastructure.

4.3.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Construction impacts would be similar to those described for rock shoreline protection in Section 4.3.4.3 and are not expected to be significant. Construction of the dam previously disturbed the area and some shoreline protection already exists on the saddle dikes and right dam abutment, reducing the amount of clearing needed. This alternative includes construction of approximately 0.1 mile of access road, 2 acres of clearing, 5,000 CY of fill, 2,400 CY of riprap, removal of existing asphalt, construction of a new boat ramp, and 1.2 acres of revegetation.

Operation

There would be no long-term impacts of increased erosion on the right dam abutment and saddle dikes, because the measures to increase the freeboard would also provide increased erosion protection.

4.3.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

Construction impacts would be similar to those described for rock shoreline protection in Section 4.3.4.3, and Reclamation does not expect them to be significant. This alternative includes approximately 2.8 acres of clearing, 9,200 CY of fill, 6,100 CY of riprap, removal of existing asphalt, repairs of roads, construction of a new boat ramp and 2.3 acres of revegetation.

Operation

The proposed shoreline protection work would protect shorelines, campgrounds, and roads from future erosion; therefore, there would be minimal long-term impacts to earth in these areas.

4.3.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.3.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.3.4.1).

4.3.5.2 Additional Stored Water Used for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.3.4.2).

4.3.5.3 Hybrid Shoreline Protection

Construction

Construction impacts would be similar to those described for rock shoreline protection in Section 4.3.4.3 although the areal extent of impacts could be greater since some of the protection measures would require disturbance and clearing of more area. Reclamation expects impacts to be short term and localized, and not be noticeable after construction is complete.

Operation

Hybrid shoreline protection would incorporate techniques that may keep more shoreline bank slopes exposed to wave erosion than rock shoreline protection and would, therefore, result in more erosion. For example, perched beaches would expose sediments to erosion. Fine-grained sediment may be eroded out of the fill placed for the perched beach and create turbidity in near-shore areas. The fine-grained material would winnow out of the placed beach sediments when exposed to waves. That may happen within a few years of construction completion, depending on whether the reservoir fills above elevation 2,240 and wind driven waves occur when the reservoir is above that level. Techniques such as log terraces and bioengineered slope treatments may be more prone to erosion than rock shoreline protection because Reclamation would not install those protection techniques on the entire bank. However, these techniques include cutting back the shoreline slopes to a stable slope and revegetating to minimize erosion and the potential for eroding fine sediment into the reservoir. The hybrid shoreline protection measures would protect private property and infrastructure, the same as Alternative 2.

Long-term impacts of hybrid shoreline protection on earth would be minimal as the protection techniques would protect private property and infrastructure and minimize erosion where installed. Some additional erosion would occur in the areas where Reclamation does not install rock shoreline protection compared with Alternative 2; however, that additional erosion would be minimal and would not affect the purpose of the hybrid shoreline stabilization which is to protect private property and infrastructure.

4.3.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.3.4.4).

4.3.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.3.4.5).

4.3.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.3.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.3.4.1).

4.3.6.2 Additional Stored Water Used for TWSA

Reclamation anticipates no short-term impacts on earth from using the additional stored water for TWSA because there is no construction associated with this element of the alternative. Long-term impacts would be the same as described for using the additional water for instream flows (Section 4.3.4.2).

4.3.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.3.4.3).

4.3.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.3.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.3.4.11).

4.3.7.2 Additional Stored Water Used for TWSA

Impacts would be the same as for Alternative 4 (Section 4.3.6.2).

4.3.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.3.5.3).

4.3.8 Mitigation Measures

To reduce erosion caused by the higher pool level, Reclamation would not raise the level of the reservoir until all proposed shoreline protection measures are complete. During construction, Reclamation would implement the following best management practices and other techniques to minimize the potential for erosion.

- Prepare and implement a Temporary Erosion and Sedimentation Control Plan for construction activities.
- Use straw bales, silt fencing, or other suitable sedimentation control or containment devices when shoreline protection measures are constructed.
- Cover exposed soil or rock stockpiles and exposed slopes.
- Retain vegetation along the shoreline where possible to minimize soil erosion.
- Seed or plant exposed areas with appropriate native vegetation as soon as possible after work is completed.

Reclamation would stabilize portions of the west shoreline to mitigate impacts resulting from the increase in pool elevation. Stabilization would occur in two general areas—along the south end of the west bank and at three stream mouths (Figure 4-5). For both areas, Reclamation would use existing, on-site driftwood, trees, and vegetation as stabilization material. In general, large trees would be placed or felled parallel to the shoreline at the high water mark. Methods used to anchor the trees include:

- Attaching steel cables to anchors epoxied into large boulders or bedrock or;
- Anchoring to ballast logs/trees/rocks above the high water mark or;
- Constructing anchors using local depressions and hand excavation.

To reduce construction impacts, Reclamation would use hand methods to install the shoreline protection. No access road would be required and no heavy machinery would be used. Hand work includes the use of equipment such as chainsaws, winches, ropes, and cables. This work would not require importing any additional materials. The exact methods and configurations of shoreline stabilization are contingent on what material is available in the immediate area and local site conditions.

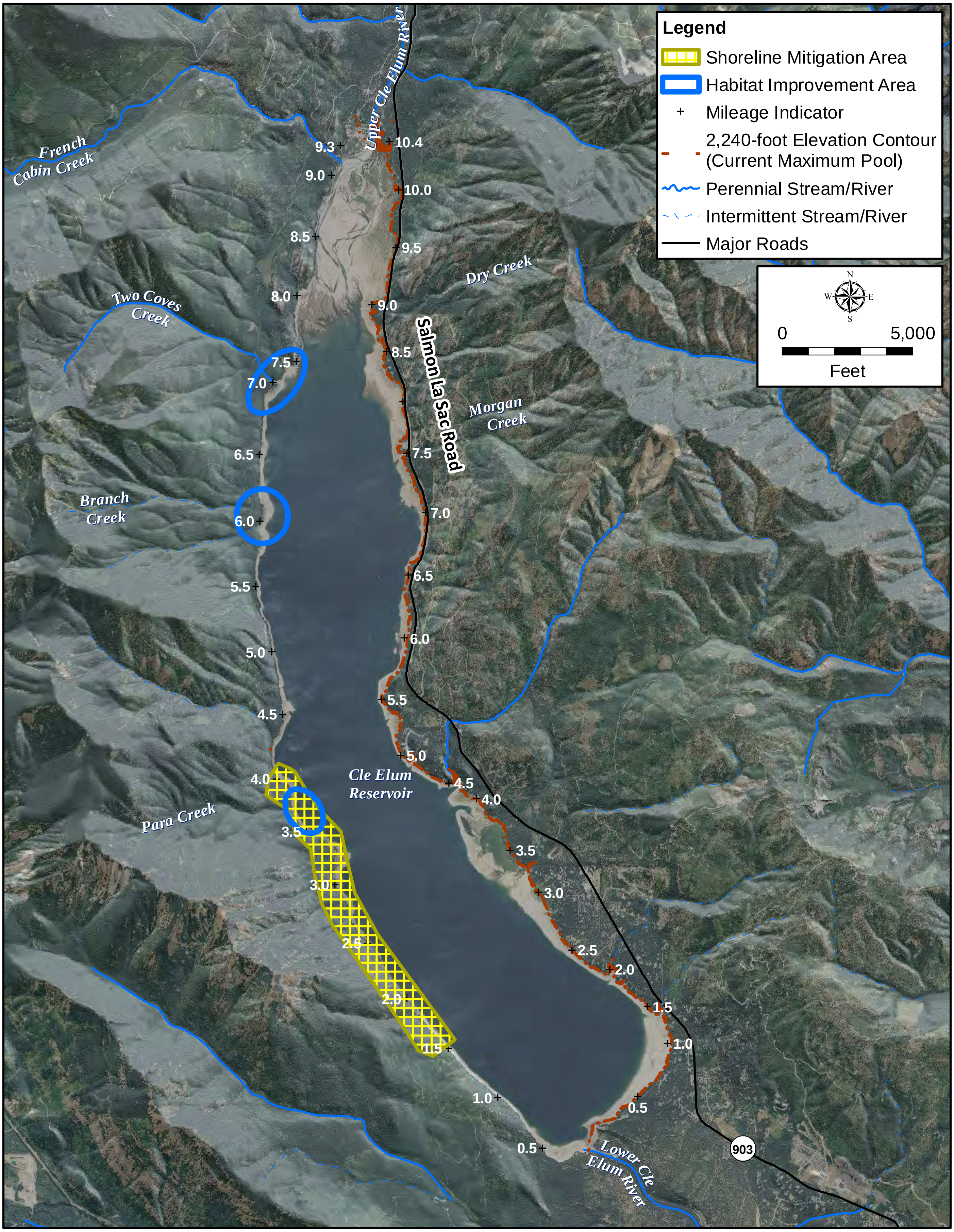


Figure 4-5. Proposed Shoreline Mitigation Areas and Habitat Improvement Areas

Resources affected by shoreline mitigation include: surface water resources, earth, surface water quality, fish, vegetation and wetlands, noise and vibration, and cultural resources. The shoreline stabilization is intended to reduce the rate and severity of erosion while protecting or improving riparian and nearshore upland habitat, as well as nearshore aquatic habitat. Potential adverse effects of implementing these measures are related to surface water resources, earth, surface water quality, vegetation and wetlands, noise and vibration. These effects are expected to be of short duration, occurring primarily during construction.

The effects are not considered significant because minimal ground disturbance is required, no heavy machinery would be used, and overall affected area and intensity of effects are localized and minor. Reclamation would conduct a cultural resources survey to determine the presence of cultural resources in the construction areas. Reclamation would also conduct wetlands evaluation prior to construction activities and comply with permit requirements to minimize impacts to wetlands.

Reclamation expects the installed shoreline protection measures and mitigation measures for the west side of the reservoir would minimize erosion and damage to private land and recreation facilities in protected areas. Reclamation would continue to implement its existing inventory of shoreline conditions as described in Section 2.4.3.5.

4.4 Surface Water Quality

4.4.1 Methods and Impact Indicators

This section evaluates the potential for the Cle Elum Pool Raise Project to degrade water quality during construction and operation. Reclamation conducted this analysis by reviewing existing literature and using best professional judgment. The Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201 WAC) outline the required thresholds for turbidity measured in Nephelometric Turbidity Units (NTUs) during construction (Section 3.4) as well as temperature, dissolved oxygen (DO), total dissolved gases, and fecal coliform levels. The State currently has no surface water standard for suspended sediment or nutrients (nitrogen and phosphorus). Table 4-6 shows water quality impact indicators and criteria for determining impact significance. Reclamation measured impacts relative to the No Action Alternative.

Table 4-6. Water Quality Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Turbidity	5 NTU over background
Temperature	<16°C (60.8°F) suitable for aquatic life use for summer salmonids habitat
Dissolved Oxygen	>9.5 mg/l
Suspended Sediment	No State standard, turbidity is used as a general indicator for water clarify
Nutrients (nitrogen and phosphorus) and change in Trophic State	No State standards, a change from current water quality conditions or trophic state is used
Total Dissolved Gas	Not to exceed 110 percent
Fecal Coliform	Must not exceed a geometric mean value of 50 colonies per 100 mL

4.4.2 Summary of Impacts

The No Action Alternative would largely continue existing water quality trends, as described in Section 3.4. Because no construction is proposed, there would be no construction-related impacts. Long-term water quality conditions would remain largely unchanged from current conditions.

For Alternatives 2 and 4, the Cle Elum Pool Raise Project would locally increase sediments, turbidity, and nutrients as unprotected shorelines erode into the reservoir. The increased sediment loading would be small and within the range of measured suspended sediment concentrations in the Cle Elum River at the head of the reservoir. A small increase in nutrients would occur along with the increase in sediment loading. However, Cle Elum Reservoir is oligotrophic and the increased nutrient loading would not affect overall water quality or trophic state.

Alternatives 3 and 5 contain the same amount of unprotected shorelines and the increase in sedimentation, turbidity and nutrients from those shorelines would increase slightly from that described for Alternatives 2 and 4. Alternatives 3 and 5 include hybrid shoreline protection measures which include biotechnical stabilization techniques such as perched beaches. These measures would have the potential for more sedimentation, turbidity and nutrients as fine-grained material within the perched beach sediments may wash out over the first 10 years. However, the increases would be small and within the range of measured suspended sediment concentrations in the Cle Elum River at the head of the reservoir.

Reclamation does not expect an increase in reservoir or outflow temperature for any of the alternatives as the reservoir surface area would increase by only about 1 percent and the change in solar heating would be minimal. In addition, Reclamation would discharge reservoir outflows through the existing outlet located at an invert of 2,110 feet, about 50-100 feet below the level of the reservoir during summer. During years when additional storage occurs, the higher pool level would submerge the outlet slightly more than under existing conditions.

This may result in slightly cooler outflows in the summer as temperatures drop with depth; however, the temperature difference would be small and likely not measureable.

In the reservoir, any potential increases in the heating of the surface layer may translate to decreases in DO, but not more than currently occurs. Dissolved oxygen concentrations would remain similar to existing conditions at depth, where the reservoir is well oxygenated.

4.4.3 Alternative 1 – No Action Alternative

Under the No Action Alternative, Reclamation and Ecology would not implement the Cle Elum Pool Raise Project. No construction would occur and Reclamation would not install shoreline protection measures. None of the projects included in the No Action Alternative would cause construction related impacts on water quality. Reconstruction of the interim fish passage facility would occur entirely on the existing dam spillway and would not cause erosion or sedimentation. Any ongoing shoreline erosion and related sedimentation would continue as described in Section 4.4.2. As part of the No Action Alternative, Reclamation would continue to implement its existing annual survey of shoreline conditions as described in Section 2.3.

Cle Elum Reservoir currently has moderate to good water quality conditions. The reservoir is oligotrophic and stratifies in the summer. Reservoir waters are clear with low turbidity and low fecal coliform bacteria counts. Summer surface water temperatures can exceed State Surface Water Quality criterion of 16°C (60.8°F) and summer DO concentrations can be below the State Water Quality Criterion of 9.5 mg/l. Nutrient concentrations are generally low, but are elevated at the surface during the summer. These overall conditions within the reservoir would likely remain in the future if land use conditions within the watershed remain similar to current conditions. The ongoing fish reintroduction program may slightly increase nutrient levels in the reservoir as salmonids die and decay.

Alternative 1 would result in a continuation of current water quality conditions. Criteria that currently do not meet water quality standards, including seasonal temperature exceedances, would continue and potentially increase with climate change conditions. This may result in inconsistencies with the Washington State Antidegradation Policy, which could require additional analysis and possible corrective actions.

The No Action Alternative provides minimal flexibility to respond to changing conditions associated with climate change. Reduced water storage could result in reduced DO levels and increased temperatures, as discussed in Section 4.12.4.

4.4.4 Alternative 2 – Additional Stored Water Used for Instream Flow With Rock Shoreline Protection

4.4.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

The radial gate modifications would not cause construction related water quality impacts. Construction would take place on the existing dam in dry conditions when the reservoir is drawn down, minimizing the potential for pollutants reaching surface water. Short-term impacts on water quality could result from inadvertent release of fuel, oil, or other construction equipment related fluids. Reclamation would implement BMP measures to minimize the potential for spills and leaks of petroleum products or other toxic materials into the reservoir. A spill prevention and response plan would be developed and implemented for the duration of construction. Reclamation would collect and remove construction waste and debris from the work area. Therefore, construction activities would not cause exceedance of water quality standards.

Operation

Operation of the modified radial gates would not impact water quality. The modified gates would not alter how Reclamation would release water from the dam. Therefore, the radial gate modifications would not change the temperature of water releases or cause release of pollutants to Cle Elum River.

Increased Reservoir Pool

Operation

The Cle Elum Pool Raise Project could increase nutrients and sediment load in the reservoir as shorelines erode. Section 4.3.4 describes the potential for increased erosion and is the basis for determining potential sedimentation levels in the reservoir. As the shoreline adjusts to higher pool reservoir elevations, shoreline erosion would occur, introducing suspended sediment to the reservoir. Based on Reclamation's evaluation of potential erosion (approximately 17,000 to 34,000 CY) and the percentage of that material that is fine grained (approximately 50 percent), the average increase in suspended sediment would be 0.25 to 0.5 mg/l over the next 50 years (Reclamation, 2014c). The assumption is that all of the erosion predicted by Reclamation would occur in the first 50 years of operation of the Cle Elum Pool Raise Project. Reclamation selected the 50-year period to provide a conservative (high) estimate of the rate of erosion for the purposes of this DEIS. The increase is small relative to current conditions in which Reclamation measured total suspended solids to be below detection levels to a high of 8 mg/l (EPA, 2014). Episodes of high-suspended sediment would be short lived as the areas of localized increases would dissipate and mix in the reservoir as the shoreline stabilizes. Localized areas of increased turbidity could exceed 5 NTU over background; however, the increases would be short term. The increases are not likely to have an impact on water quality.

Reclamation conducted a water quality study of Cle Elum Reservoir in 2007 that measured and analyzed nutrient levels in the reservoir and classified it as oligotrophic (Reclamation, 2007). This is the most recent study of reservoir water quality and Reclamation considers the information still valid since few changes have occurred at the reservoir. Nutrient levels are very low and appear to be limited to algal growth. The reservoir may experience slight increases in nutrient levels associated with suspended sediment inputs. Nutrients contributed through shoreline erosion may increase algal production. However, the change in nutrient concentrations would be small (less than suspended sediment concentrations) and would not change the overall water quality of the reservoir. These increases in sediment would likely only occur until the shorelines stabilize at the higher reservoir pool elevations.

The water quality study of Cle Elum Reservoir also measured temperatures. The warmest temperatures measured on the surface of the reservoir during the study period (2003 to 2005) ranged from 18.3°C to 21.2°C, while the warmest temperature at the outlet to the Cle Elum River measured 19.5°C in July 2004 (Reclamation, 2007). These temperatures exceed the water quality standard of 16.0°C. During 2005, cooler temperatures occurred and the warmest outlet temperature was 16.4 °C in August. The low-level reservoir outlet is located at elevation 2,110, which is generally 50 to 100 feet below the surface of the reservoir during summertime when warmest temperatures occur. The addition of more water for storage would raise the reservoir pool by 3 feet at full pool and up to 5 feet when the reservoir is drawn down in summer. The increase in reservoir depth would not interfere with development of the summer thermocline. This thermocline would likely develop at the same depth as currently occurs. If the thermocline depth remains similar to current conditions, the depth of the hypolimnion could potentially increase by 3 to 5 feet. This potential change in the hypolimnion thickness (up to 5 feet) would not alter water quality within the hypolimnion. Any potential increases in the heating of the reservoir surface layer may translate to decreases in DO, but Reclamation does not expect impacts beyond what is occurring during current conditions. Dissolved oxygen concentrations would remain similar to existing conditions at depth, where the reservoir is well oxygenated.

The estimated increase in surface area caused by additional storage is approximately 46 acres (Section 2.4.1.2). The surface area of the reservoir is currently 4,868 acres and the additional inundated area represents approximately 1 percent of the current reservoir surface area at full pool. Additional solar heating created by the increased pool level would be small because of the small surface area difference after implementation of the pool raise project. In addition, Reclamation expects fecal coliform counts to remain similar to baseline conditions.

Only small changes in sediment transport and suspended sediment and nutrient input into the reservoir from the Cle Elum River would occur as a result of the pool raise. A review of peak flows into the Cle Elum River shows that the peak flows that transport the most sediment occur in the winter, when the reservoir is drawn down by 10 to 100 feet below the full pool at elevation 2,240. An increase in pool elevation of 3 feet would not change the location of deposition of sediment at the Cle Elum River delta at the north end of the reservoir as the delta is exposed during floods. Sediment would continue to move into the reservoir or deposit below the existing full pool level. The reservoir level increase in the spring would continue to inundate sediments deposited on the delta, providing a source of nutrients.

As described above, localized increases in turbidity may occur associated with construction that could exceed the water quality standard, and there is the potential that localized levels of nutrients and temperature would not meet applicable water quality standards at all times of the year. This could result in potential inconsistencies with the Washington State Antidegradation Policy. Additional analysis would be needed to determine the potential extent and magnitude of these issues, and to identify any needed corrective measures. Reclamation would coordinate with Ecology as part of this evaluation.

4.4.4.2 Additional Stored Water Used for Instream Flow

Operation

The Cle Elum Pool Raise Project would cause both decreases and increases to streamflows in the Cle Elum and Yakima rivers. Flows would decrease from the No Action Alternative during a short period in spring when the reservoir fills with additional storage and would increase in the winter when Reclamation releases the additional stored water. The decreased instream flows would occur in spring when the highest flows in the Yakima River system occur and water temperatures in the rivers are lower than water quality criterion for maximum temperature. Although the rate of flow discharged from Cle Elum Reservoir would decrease, the discharge would occur from the same outlet level as higher flows, ensuring temperatures and other water quality parameters do not change from current conditions.

The temperature of the additional flow discharged during winter would be close to existing water temperatures. The reservoir is well mixed and during the winter water temperature does not vary much with depth during the winter.

Discharge to the Cle Elum River would continue to occur from the existing reservoir outlets. The spillway gates and low-level outlet control flow out of the reservoir. During years when additional storage occurs, the increased pool level would submerge the low-level outlet slightly more than under existing conditions. This may result in slightly cooler outflows in the summer as temperatures drop with depth. However, the temperature difference would be small and likely not measureable. When water is not available for the additional storage, such as during drought years, reservoir or outlet temperatures would not change. The Cle Elum Pool Raise project would not raise water temperatures in the Cle Elum River more than 0.3°C (0.6°F) and would meet State Water Quality Standards of 16°C (60.8°F) for salmonid habitat. Similar to temperature, changes to baseline DO concentrations would not occur. Dissolved oxygen concentrations from the existing reservoir outlet currently meet the State Surface Water Quality Standard of 9.5 mg/l (WAC 173-201A). With the outlet works staying at the same elevation, Reclamation expects nutrient concentrations within the outlet waters to be similar to existing conditions.

With the proposed project, the reservoir outlet works would be the same as currently used and the proposed flow rates from the reservoir would remain within the range of current conditions (from a low of 180 cfs to over 5,000 cfs). Therefore, total dissolved gas at the reservoir release point would remain similar to existing conditions and no impacts from total dissolved gas would occur.

4.4.4.3 Rock Shoreline Protection

Construction

Construction activities could affect water quality if sediments enter the reservoir. Sediment from construction disturbances could temporarily degrade nearby water quality. Reclamation would conduct all construction in dry conditions when the reservoir is drawn down, minimizing the potential for sediments reaching surface water. Five miles of new access roads may be necessary to access the construction areas. These roads would be 20 feet wide, graded through existing soil, and surfaced with gravel as needed. The newly exposed areas and vehicular use during construction would have the potential to generate sediment and fine materials. However, Reclamation would enclose the perimeter of these areas in erosion control measures, thereby limiting delivery to area surface waters. Reclamation would return the areas to native vegetation following construction.

Short-term impacts on water quality could also result from inadvertent release of fuel, oil, or other construction equipment related fluids. Reclamation would implement BMP measures to prevent spills. A Spill Prevention, Control, and Countermeasures Plan for the project would include these BMP measures. Therefore, construction impacts to receiving surface waters would not occur during project construction.

Operation

It is likely that once Reclamation raises the pool elevation inundating the rock shoreline projects, the higher water levels could erode fine materials disturbed during construction. This could cause some minor and temporary localized turbidity. During the initial adjustment period, exceedances of that State Water Quality Standard for turbidity may occur (greater than 5 NTU over background). This would be short term, limited to nearshore areas and would not be a chronic source of turbidity or sedimentation of downstream areas since the fine material would settle out quickly. In the long-term, the rock shoreline protection measures would reduce erosion and sediment production in the most erosion prone areas. Turbidity measurements would likely meet standards in the long-term (less than 5 NTU over background).

4.4.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts from shoreline protection of saddle dikes and the right dam abutment would be similar to those described for rock shoreline protection (Section 4.4.4.3).

4.4.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts from shoreline protection for recreational facilities and access would be similar to those described for rock shoreline protection (Section 4.4.4.3).

4.4.5 Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection

4.4.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.4.4.1).

4.4.5.2 Additional Stored Water Used for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.4.4.2).

4.4.5.3 Hybrid Shoreline Protection

Construction

Potential water quality impacts from construction would be similar to those for rock shoreline protection (Section 4.4.4.3). Construction of the perched beach berms would require more earthwork and placement of material adjacent to the reservoir. This potentially could disturb more ground during construction. However, all construction work would occur in the dry, and Reclamation would use erosion control measures during construction to minimize construction runoff and debris from entering the reservoir. Water quality impacts to the reservoir would not occur during construction.

Operation

It is likely that once Reclamation raises the pool elevation, some fine sediments washing out of material placed to construct the perched beaches and other biotechnical stabilization techniques could cause turbidity. The project would place an estimated 215,000 CY of material for this alternative. The source of the material would be from existing reservoir sediments that would have a low percentage of fine sediment, due to exposure to wave action and fluctuating reservoir levels over the 80-year history of the reservoir. Assuming a 5 to 10 percent fine sediment concentration (existing alluvial deposits around the shoreline have a 6 percent fine sediment concentration) and the fine sediments wash into the reservoir over a 10-year period, the estimated suspended sediment concentration in the reservoir would be 1.5 to 3 mg/l. Reclamation selected a 10-year period because construction of the shoreline stabilization projects would occur over approximately a 5-year period and inundation and wave action would not affect the perched beaches every year. As described in Section 4.2.4.1, the proposed reservoir elevation would reach 2,243 feet in about 52 percent of the years. The 10-year period for this sediment input is different than the 50-year period assumed for shoreline erosion because the fine sediment could winnow out of the perched beach sediments much more quickly since they are disturbed during construction. For the existing shorelines subject to erosion, shoreline materials are more resistant to erosion and the erosion processes would take longer.

Combined with expected erosion of the west shoreline (Section 4.3.4.1), the average expected increase in suspended sediment is about 1.8 to 3.5 mg/l in the first decade of operation of the Cle Elum Pool Raise Project. Concentrations would decrease with establishment of armoring layers on the surface layer of sediments placed for perched beaches and other techniques and as vegetation establishes on exposed slopes. The long-term average suspended sediment would be similar to that discussed in Section 4.4.4.1, approximately 0.25 to 0.5 mg/l. Both concentrations are low, within the existing range of measured suspended sediment inflow from the Cle Elum River during average flow conditions and suspended sediment concentrations in the Cle Elum River below Cle Elum Dam.

The nearshore areas would experience the highest concentrations of suspended sediment and turbidity because of the proximity to the source of eroded sediments, wind, and wave action, which would keep sediments in suspension. As the reservoir level drops, most of the sediment would likely redeposit in deeper areas and not be discharged from the reservoir into the Cle Elum River below Cle Elum Dam. These higher suspended sediment concentrations may translate into increased turbidity measurements during the first 10 years as erosion of the fine sediments occurs. These increases may exceed State Water Quality Standards. The violations would be short lived as the areas of localized increased turbidity associated with higher pool elevations would diminish over time, and Reclamation would expect turbidity readings to meet the standard of less than 5 NTU over background.

Nutrients associated with increased sediment loads could result in localized areas of increased nutrients; however, given the low level of productivity in the reservoir, and the localized and temporary nature of the sediment related increases, impacts are not expected.

In the long-term, the shoreline protection measures would reduce erosion and sediment production in the most erosion prone areas. This would also reduce any nutrient loadings associated with these sediments inputs. In addition, shoreline protection measures would not impact reservoir pool water temperatures, DO concentrations, or fecal coliform counts. Therefore, long-term impacts to water quality are not expected.

4.4.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.4.4.4).

4.4.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.4.4.5).

4.4.6 Alternative 4 – Additional Stored Water Used for TWSA with Rock Shoreline Protection

4.4.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.4.4.1).

4.4.6.2 Additional Stored Water Used for TWSA

Operation

The effects on Cle Elum Reservoir and Cle Elum River temperatures from using the additional stored water for TWSA would be similar to those described for the Additional Stored Water Used for Instream Flow scenario (Section 4.4.4.2). When the reservoir is filling with additional water in spring, outflow from the reservoir would decrease. There would be no effect to outfall temperature because the reservoir would fill during a time when reservoir temperatures are cool and the proportion of flow retained compared to that released is small. When the stored water is released for additional water supply during summer in drought years (when available), the temperature of outflow from the reservoir would likely not change from existing conditions as the depth at which water is withdrawn from the reservoir would change slightly compared to the overall reservoir depth. The potential increase in stored water (14,600 acre-feet) at the beginning of a drought is still small (4 percent) compared to the volume of water released from the reservoir in a drought year (approximately 350,000 acre-feet).

Predicted impacts for other water quality parameters would be similar to those described for Alternative 2.

4.4.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.4.4.3).

4.4.7 Alternative 5 – Additional Stored Water Used for TWSA with Hybrid Shoreline Protection

4.4.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.4.4.1).

4.4.7.2 Additional Stored Water Used for TWSA

Impacts would be the same as for Alternative 4 (Section 4.4.6.2).

4.4.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.4.5.3).

4.4.8 Mitigation Measures

During construction, Reclamation would implement BMPs and other techniques to minimize the potential for erosion and turbidity in the reservoir, such as working during low reservoir (dry) conditions and using erosion control measures (e.g., silt fencing) around perimeters of the work areas, access roads, and borrow areas. Section 4.3.8 describes these measures. For Alternatives 4 and 5 (hybrid protection), Reclamation would also use sediments with a low percentage of fines in perched beach construction to minimize the amount of fine sediment subject to wave erosion. Reclamation would cover sediments with higher levels of fine-grained material with clean gravel and cobbles to form an armor layer and minimize turbidity.

Regardless of type, Reclamation expects the installed shoreline protection measures to minimize long-term erosion and damage to private land and recreation facilities. Reclamation would continue to implement its survey of shoreline conditions as described in Section 2.3. If Reclamation identifies erosion problems or failing shoreline protection measures, the agency would determine the appropriate measures to control the erosion or repair the shoreline protection measures.

4.5 Groundwater

4.5.1 Methods and Impact Indicators

Reclamation evaluated potential impacts by analyzing the expected increased water level caused by the increased reservoir pool (see additional inundated areas on Figures 2-3 through 2-7). The agency revaluated potential impacts to on-site sewer systems (OSS) and groundwater quality by comparing existing OSS locations with the expected change in the reservoir level. Table 4-7 lists groundwater impact indicators and significance criteria.

Table 4-7. Groundwater Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Introduction of contaminates during construction from spills	A decrease in groundwater quality as measured against groundwater quality standards
Changes in water levels in nearby wells	A decrease in water available for use or increase in pumping costs
Effects to OSS	Loss of functionality of OSS

4.5.2 Summary of Impacts

The No Action Alternative would not result in impacts to groundwater because there would be no construction and no changes to reservoir operations, and there are no known negative impacts to groundwater resources caused by current reservoir operations.

Under the Action Alternatives, impacts to groundwater would be similar for each alternative. All four action alternatives would have no negative effects on water wells or groundwater levels because temporary increases in groundwater levels would not impair the function of wells or decrease the yield of the aquifer. The higher reservoir level under all four action alternatives could potentially have negative effects on some OSS due to higher groundwater levels causing some OSS to become out of compliance, and could also impact groundwater quality due to inadvertent spills during construction activities.

4.5.3 Alternative 1 – No Action Alternative

Under the No Action Alternative, Reclamation and Ecology would not implement the Cle Elum Pool Raise Project and there would be no impacts to groundwater quality, water levels, or OSS in the Cle Elum Reservoir area. Reclamation does not anticipate any long-term impacts to groundwater from the No Action Alternative since it would maintain the reservoir pool elevation as it is currently, and there are no known negative impacts to groundwater at this time. Conditions would largely continue as described for baseline conditions.

4.5.4 Alternative 2 – Additional Stored Water Used for Instream Flow With Rock Shoreline Protection

4.5.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Construction to modify the radial gates is not likely to affect groundwater because the work would take place on the existing dam. Possible sources of groundwater contamination associated with construction activities include minor spills of petroleum products or hazardous materials used in construction, or leaks of fuel or fluids from construction equipment. These could occur at the dam, along access routes for construction vehicles, or at staging areas. Reclamation would take measures to prevent spills, so groundwater quality effects are unlikely. No dewatering would be required, so construction would not affect groundwater levels.

Operation

Operation of the new radial gates would not impact groundwater because they would function in the same way as the existing radial gates and would not be in contact with groundwater.

Increased Reservoir Pool

Operation

The Cle Elum Pool Raise Project would result in a 3-foot rise in the reservoir during the spring and late summer. Groundwater level responses to the increased pool level would likely be both temporary and cyclical (on an annual basis). The amount that groundwater levels would change is a function of the local geology and how the reservoir interacts with the groundwater system. The wetted perimeter of the reservoir is in contact with unconsolidated sediments as well as sedimentary and crystalline bedrock. In general, expected groundwater levels would not fluctuate more than 3 feet if the reservoir were to rise 3 feet, and in some locations the fluctuation could be less than 3 feet, depending on the permeability of the geology in the area. Reclamation expects maximum fluctuations in groundwater levels in areas of glacial outwash and highly fractured bedrock due to the relatively high permeability of the material and greater hydraulic connection with the reservoir. Conversely, the agency expects low permeability materials such as clay and nonfractured bedrock to see minimal groundwater level fluctuation since water does not travel into these materials efficiently. Deep confined bedrock aquifers would likely show little or no response to temporarily raising the reservoir level by 3 feet, since Reclamation expects confined aquifers to have a poor hydraulic connection to the reservoir.

As mentioned in Section 3.5.1, few wells near the reservoir appear to have open intervals in shallow formations, and most wells near the reservoir are in deeper formations and may experience little or no response to the higher reservoir level. The likelihood of physical inundation of a well at the surface is low given the estimated well locations and local topography, but if inundation were to occur, each well is equipped with a grout surface seal to prevent surface water from entering the borehole and well casing. The project would not have a negative effect on local aquifers or wells because higher water levels would not decrease aquifer yield or impair well performance.

As described in Section 3.5.2, property owners near the reservoir have an OSS. The newly inundated areas shown on Figures 2-3 through 2-7 are outside the 100-foot horizontal setback requirement for the OSS mandated by the Washington State Department of Health. The intent of this horizontal setback requirement is to protect surface water bodies from contamination from OSS. The newly inundated areas would be outside the 100-foot requirement; therefore, the OSS on newly inundated parcels would remain in compliance with the setback requirement. The Kittitas County Department of Health determines requirements for vertical separation of the OSS and the water table on an individual basis. A higher water table resulting from the Cle Elum Pool Raise Project would reduce the vertical separation between the OSS and the water table. Although the current depth to the water table under each OSS is not known, Table 3-2 indicates the first water bearing formation is likely much deeper than the OSS. It is unlikely that the project would affect the OSS given the likelihood that the first water bearing formation is at a depth much greater than typical OSS construction. Reclamation does not anticipate increased reservoir levels would have a negative effect on OSS functionality; therefore, the OSS should have no additional effect on groundwater quality because the OSS would continue to function normally and there would be no increased potential for leaching of contaminants to groundwater. However, enough uncertainty exists regarding the location and construction of each OSS that Reclamation would evaluate OSS on properties with potential for additional inundation prior to raising the pool level.

4.5.4.2 Additional Stored Water Used for Instream Flow

Operation

Release of additional stored water for instream flow could result in temporary and cyclical (on an annual basis) fluctuations in groundwater levels adjacent to the river downstream from the dam. These temporary fluctuations would be within the range of normal variability caused by snowmelt, weather events, and dam operations (see Section 3.2.2 for a description of historic reservoir releases) and would not have a negative impact on groundwater resources or users.

4.5.4.3 Rock Shoreline Protection

Construction

Rock shoreline protection would not be likely to affect groundwater resources. During construction, minor spills or leaking construction equipment could affect groundwater quality, but Reclamation would take measures to prevent spills and adverse impacts to water quality. Reclamation expects no effects on groundwater levels during project construction activities because no dewatering would be required.

Operation

Rock shoreline protection would not affect groundwater resources since the material would not be in contact with groundwater and change groundwater levels.

4.5.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Impacts would be similar to those described for rock shoreline protection (Section 4.5.4.3).

Operation

Increased freeboard on saddles dikes and the right dam abutment would not affect groundwater resources since the additional rock shoreline protection material would not be in contact with groundwater or change groundwater levels.

4.5.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

Impacts would be similar to those described for rock shoreline protection (Section 4.5.4.3).

Operation

Shoreline protection for Federal recreation facilities would not affect groundwater resources since the shoreline protection material would not be in contact with groundwater levels or change groundwater levels.

4.5.5 Alternative 3 – Additional Stored Water Used for Instream Flow with Hybrid Shoreline Protection

4.5.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.5.4.1).

4.5.5.2 Additional Stored Water Used for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.5.4.2).

4.5.5.3 Hybrid Shoreline Protection

Impacts to groundwater would be the same as Alternative 2 (Section 4.5.4.3).

4.5.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.5.4.4).

4.5.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.5.4.5).

4.5.6 Alternative 4 – Additional Stored Water Used for TWSA With Rock Shoreline Protection

4.5.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.5.4.1).

4.5.6.2 Additional Stored Water Used for TWSA

Release of stored water to TWSA for instream uses could result in temporary fluctuations in groundwater levels adjacent to downstream rivers. These anticipated temporary fluctuations would be within the range of normal variability caused by snowmelt, weather events, and dam operations (see Section 3.2.2 for a description of historic reservoir releases) and would not have a negative impact on groundwater resources or users.

4.5.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.5.4.3).

4.5.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.5.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.5.4.1).

4.5.7.2 Additional Stored Water Used for TWSA

Impacts would be the same as for Alternative 4 (Section 4.5.6.2).

4.5.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.5.5.3).

4.5.8 Mitigation Measures

Prior to raising the pool level, Reclamation would identify any OSSs that the higher pool level could affect and determine the baseline condition of those systems. If the increased reservoir pool would cause OSS to become noncompliant with horizontal or vertical location requirements, Reclamation would develop mitigation strategies in cooperation with the property owner and Kittitas County Department of Health. Mitigation could include reconstructing or relocating the OSS.

During construction, Reclamation would prevent or minimize negative effects to groundwater quality from inadvertent spills through use of construction BMPs, such as good housekeeping; proper storage of hazardous materials and petroleum products; and implementation of a Spill Prevention, Control, and Countermeasures Plan. There would be no need for dewatering during any construction activities; therefore, no dewatering mitigation is required.

4.6 Fish

4.6.1 Methods and Impact Indicators

For the proposed alternatives, potential impacts to fish species would result from (1) increased water levels in the reservoir, (2) shoreline protection activities, and (3) downstream effects of managing the additional stored water. Methods used to conduct evaluations include review of existing literature and available studies, and application of best professional judgment.

Table 4-8 summarizes the impact indicators for fish and habitats in reservoir and tributary habitats along with positive and negative significance criteria.

Table 4-8. Fish and Habitat Impact Indicators and Significance Criteria

Impact Indicators	Significance Criteria	
	Positive	**Negative**
Erosion and Turbidity	Reduction in erosion and turbidity levels	Increased erosion and turbidity levels
Primary Productivity	Maintenance of nutrient levels that support native fish populations	Changes in nutrient levels that reduce productivity of reservoir
Habitat complexity	Increased quantity of riparian vegetation, in-water structures or other habitat features that promote use by a diversity individual native species and requirements of different life history stages (i.e., incubation, rearing, or spawning)	Reduced riparian vegetation and in-water structure that simplifies habitats and reduce use by native species or specific life history stages
Connectivity within reservoir habitats	Improved access between habitats within individual tributaries (i.e., removal of passage barriers)	Decreased access between habitats within individual tributaries (i.e., creation of passage barriers)
Connectivity between tributary and reservoir habitats	Improved access between tributary and reservoir habitats	Decreased access between tributary and reservoir habitats
River flow	River flows that are similar to unregulated flows or meet instream flow requirements for salmonids	River flows that are not similar to the unregulated flows or do not meet instream flow requirements for salmonids

4.6.2 Summary of Impacts

Existing low flow conditions under the No Action Alternative would continue to negatively impact fish in the Cle Elum and Yakima rivers.

For all action alternatives, the increased reservoir level would have minor negative and positive effects on fish species and habitats. Higher reservoir levels would temporarily increase erosion-causing turbidity, which would negatively impact fish species. At the same time, erosion may also cause temporary increases in nutrients which would cause short-term increases in primary productivity that would benefit fish species. The inundation of shoreline vegetation would also cause a short-term increase in habitat complexity that would benefit reservoir species by providing additional in-water structure. Reclamation does not expect significant changes in habitat access within the reservoir or between the reservoir and tributaries.

For Alternatives 2 through 5, construction of the shoreline protection measures would not impact fish because all construction would occur above the level where fish would be expected in the reservoir. Construction would not cause increased erosion or turbidity that would negatively impact fish, because of the localized nature of the increased turbidity near the construction activity. The completed shoreline protection would not impact fish because it would reduce the potential for erosion and turbidity in the reservoir. There would also be minimal opportunity for fish to use protected shoreline habitats since the increases in reservoir pool elevation would be limited to about 40 days per year.

Under Alternatives 2 and 3, using the additional stored water for instream flows would provide a positive impact for salmonids and resident species in the Cle Elum Reservoir by increasing river flows in a manner that is more similar to unregulated conditions and by addressing documented low instream flow conditions that exist during October through March. Under Alternatives 4 and 5, Reclamation would use the additional stored water for TWSA, resulting in increased summer flows and decreased winter flows. The timing of flow releases under this alternative would not occur at a time that would benefit spawning or migration for salmonids in the Yakima and Cle Elum rivers.

4.6.3 Alternative 1 – No Action Alternative

Reclamation and Ecology would not implement the Cle Elum Pool Raise Project under the No Action Alternative; therefore, there would be no changes in reservoir levels and no increases in instream flows downstream of Cle Elum Dam. Reclamation would not augment the fall and winter low-flow regime because no additional stored water would be available; therefore, existing low-flow conditions would continue (Section 3.6). Under this alternative, additional flows would not be available to increase lateral habitat connectivity in the Cle Elum River during fall and winter months, precluding an opportunity to improve habitat for fish. Reclamation expects that fish survival and productivity in the Cle Elum River would remain relatively low (Reclamation and Ecology, 2011g).

Under Alternative 1, Reclamation expects that kokanee and lake trout populations would gradually decline because of recent changes in fisheries management. WDFW no longer stocks the reservoir with kokanee and encourages anglers to harvest nonnative lake trout. These changes may benefit juvenile sockeye salmon by reducing potential competition for prey with kokanee and reducing predation by lake trout (Johnson and Martinez, 2000). Under Alternative 1, Reclamation expects fishing pressure to remain light in the reservoir with anglers continuing to harvest kokanee, lake trout, and burbot (WDFW, 2014a).

With continuation of the Yakama Nation’s sockeye restoration effort (Section 3.6.2), fisheries managers expect that sockeye populations within the lake would continue to increase. The deposition of marine derived nutrients from sockeye carcasses is likely to increase nutrient levels within the system and provide direct and indirect sources of food to other levels of the food chain (Willson and Halupka, 1995). This source of biological feedback is usually an important driver of fish populations that exist in otherwise unproductive environments (Schindler et al., 2003). Reconstruction of the existing interim fish passage facility which is deteriorating would improve passage for sockeye and coho salmon.

This alternative does not meet the stated Purpose and Need for the project, because it does not provide improved aquatic resources for fish habitat, rearing, and migration in the Cle Elum and upper Yakima rivers. The No Action Alternative allows the existing trends of low fish survival and productivity in the Cle Elum River to continue, and potentially worsen with climate change or other changing future conditions.

4.6.4 Alternative 2 – Additional Stored Water Used for Instream Flow with Rock Shoreline Protection

4.6.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Modification of the spillway gates on Cle Elum Dam would occur at the end of irrigation season when the reservoir is drawn down and would not affect fish because the proposed construction activities would be completely isolated from fish and their habitat. Radial gate construction would not affect water storage or water releases from the dam and thus would not affect fish habitat accessibility, complexity, and function in the reservoir or downstream of the reservoir.

Operation

The modified spillway gates would be structurally similar and function in the same manner as the existing spillway gates. As a result, Reclamation expects no additional impacts above the existing baseline to occur to fish species or habitat. The modified spillway gates would allow additional water to be stored in the reservoir and releases of that additional stored water could benefit fish as described in Section 2.4.2.

Increased Reservoir Pool

Operation

Expected impacts to fish caused by the increased reservoir pool elevation are small in magnitude because the change in reservoir level would be small and proposed operations would be similar to current baseline operations and existing pool fluctuations (Table 4-1). The reservoir level currently fluctuates as much as 120 feet during the year and the additional 3 feet of active storage represents only a 3.3 percent increase over the baseline. On average, reservoir levels would exceed the baseline 2,240 feet on June 2, and stay above that level until July 10. The increased reservoir levels are nearly identical to the baseline period of maximum pool elevation (Figure 4-1). Similarly, the expected minimum pool elevation, under Alternative 2, would be nearly the same as baseline minimum elevations occurring in the fall and winter under the No Action Alternative.

Increased reservoir elevation would increase erosion along newly exposed shoreline areas (Section 4.2). Reclamation would mitigate the level of erosion with shoreline protection measures (Section 4.3.4.3 and 4.3.4.5). In unprotected areas, increases in erosion would impact littoral habitats disturbing fish present in these areas. Under Alternative 2, increases in erosion and turbidity that would occur would also be limited to about 40 days per year, during June through early July, in years when the reservoir would exceed 2,240 feet. After shoreline protection is in place and loose material has eroded, turbidity levels would decrease, so long-term impacts would not be significant. Higher turbidity could alter normal fish behavior (Berg and Northcote, 1985), reduce the productivity of aquatic ecosystems

(Henley et al., 2000), and alter the dynamics of predator-prey relationships among fish species (Gregory and Levings, 1998). Fish species that may be disturbed by temporary, initial increased turbidity include mountain whitefish, cutthroat trout, rainbow trout, eastern brook trout, lake trout, brown trout, longnose dace, leopard dace, speckled dace, chiselmouth, redside shiner, peamouth, northern pikeminnow, largescale sucker, mountain sucker, threespine stickleback, and sculpins (Impact to bull trout are addressed in Section 4.9).

Initial inundation and shoreline erosion in unprotected shoreline areas may also release nutrients and cause a small, temporary increase in primary productivity and availability of zooplankton prey for limnetic species such as kokanee and juvenile sockeye salmon within the reservoir (Kimmel, 1990; Hall et al., 1999). However, this temporary, minor source of nutrients would decrease after initial inundation and after eroding shorelines stabilize. Therefore, no lasting impacts to limnetic fish species are expected.

The higher reservoir level may alter vegetation along the reservoir shoreline depending on the tolerance of species to water level fluctuations (Section 4.7). Shifts in riparian community structure would initially cause accumulation of woody debris when trees that are intolerant of intermittent higher water levels die and fall. Submerged vegetation along the inundated shoreline would temporarily increase habitat complexity and foraging opportunities and benefit some fish in the reservoir (Thornton, 1990). Fish that would potentially benefit include species that utilize littoral habitats such as mountain whitefish, cutthroat trout, rainbow trout, eastern brook trout, brown trout, dace, chiselmouth, redside shiner, peamouth, northern pikeminnow, largescale sucker, mountain sucker, threespine stickleback, and sculpins.

Increased storage would increase accessibility to some new littoral habitats for an average of 38 days typically from early June to early July. Fish attracted to these areas could strand or dewater when the reservoir level drops. However, during fall and winter, the reservoir level would also be higher, preventing dewatering of some existing habitats (Figure 4-1). Because the period and net difference in operational elevation (i.e., peak to minimum reservoir elevation) would be similar to the baseline condition or No Action Alternative, the risk of stranding or dewatering would not be different from the No Action Alternative. The increased water levels and changed pool operations would not affect beach spawning sockeye redds because spawning occurs during September and October when the reservoir is already at minimum pool elevation. Increased water storage during the minimum pool elevation may slightly increase the availability of beach spawning habitats, particularly at the mouth of the upper Cle Elum River, an area where beach spawning sockeye frequently spawn (Matala et al., 2014).

For other fish species inhabiting Cle Elum Reservoir, the minor changes in inundated shoreline habitat may shift some spawning habitats to new locations within the reservoir. However, the increase in reservoir elevation would not preclude access to habitats formerly used. It would create a net increase in reservoir surface area and, therefore, would not decrease the quantity and quality of available habitat for any species. For tributaries entering the reservoir, spawning habitat would be the same or slightly increased access because the shift in pool elevation would increase the depth of water from the baseline throughout the reservoir and at tributary mouths.

The expected potential effect of the increased reservoir pool on nonnative salmonids, such as brook trout and lake trout, would be similar to those experienced by other salmonids. There are no specific habitat alterations or operational impacts that would pose an asymmetric risk or benefit to nonnative salmonids.

In summary, the impacts associated with increased reservoir level would have both minor negative and positive effects on fish species and habitats. Higher reservoir levels would temporarily increase erosion-causing turbidity which would negatively impact fish species. At the same time, erosion may also cause temporary increases in nutrients which would cause short-term increases in productivity that would benefit fish species. Additionally, the inundation of shoreline vegetation would cause a short-term increase in habitat complexity that would benefit reservoir species by providing additional in-water structure. Reclamation does not expect significant changes in habitat access within the reservoir or between the reservoir and tributaries.

4.6.4.2 Additional Stored Water Used for Instream Flow

When available, the additional 14,600 acre-feet of stored water could help offset existing seasonal instream flow issues by providing Reclamation with greater flexibility to meet target flow ranges. The additional release of an average of 36 cfs from October to March would represent a 20 percent increase in winter instream flows at a time when releases are at the minimum level in the Cle Elum River (Figure 4-2). Based on modeling results, the additional flows would be available in about 72 percent of the years modeled. These changes would incrementally bring the Cle Elum River closer to unregulated flows that would provide the best habitat conditions for native fishes and ecosystems (Lytle and Poff, 2004).

Increased flows would expand available habitats for resident fish and anadromous salmonids in the river during the fall, winter, and spring when baseline flows are lower than desired for fish (Reclamation and Ecology, 2012). Increased flows would directly address the existing low flow condition and lack of flow variation that occurs in the fall and winter and limits access to available side channels when juvenile Chinook are rearing and presmolts are migrating. For spring Chinook that spawn from August through October (Sampson et al., 2013), additional winter flows would increase the availability of spawning areas and help ensure that fall redds would not be dewatered in winter. Increased flow during the October to March period would also benefit migrating juvenile spring Chinook salmon, sockeye salmon, and potentially coho salmon originating in the upper Yakima and Cle Elum rivers by providing migratory cues and flow variation necessary for outmigration (Reclamation and Ecology, 2012). Reclamation expects that collectively these flow improvements would increase the survival and productivity of salmonids in the upper Yakima basin (Reclamation and Ecology, 2011g).

Reclamation could also carry the additional water over to the following year to allow for a higher reservoir level that improves the efficiency of fish passage when out-migrating juvenile salmon are using the proposed Cle Elum fish passage facilities.

A reduction in flows compared to the No Action Alternative would occur when the reservoir is filling with the additional stored water. This would occur in spring when high flows from snowmelt fill the reservoir above its current high pool level of elevation 2,240. While the reservoir is filling up to elevation 2,240, Reclamation releases minimum flows of 180 to 220 cfs. Those minimum flows would continue for a short period of time until the additional storage fills the reservoir. No impact to fish in Cle Elum River would result because the current and typical flow regime for the Cle Elum River would continue during the time the reservoir fills with the additional storage.

4.6.4.3 Rock Shoreline Protection

Construction

Construction activities related to rock shoreline protection would not impact individual fish or fish habitat accessibility, complexity, and function. Construction would occur during the dry period when the reservoir is drawn down. Therefore, fish would not be present near the shoreline construction areas. Construction would require access routes and staging areas adjacent to aquatic habitats. Reclamation would use BMPs to minimize erosion and would restore and revegetate construction areas and access roads following construction.

Operation

Rock shoreline protection has the potential to negatively affect fish by precluding normal hydrogeomorphic processes from occurring, limiting the establishment and recruitment of vegetation (Li and Eddleman, 2002), and reducing the availability of complex rearing habitats (Knudsen and Dilley, 1987). Alternatively, riprap may increase the diversity and abundance of invertebrate prey (Schmude et al., 1998) and habitat use by fishes (Knudsen and Dilley, 1987). The areas of shoreline protection are small relative to the size of the reservoir (approximately 16 percent of the 20-mile-long reservoir shoreline). The increases in reservoir pool elevation would be limited to about 40 days per year. These factors limit the exposure of fish to the shoreline protection areas; therefore, there would be minimal opportunity for the fish or invertebrates to use protected shoreline habitats and accrue any impacts.

4.6.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Construction activities related to raising the elevation of the saddle dikes and right dam abutment would not impact fish. Reclamation would conduct construction activities in the dry after the reservoir is drawn down, so no fish would be present near construction areas. Reclamation would employ BMPs to control erosion and would revegetate and restore areas following construction.

Operation

Impacts to fish from the completed projects would similar to those described for rock shoreline protection in Section 4.6.4.3.

4.6.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

For most construction activities, there would be no impacts to fish from rock shoreline protection. Construction at Wish Poosh Campground includes extending a culvert at Davis Creek, requiring a temporary diversion of the creek. Construction could cause a short-term increase in turbidity and disconnection between upstream and downstream habitats. These impacts would last for the duration of the construction period, likely 5 to 10 days. These disturbances would temporarily affect resident species that may occupy Davis Creek. If resident fish are present during construction activities, Reclamation would implement BMPs, including removal of fish from the construction zone, to minimize potential negative impacts.

Operation

Impacts to fish from the completed projects would similar to those described for rock shoreline protection in Section 4.6.4.3.

4.6.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.6.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.6.4.1).

4.6.5.2 Additional Stored Water Used for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.6.4.2).

4.6.5.3 Hybrid Shoreline Protection

Construction

Construction activities for hybrid shoreline protection would be similar to those proposed for rock shoreline protection under Alternative 2. Construction impacts would be similar to those described in Section 4.6.4.3.

Operation

Impacts would be similar to rock shoreline protection (Section 4.6.4.3). The hybrid, bioengineered approaches are expected to be subject to habitat shaping mechanisms that would eventually allow natural hydrogeomorphic processes and the establishment of vegetation communities to occur while reducing the amount of erosion in the short-term (Li and Eddleman, 2002). These natural habitat-forming processes would support the succession and function of typical riparian habitats, providing cover and forage for resident fish species littoral habitats. However, fish exposure to these areas would be limited as described in Section 4.6.4.3; therefore, Reclamation anticipates no adverse impacts to fish.

4.6.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.6.4.4).

4.6.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.6.4.5).

4.6.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.6.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.6.4.1).

4.6.6.2 Additional Stored Water Used for TWSA

Operation

As part of TWSA, Reclamation would use the additional stored water to provide water supply for proratable irrigation districts. Under Alternative 4, the net quantity of additional stored water would not change from Alternative 2 (Section 4.2.6.3), but in some years more of the water would be used for irrigation. Under this alternative, the average duration of additional inundation would be 40 days instead of 39 days for Alternative 2. The scenarios modeled for this DEIS assume Reclamation would use the additional stored water for TWSA. The model results indicate slightly reduced outflows from the reservoir in the winter in a typical sequence of years and slightly increased outflows during the summer (Figure 4-4). Increased summer flows and decreased winter flows would represent a negative impact for fish in the lower Cle Elum or upper Yakima rivers. The timing of flow releases under this alternative would not occur at a time that would benefit spawning or migration for salmonids in the Yakima and Cle Elum rivers.

4.6.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.6.4.3).

4.6.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.6.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.6.4.1).

4.6.7.2 Additional Stored Water Used for TWSA

Impacts would be the same as for Alternative 4 (Section 4.6.6.2).

4.6.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.6.5.3).

4.6.8 Mitigation Measures

Reclamation would use construction BMPs, such as straw bales, silt fencing, and other methods described in Section 4.3.8, to reduce erosion. Construction would occur when the reservoir is drawn down and fish would not be present near the shore. Reclamation would restore and revegetate disturbed areas following construction. In-water and near-water construction would comply with applicable permits and approvals.

Reclamation would coordinate with WDFW to evaluate stranding or dewatering in newly inundated habitat after Reclamation initially raises the reservoir level. Reclamation would also evaluate tributary mouths to determine if there is degrading of fish passage by the higher water levels. If there were problems identified, Reclamation would work with WDFW to identify and implement appropriate mitigation measures.

4.7 Vegetation and Wetlands

4.7.1 Methods and Impact Indicators

Reclamation assessed impacts to vegetation and wetlands using the Service NWI (2013) wetland inventory Geographic Information System (GIS) database, aerial photographic interpretation of nonwetland vegetation communities using recent imagery from Google Earth (2013) and ESRI (2011), Reclamation's shoreline elevation GIS data, and preliminary results of Cle Elum Pool Raise Project hydrologic modeling. Literature regarding effects of water regime changes on vegetation composition and productivity (Cooke and Azous, 1997; Walters et al., 1980; Kercher and Zedler, 2004, Varteapetian and Jackson, 1996) provided the basis for a qualitative evaluation of potential short-term and long-term effects of additional inundation to vegetation communities.

A quantitative and qualitative assessment of the amount of wetland area or nonwetland vegetation area that would be disturbed by the footprint of the shoreline protection measures provided the basis for assessing impacts on vegetation caused by shoreline protection measures.

Potential impacts on wetlands and other vegetation communities result from (1) increased water levels in the reservoir, and (2) shoreline protection activities. Table 4-9 lists vegetation and wetland impact indicators and significance criteria.

Table 4-9. Vegetation and Wetland Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Changes to upland and riparian vegetation	Loss of upland and riparian vegetation Loss of suitable habitat for USFS Survey and Manage plant species
Changes to wetlands near the reservoir	Loss of wetland area or decrease in wetland function

4.7.2 Summary of Impacts

The No Action Alternative would not result in any changes to wetlands or vegetation.

Alternatives 2 through 5 would increase the reservoir pool elevation by 3 feet, and result in the same type and extent of changes to wetlands and upland and riparian vegetation due to increased inundation. Reclamation would implement the same projects under all four action alternatives to increase freeboard at existing dam facilities and to provide shoreline protection measures at recreation facilities and access sites, resulting in the same amount of construction and permanent impacts to vegetation and wetlands. The rock shoreline protection strategy proposed under Alternatives 2 and 4 is likely to have a smaller construction footprint than the hybrid shoreline protection strategy proposed for Alternatives 3 and 5, thus Alternatives 2 and 4 are likely to result in smaller changes to wetlands and shoreline vegetation. Reclamation does not anticipate changes to wetlands and vegetation for radial gate modifications, use of additional stored water for instream flows, or use of additional stored water for TWSA.

4.7.3 Alternative 1 – No Action Alternative

Under the No Action Alternative, Reclamation and Ecology would not implement the project. The ongoing projects included in the No Action Alternative—reservoir operations and fish reintroduction at Cle Elum Reservoir and upper Cle Elum River—would not impact vegetation or wetlands. Reconstruction of the interim fish passage facility would not affect vegetation because construction would occur on the existing dam spillway and no clearing or grading is required. Reclamation's ongoing survey of the Cle Elum Reservoir shoreline (Section 2.3) would reduce erosion that could cause loss of shoreline vegetation.

4.7.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.7.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

There would be no vegetation or wetlands impacts by modifying the existing radial gates on the Cle Elum Dam spillway because the work would take place in developed areas at the existing dam and spillway, and use existing access roads.

Operation

Operation of the modified spillway gates would not affect vegetation because there is no vegetation on the dam.

Increased Reservoir Pool

Operation

The project would inundate approximately 46 additional acres of the Cle Elum Reservoir shoreline at the maximum pool elevation of 2,243 feet for about 40 days per year, generally in June and July. Table 4-10 summarizes the approximate acres of additional inundation by wetland and vegetation community type between elevation 2,240 and 2,243.

Table 4-10. Acres of Additional Inundation by Vegetation Community

Wetland/Vegetation type	Additional acres inundated between elevation 2,240 and 2,243
Wetland - Emergent wetland	2
Wetland - Forested/shrub	<0.5
Coniferous forest	30
Deciduous tree/shrub	9
Emergent/herbaceous	<0.5
Bare/developed	4
Total	**46**

The increased reservoir pool would seasonally inundate approximately 2 additional acres of wetland, about 1 acre of which is emergent wetland vegetation. The basis of this estimate is the preliminary results of Cle Elum Pool Raise Project hydrologic modeling, and the assumption that the anticipated timing of reservoir pool refill and drawdown would be nearly identical to existing conditions of the Cle Elum Reservoir, with peak water surface elevations occurring in June and July.

The higher water level could affect wetland vegetation along the reservoir shoreline. However, wetland vegetation communities around Cle Elum Reservoir are already adapted to seasonal inundation during the growing season. The reservoir supports the wetlands affected by the additional inundation; the wetlands have likely developed at the site because of the reservoir. Temporary seasonal increases in water surface elevations in these wetlands are unlikely to cause substantial change in most of the existing vegetation communities, although some woody vegetation, such as alder or black cottonwood trees, may succumb to anaerobic stress. More flood-tolerant species, such as spirea and some rose species, as well as sedges, rushes, and bulrushes, are most likely to withstand additional inundation and may recruit into areas previously vegetated by less flood-tolerant trees and shrubs. In summary, Reclamation does not anticipate the increased reservoir levels to result in significant changes to wetland communities around the Cle Elum Reservoir shoreline. Additionally, Reclamation does not anticipate seasonally higher water elevations to significantly alter the extent of the existing wetland vegetation communities since they are already adapted to inundation during the growing season. Small shifts in wetland vegetation composition may occur, but would not result in substantial loss of wetland acreage.

The project would inundate approximately 30 acres of coniferous forest, 11 acres of deciduous tree and shrub, and 0.1 acres of herbaceous vegetation between 2,240 feet and

2,243 feet. Coniferous species such as Douglas fir, ponderosa pine, and grand fir are generally less tolerant of saturated soil conditions or inundation compared to deciduous trees and shrubs found at the reservoir. As with wetland areas, it is likely that coniferous trees could succumb to anaerobic stress caused by additional flooding, but more flood-tolerant species could recruit into the area and establish deciduous tree/shrub or emergent vegetation communities. Any trees or other woody vegetation that succumb to increased flooding may become snags that could be used as perching, feeding, and nesting sites, or large woody material that adds protection to the shoreline from wave erosion.

The seasonal pool raise may also affect vegetation communities that are immediately landward of 2,243 feet. In areas where the elevation gain landward of 2,243 feet is gradual, such as near the mouth of the Cle Elum River and smaller tributaries, soil may stay saturated for longer durations during the growing season when the pool elevation is above 2,240 feet. However, since these areas are in a landscape position where there is seasonally saturated soil under existing conditions, vegetation communities are already adapted to saturated soil, and thus would be unlikely to succumb to anaerobic stress when the pool elevation is temporarily at elevation 2,243.

In areas where there is more rapid elevation gain landward of 2,243 feet, such as along most of the west reservoir shoreline, it is anticipated that soil would be not be saturated in the root zone for substantially longer periods of time because there is greater soil drainage and vertical distance between the root zones of existing vegetation communities and the water table. The plant associations found in the western hemlock, Pacific silver fir, and mountain hemlock forest cover types occur in regions with higher levels of precipitation (USFS, 1993) and thus are able to withstand seasonally moist soil. If there are any plant species established adjacent to elevation 2,243 that can only survive in very well-drained, dry soil, they may be negatively affected by minor changes in soil moisture conditions due to the higher pool elevation.

In summary, Reclamation does not anticipate the increased reservoir levels to result in significant loss of vegetation around the Cle Elum Reservoir shoreline. The higher reservoir level may result in loss of some coniferous forest vegetation, although it is likely that more flood-tolerant tree and shrub species would recruit into areas once occupied by coniferous trees. Because the maximum inundated area is less than 50 acres in size, which is a fraction of the over 13,000 acres of relatively undisturbed forests in the Cle Elum watershed (USGS, 2014) that would not be affected by the proposed pool raise, the project would have negligible effects on extent and connectivity of forested habitat in the immediate Cle Elum River watershed, or in the larger tracts of forest land encompassed by the Okanogan-Wenatchee National Forest.

The increased reservoir level would likely have variable effects on sensitive species and USFS Survey and Manage plant species. Species whose habitat consists of inundated areas such as wetlands, reservoir, and lake margins would likely be able to adapt to changes in inundation levels. Inundation of the 30.1 acres of conifer forests may result in loss of suitable habitat for USFS Survey and Manage plant species found in this type of vegetation community.

Increased erosion on some shorelines may cause additional trees to fall into the reservoir. It is difficult to estimate the number of trees anticipated to fall, but it could represent an increase in the current number of trees that fall into the lake. For safety reasons, Reclamation proposes to capture the trees that approach the dam. Reclamation would stockpile the trees and make them available for restoration projects.

4.7.4.2 Additional Stored Water Used for Instream Flow

Using additional water stored in Cle Elum Reservoir to improve instream flows in the lower Cle Elum River and in downstream reaches of the Yakima River would not impact vegetation or wetlands. The proposal to reduce flows slightly from the reservoir during spring and early summer is not likely to alter wetland or riparian vegetation communities downstream of the Cle Elum Dam because the temporarily reduced flows are unlikely to substantially reduce hydrologic input to wetland and riparian vegetation communities that fringe the Cle Elum River. Likewise, releasing additional stored water during the fall and winter (October to March) would occur outside of the growing season and is unlikely to affect existing wetlands and riparian vegetation on the Cle Elum River because temporary increases to water surface elevations when plants are dormant would occur when the root systems of plants are in a state of low metabolic activity and not prone to anaerobic stress.

4.7.4.3 Rock Shoreline Protection

Construction

The NWI does not show inventoried wetlands in the areas proposed for rock shoreline protection, but wetlands could be located in these areas. Rock shoreline protection would involve construction of rock riprap embankments comprised of rock, rootwad logs, or gabion baskets along existing shoreline banks. After construction, Reclamation would install native vegetation on exposed banks not covered by riprap. Construction would result in temporary and permanent impacts on wetlands if shoreline protection were located within or adjacent to wetland boundaries. Grading and clearing of wetlands or buffers may temporarily affect wetland hydrology, vegetation, or structure. Clearing and grading may be needed for installation of temporary staging areas, work areas, and access roads. Direct impacts on wetlands through filling, excavation, or changes to vegetation could change the capacity of a wetland to perform particular functions, such as storing stormwater, filtering pollutants, protecting stream banks and shorelines, and providing habitat to wildlife. Changes may result from construction or expansion of structural stabilization measures or berm construction.

To the extent possible, Reclamation would use existing roads, cleared areas, and the dry reservoir bed for staging and access to construction sites to minimize disturbance to wetlands and vegetation. However, construction of approximately 5 miles of new shoreline access roads may be necessary to access some sites, such as the right abutment of Cle Elum Dam, the shoreline west of the dam, and shorelines adjacent to or on private property where shoreline protection is proposed.

Indirect, long-term impacts could occur to wetlands due to construction and operation activities, such as modification of vegetation, partial shading, water quality degradation, and alteration of wetland hydrology sources. Prior to construction, Reclamation would survey wetlands in the project area and design the shoreline protection measures to avoid or minimize impacts on wetlands.

In summary, Reclamation does not anticipate the rock shoreline protection activities to significantly impact wetlands along the Cle Elum Reservoir shoreline. The rock shoreline protection activities would permanently impact a total of approximately 21.7 acres of shoreline, small portions of which may be comprised of patches of vegetated wetlands. Regardless, any wetlands permanently impacted by construction activities comprise a fraction of the over 140 acres of palustrine wetlands mapped along the reservoir shoreline. The proposed construction would not affect large wetland complexes. Reclamation would implement compensatory mitigation for unavoidable wetland impacts (discussed in Section 4.7.8), resulting in an overall effect of no net loss of wetlands.

The proposed shoreline protection activities may permanently replace coniferous or deciduous trees as well as shrub vegetation with the rock embankment. Reclamation does not anticipate the overall effects of shoreline protection impacts on vegetation to be significant because most of the rock shoreline protection projects are small-scale, totaling approximately 22 acres of 60,000 acres of vegetation within the Cle Elum watershed.

Reclamation does not anticipate the proposed shoreline protection activities to occur in areas with USFS Survey and Manage species since the protection activities generally adjoin already developed areas. However, if populations of USFS Survey and Manage plant species were present in the project area, construction activities could affect them through trampling, removal of individuals, habitat degradation, potential spread and colonization of noxious weeds, or degradation of habitat through erosion and sedimentation.

Rock shoreline protection may require obtaining materials from off-site sources. Impacts to wetlands and vegetation at material source sites outside of the project area may occur; Reclamation would evaluate this issue upon selection of a preferred alternative.

Operation

Once construction is complete, the shoreline protection would not impact vegetation or wetlands because ongoing maintenance would be limited to activities such as irrigation, weeding, spraying, and replacement of plants, as needed, to ensure revegetated areas are established after construction. Reclamation does not anticipate these activities to require additional clearing or grading outside of the rock shoreline protection footprint.

4.7.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

No wetlands are present on the saddle dikes or right dam abutment, and Reclamation would avoid siting access and staging areas in wetlands. If wetland impacts are unavoidable for construction of the saddle dikes or right dam abutment, temporary and permanent impacts on wetlands due to placement of fill and construction activities would be similar to those resulting from rock shoreline protection, although the extent of impacts may be less since these areas are in uplands and more developed areas around the reservoir.

Increasing the freeboard of the saddle dikes and right dam abutment would require construction of a new access road and clearing of some forested areas. Construction at Saddle Dike 1 would require clearing of approximately 0.75 acres of forested area. Construction at Saddle Dikes 2 and 3 would require clearing of approximately 1.6 acres of mostly unforested area. Construction at the right abutment of the dam would require clearing approximately 3.5 acres of forested area. Vegetation removal in these areas would cause similar types of impacts as rock shoreline protection (Section 4.7.4.3), although the extent of impact (up to 0.75 acres) would be less than the rock shoreline protection measures.

Operation

Once construction is complete at the saddle dikes and right dam abutment, no impacts would occur to vegetation or wetlands. The areas are currently unvegetated and would continue to be so following construction.

4.7.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

Proposed shoreline protection for USFS recreational facilities and portions of Salmon La Sac Road would require raising and stabilizing existing access roads and recreational facilities that the increased reservoir level most likely would affect. Temporary and permanent impacts due to filling wetlands in these areas would be similar to rock shoreline protection, although the extent of impacts would likely be greater under this element since there are numerous wetlands inventoried at Cle Elum River and Wish Poosh campgrounds. To the extent possible, Reclamation would use existing roads, cleared areas, and the dry reservoir bed for staging and access to construction sites to minimize disturbance to wetlands and vegetation.

Construction at Wish Poosh Campground would require clearing approximately 1.9 acres of sparsely forested area. Vegetation clearing totaling 0.4 acres would be required at Cle Elum River Campground. Installing additional riprap along portions of Salmon La Sac Road would require limited clearing because the existing riprap area is mostly unvegetated. Clearing or vegetation removal would cause similar types of impact to vegetation communities as rock shoreline protection, although the extent of vegetation removal (less than 3 acres) would be less than for the rock shoreline protection activities (Section 4.7.4.3).

Operation

Operation of the shoreline protection at recreational facilities and Salmon La Sac Road would be similar to rock shoreline protection; no further impacts to wetlands or vegetation are anticipated for ongoing maintenance and monitoring activities.

4.7.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.7.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.7.4.1).

4.7.5.2 Additional Stored Water Used for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.7.4.2).

4.7.5.3 Hybrid Shoreline Protection

Construction

Under the hybrid shoreline protection strategy, Reclamation would protect shorelines using rock walls where needed combined with bioengineered shoreline protection measures such as perched beaches, anchored logs (Section 2.5.3.2). Types of impacts to wetlands and vegetation would be similar to those for rock shoreline protection (Section 4.7.4.3), although the extent of impacts would be greater (approximately 30.1 acres) than rock shoreline protection techniques (approximately 21.7 acres). Some of the hybrid techniques require the use of logs. Reclamation would use logs salvaged from the reservoir and from clearing shoreline areas for construction and would not harvest trees or import them from another site. Impacts to offsite wetlands and vegetation from obtaining materials outside of the project area may have similar impacts as rock shoreline protection if the source of the materials is at the same site or sites.

In summary, hybrid shoreline protection activities are unlikely to significantly impact wetlands along the Cle Elum Reservoir shoreline, even though the footprint extent is greater than that proposed for rock shoreline protection. Small patches of wetlands may be located in areas where hybrid shoreline protection occurs, nonetheless they would comprise a fraction of the over 140 acres of palustrine wetlands mapped along the reservoir shoreline. The proposed construction would not affect large wetland complexes. Reclamation would implement compensatory mitigation for unavoidable wetland impacts (discussed in Section 4.7.8), resulting in an overall effect of no net loss of wetlands.

Operation

Once construction is complete, the shoreline protection would not impact vegetation or wetlands because ongoing maintenance would be limited to activities such as irrigation, weeding, spraying, and replacement of plants, as needed, to ensure the establishment of revegetated areas after construction. Reclamation does not anticipate these activities to require additional clearing or grading outside of the rock shoreline protection footprint. Vegetation is likely to reestablish on some types of hybrid shoreline protection.

4.7.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.7.4.4).

4.7.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.7.4.5).

4.7.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.7.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.7.4.1).

4.7.6.2 Additional Stored Water Used for TWSA

Impacts to vegetation and wetlands from using the additional water for TWSA would be similar to those described for using the additional water for instream flows (Section 4.7.4.2).

4.7.6.3 Rock Shoreline Protection

Impacts from Rock Shoreline Protection would be the same as for Alternative 2 (Section 4.7.4.3).

4.7.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.7.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.7.4.1).

4.7.7.2 Additional Stored Water Used for TWSA

Impacts would be the same as for Alternative 4 (Section 4.7.6.2).

4.7.7.3 Hybrid Shoreline Protection

Impacts from Hybrid Shoreline Protection would be the same as for Alternative 3 (Section 4.7.5.3).

4.7.8 Mitigation Measures

Prior to construction in areas where any type of construction is proposed, Reclamation would conduct wetland surveys using current wetland delineation methodology accepted by Federal, State, and local agencies. Reclamation would design the projects to avoid wetland impacts. If impacts occur, Reclamation would comply with mitigation measures as established in permit conditions from applicable agencies. Reclamation would work with the Corps and State and local agencies to develop appropriate methodologies to determine whether the proposed additional inundation would result in a loss of wetlands that requires permit approval. Mitigation measures, if necessary, would be developed and implemented to meet agency permit conditions for any wetland impacts caused by the pool raise.

The design of shoreline protection would minimize the need for vegetation removal to the extent possible. Reclamation would locate facilities, access roads, and staging areas in areas of previously disturbed vegetation or on the reservoir shoreline to the extent possible. Reclamation would replant disturbed areas with native vegetation where replanting did not interfere with the function of shoreline protection measures.

Reclamation would coordinate with the USFS to determine if any Sensitive or Survey and Manage species were present in construction or pool raise areas and would take appropriate steps to minimize impacts to those species.

Reclamation would assess the areas where shoreline protection would be installed to determine if there were any invasive species or undesirable vegetation. If present, Reclamation would suppress this vegetation prior to ground disturbance. Reclamation would monitor for infestations of invasive plant species associated with project ground disturbances. If present, Reclamation would implement suppression strategies to control invasive plant populations. These strategies could entail mechanical, chemical, and biological controls. Reclamation would evaluate strategies to reduce environmental risks associated with such controls and ensure compliance with Federal, State, and local laws and requirements.

4.8 Wildlife

4.8.1 Methods and Impact Indicators

Reclamation identified potential impacts to wildlife and wildlife habitat by evaluating what wildlife habitats the higher reservoir level and proposed shoreline protection would inundate and displace. The agency identified types of construction activities that might result in disturbance to wildlife using habitats in the reservoir area. Reclamation conducted a literature review to determine the likely species to be located in the area, and analyzed the area of inundation around the shoreline using aerial photographs to determine the types of habitats in the area.

Table 4-11 lists wildlife impact indicators and significance criteria.

Table 4-11. Wildlife Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Wildlife habitat loss	Direct or indirect loss or changes to habitat such that it no longer supports wildlife or only provides limited function
Disturbance of wildlife species in the vicinity from construction noise or activities	Direct harm (injury/death) or harassment of wildlife
Disturbance of wildlife species from increased noise levels and human activity associated with project operation	Direct harm (injury/death) or harassment of wildlife Reduce long-term viability of wildlife populations in the vicinity

4.8.2 Summary of Impacts

The No Action Alternative would not result in any short-term disturbance to wildlife in the vicinity or changes to wildlife habitat. Current patterns and trends of wildlife habitation would continue as they currently occur.

Alternatives 2 through 5 would increase the reservoir pool elevation by 3 feet, and result in comparable type and extent of disturbance to wildlife during construction and changes to wildlife habitats due to increased inundation. Reclamation would implement the same projects under all four action alternatives to increase freeboard at existing dam facilities and to provide shoreline protection measures at recreation facilities and access sites, resulting in the same amount of construction noise and activity in the vicinity of the projects and permanent impacts to wildlife habitat. The rock shoreline protection strategy proposed under Alternatives 2 and 4 is likely to have a smaller construction footprint than the hybrid shoreline protection strategy proposed for Alternatives 3 and 5, thus Alternatives 2 and 4 are likely to result in smaller changes to shoreline habitats. In addition, hybrid shoreline protection may have a beneficial long-term effect on wildlife that use the reservoir shoreline because it would provide foraging, resting, and shelter for waterfowl, reptiles or amphibians, and small mammals. Reclamation does not anticipate permanent changes to wildlife habitat for radial gate modifications, use of additional stored water for instream flows, or use of additional stored water for TWSA.

4.8.3 Alternative 1 – No Action Alternative

Under the No Action Alternative, Reclamation and Ecology would not implement the Cle Elum Pool Raise Project and there would be no impacts to wildlife habitat or disturbance to wildlife using habitats in the reservoir area. Current trends in wildlife habitation and use would continue over the long term. Conditions would remain similar to the baseline condition. Wildlife could benefit from increased productivity in the reservoir from the ongoing fish reintroduction project (Section 2.3).

4.8.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.8.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Construction to modify the existing spillway radial gates would result in increased noise and human activity for approximately 6 to 9 months in the area surrounding the dam spillway gates. Noise from sand-blasting the existing radial gates, and bolting and welding of the gate extensions may result in short-term disturbance to wildlife using habitats in immediate vicinity of the dam. Wildlife using open water and habitats along the shoreline, such as waterfowl and songbirds, may move to adjacent suitable habitats in the reservoir area during periods of elevated noise and human activity associated with construction. Suitable habitat is available for displaced wildlife, although there would be increased competition for food and other resources between displaced individuals and wildlife already using those habitats. Species most sensitive to disturbance include waterfowl that nest along the shoreline (such as ducks, Canada geese, and common loon). Reclamation expects this impact to be short-term as wildlife would likely return to previous habitats in the vicinity after construction is complete because construction duration would be short and the dam area provides marginal wildlife habitat.

Operation

Operation of the new radial gates would not affect wildlife because there would be no additional noise or changes from existing conditions.

Increased Reservoir Pool

Operation

The pool raise would impact wildlife habitat through inundation. Long-term impacts could occur where foraging habitat or nesting sites for waterfowl or burrowing wildlife is present along currently undisturbed portions of the shoreline. Approximately 46 acres of terrestrial habitat along the shoreline would be flooded for about 40 days in June and early July. The additional inundated area represents a small portion of the approximately 7-mile-long reservoir. The reservoir currently fluctuates by as much as 120 feet each year and the additional 3 feet would cause only a small increase in inundated area, estimated to be approximately 3 percent. The additional inundation would only occur in years when sufficient runoff occurs to fill the reservoir above 2,240 feet, which, according to modeling could occur in approximately 72 percent of years (Section 4.2.6). Impacts would occur along a relatively narrow strip of shoreline, and some of the affected areas do not contain vegetation or provide wildlife habitat. Improved habitat for perching and roosting birds and cavity nesters could result from live trees becoming snags because of inundation.

A potential for impacts on wildlife species from the additional inundation relates to the presence of burrowing mammals (such as voles, muskrat) and ground-nesting bird species, which the rise in pool elevation could displace. The area most affected by the 3-foot raise in pool elevation would be in the delta area where the upper Cle Elum River discharges into the reservoir at the north end of the reservoir. However, additional inundation in this area is not likely to affect burrowing mammals because this area is a sediment deposition area comprised primarily of cobble, gravels, and sand, making unsuitable conditions for burrowing. As stated in Section 3.3, consolidated soil around the perimeter of the reservoir is somewhat resistant to erosion, which would indicate that the area is unsuitable for burrowing. Therefore, Reclamation expects no significant impacts on these animals.

There are several ground-nesting bird species documented as breeding adjacent to Cle Elum Reservoir, including Canada goose, ruffed grouse, mallard, and mergansers, as well as several species that are likely to breed in the vicinity, including killdeer and spotted sandpiper (Opperman, 2003). The pool rise could inundate any ground nests in the area, causing direct loss of eggs. The species would also expend additional energy if breeding pairs have to seek out new nest sites and lay an additional clutch. (Some species are capable of laying more than one clutch per year if the first clutch does not survive.) The period of additional inundation would overlap most of the incubation periods for the species identified in the area. Reclamation does not expect substantial impacts on ground-nesting bird species based on the extent and availability of suitable habitat in the delta area at the north end of the reservoir and other shoreline areas.

Some of the nonground-nesting species known to breed and nest in the project area include the bald eagle, dusky flycatcher, dark-eyed junco, American robin, northern goshawk, Clark's nutcracker, barn swallow, cliff swallow, hairy woodpecker, McGillivray's warbler, and white-crowned sparrow (Opperman et al., 2006). With the inundation of new areas, some trees, particularly conifers, may die after prolonged exposure to water. This could result in some loss of breeding habitat over the long-term, but this expected loss would be minor because of the small amount of habitat affected by the inundation and the availability of similar habitat in the area. The density of tree species more tolerant of inundation, such as most willow species and black cottonwood, may increase and improve breeding conditions for some species in the future.

In summary, the impacts to wildlife species and habitats from the increased reservoir level would have minor negative effects. The higher reservoir would inundate only a small portion of the available shoreline area for less than two months, in approximately 52 percent of years. In addition, the area that would be inundated provides limited habitat due to lack of vegetation and stable water levels associated with current reservoir water level fluctuations. Significant changes in tree species are not expected, but would result in positive effects on species that require snags for nesting or roosting.

4.8.4.2 Additional Stored Water Used for Instream Flow

Operation

Use of the additional stored water for instream flows would not impact wildlife or wildlife habitat in the Cle Elum or Yakima rivers downstream from the reservoir because changes in flow would occur during the winter months outside of the breeding season of most wildlife and the growing season for vegetation.

4.8.4.3 Rock Shoreline Protection

Construction

Construction of the rock shoreline protection would result in increased noise and human activity for approximately 2 months during each construction year in the construction area. Construction would occur in the late summer and early fall when the reservoir is drawn down and over several seasons for approximately 5 years to complete the identified shoreline protection measures. Noise from mechanized equipment used for excavation, grading, and placement of material may result in disturbance to wildlife using habitats in the immediate vicinity. There would be increased traffic noise and human activity associated with each shoreline protection construction site where trucks deliver material. Wildlife using open water and habitats along the shoreline and near construction access roads may move temporarily to adjacent suitable habitats in the reservoir area. However, most of the areas proposed for shoreline protection are in developed areas that provide limited habitat for wildlife and construction would not take place during the waterfowl- or songbird-nesting season when species are more vulnerable to disturbance. Therefore, Reclamation expects construction to have minimal impacts on wildlife in the vicinity. Displacement would only occur during periods of elevated noise and human activity associated with construction. Wildlife would continue to use habitats in the vicinity after construction is complete.

Reclamation would install the proposed shoreline protection on both vegetated and unvegetated eroded banks of the reservoir. The identified shoreline protection measures would impact forested shoreline area, which would need to be grubbed before construction. Rock, rootwads, or gabion baskets would replace a portion of this area. Reclamation would revegetate the area with native plants. Reclamation has not yet determined the specific locations for access roads and staging areas, but would use existing roads and the dry reservoir bed for access to construction sites and staging where possible. Reclamation would restore the temporary roads and staging areas with native vegetation after construction.

Overall, Reclamation expects disturbance to wildlife species in the project vicinity from construction noise and activities to be minor. Construction of each of the shoreline protection areas would occur after the height of the breeding season for most waterfowl and songbird species, which is when they are most vulnerable to disturbance. In addition, some of the areas proposed for shoreline protection do not contain wildlife habitat because they have been previously disturbed. Thus, no direct loss of wildlife habitat would occur in these areas, and few wildlife would be disturbed.

Operation

The proposed shoreline protection activities may permanently replace wildlife habitats such as areas of conifer forest and deciduous shrub communities with rock embankment. Impacts to wildlife habitat would be limited by the small scale of the shoreline protection projects (approximately 2 miles of the total shoreline) and because most would be located in previously disturbed areas.

4.8.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Raising the saddle dikes and right dam abutment would result in the same type of impacts to wildlife and wildlife habitat as described previously for the rock shoreline protection (Section 4.8.4.3). Construction would occur in late summer and early fall when the reservoir is drawn down and would vary in duration depending on the proposed activity. Construction noise and human activity may cause disturbance to wildlife using habitats in the immediate vicinity of the dam and the construction access roads. Wildlife using open water and habitats along the shoreline and near construction access roads would move temporarily to adjacent suitable habitats during periods of elevated noise and human activity. Wildlife would continue to use habitats in the vicinity after construction is complete.

Much of the construction area for shoreline protection is void of vegetation and provides marginal wildlife habitat. Reclamation would remove some conifer trees and replace them with shoreline protection or clear and replant native species which would result in new habitat for wildlife (Table 4-12).

Table 4-12. Impacts to Wildlife Habitat Associated with Shoreline Protection Elements

Shoreline Protection Element	Habitat Impacts (acres)	Impact Type	Short-term Impacts (Construction duration)
Saddle Dike 1	0.75 (forested)	Permanent	Less 2 weeks
Saddle Dikes 2 and 3	1.6 (unforested)	Temporary	2 months
Right Abutment	3.5 (forested)	Permanent	1 month

Reclamation would use existing roads and the dry reservoir bed for access to construction sites and staging where possible. Reclamation would expand existing Forest Service roads for construction access through limited clearing, gravel, and gravel surfacing.

Operation

The completed project would cause minor long-term impacts because of the loss of forested habitat near the elevated saddle dikes and right dam abutment. The loss of 4.25 acres of forest habitat near the saddle dikes and right dam abutment is less than 1 percent of total forested habitat in the vicinity.

4.8.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

Construction of shoreline protection at the three recreation facilities would result in the same type of impacts to wildlife and wildlife habitat as described previously for the rock shoreline protection (Section 4.8.4.3). Construction would occur during the recreational off-season (between Labor Day and Memorial Day) when the reservoir is drawn down and the areas closed to the public. The duration of construction at each area would vary in length (see Table 4-13). Construction noise and human activity may cause disturbance to wildlife using habitats in the immediate vicinity of the facility and construction access roads. Wildlife using open water and habitats along the shoreline and near construction access roads would move temporarily to adjacent suitable habitats during periods of elevated noise and human activity. Wildlife would continue to use habitats in the vicinity after construction is complete.

Reclamation would remove some areas of coniferous trees and replace them with shoreline protection or clear and replant with native species (Table 4-13).

Table 4-13. Impacts to Wildlife Habitat Associated with Shoreline Protection at Recreation Facilities

Recreation Facility	Habitat Impacts (acres)	Impact Type	Short-term Impacts (Construction Duration)
Wish Poosh Campground	1.9 (sparsely forested)	Permanent	1 month
Cle Elum River Campground	0.7 acres	NA	1 week
Salmon La Sac Road Embankment	Minimal clearing	NA	2 months

Reclamation would use existing cleared areas in the campgrounds as work areas, and retain and protect existing large trees to the extent possible. In addition, access to construction sites and staging where possible would use existing roads, informal boat ramps, and the dry reservoir bed.

Operation

The shoreline protection measures in these areas would cause minor long-term impacts to wildlife after construction because there would be less than 5 percent decrease in forested habitat at Wish Poosh Campground (approximately 50 acres).

4.8.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.8.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.8.4.1).

4.8.5.2 Additional Stored Water Used for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.8.4.2).

4.8.5.3 Hybrid Shoreline Protection

Construction

Construction of hybrid shoreline protection would have the same temporary impacts to wildlife during construction (i.e., disturbance and displacement of wildlife in the vicinity) and impacts to wildlife habitat (removal of coniferous trees) as described in Section 4.8.4.3.

Operation

Operation of the soft shoreline protection measures may have a beneficial effect on wildlife that use the reservoir shoreline because the selected treatments involve vegetation, logs, and natural topography that would provide foraging, resting, and shelter for waterfowl, reptiles or amphibians, and small mammals.

4.8.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.8.4.4)

4.8.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.8.4.5).

4.8.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.8.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.8.4.1).

4.8.6.2 Additional Stored Water Used for TWSA

Additional stored water used for TWSA would not impact wildlife or wildlife habitat in the Cle Elum or Yakima rivers because the changes in flow would be small.

4.8.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.8.4.3).

4.8.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.8.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.8.4.1).

4.8.7.2 Additional Stored Water Used for TWSA

Impacts would be the same as for Alternative 4 (Section 4.8.4.2).

4.8.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.8.4.3).

4.8.8 Mitigation Measures

Section 4.7.8 identifies the measures that would minimize impacts to wildlife during construction of the shoreline protection measures. Avoidance and minimization of the need for vegetation removal to the extent possible would reduce impacts to wildlife and wildlife habitats. Reclamation would replant vegetation in areas cleared for construction and temporary access where possible.

4.9 Threatened and Endangered Species

4.9.1 Methods and Impact Indicators

Reclamation's analysis of Federal threatened and endangered species included a review of Federal and State databases to determine the presence of ESA-listed species likely to be located in the reservoir area and designated critical habitat for those species. The literature review determined the preferred habitat and life cycles of those species and supported an analysis of how the additional inundation around the shoreline would affect those species. Impacts on listed species largely relate to vegetation loss because of increasing the reservoir inundation area, altered habitat conditions, soil disturbance, and increased noise and human activity during construction. The analysis evaluated potential noise impacts by comparing expected construction noise levels with the thresholds established by the Service for individual ESA-listed species.

An impact to threatened and endangered species would be considered negative if actions taken during either the construction or operation phase of a project were to result in direct harm (injury or death) or harassment to the species or actions that result in alterations of habitat that would limit the ability of that habitat to support the continued existence and ultimate recovery of the species. Negative impacts to threatened and endangered species and some common examples include the following:

- *Any direct loss of habitat that supports a listed species, including habitat occupied during any stage of its life cycle.* For example, removal of trees of a particular size and species that are important for successfully breeding would constitute a negative impact to many listed bird species, including the northern spotted owl and marbled murrelet;

- *Any reduction in the functionality of habitat that supports listed species*. For example, if construction results in the potential for erosion (via land disturbance activities such as clearing and grading) either over the short- or long-term and a subsequent increase in sedimentation or turbidity, the resulting degradation in water quality or quality of spawning gravels may reduce the ability of habitats to function normally and thus reduces the ability of the habitat to support threatened and endangered species.

- *Any activity that restricts or prevents a threatened or endangered species movements or migration patterns*. This could include construction of physical barriers (culverts and dams) or conducting activities that may create physiological barriers to migration. Physiological barriers could include activities such as large scale clearing activities adjacent to small and medium sized streams where riparian vegetation plays a vital role in ameliorating stream temperatures.

- *Any activity that results in direct harm or harassment of a species*. For example, activities that generate excessive underwater noise have been known to result in injury or death to fish as well as marine mammals, and diving birds such as the marbled murrelet.

Impact indicators for listed fish species are the same as described in Section 4.6.1 - increased water levels in the reservoir, shoreline protection activities, and downstream effects of using the additional stored water. Section 4.7.1 describes expected vegetation loss and alteration by vegetation type.

Table 4-14 lists threatened and endangered species impact indicators and significance criteria.

Table 4-14. Threatened and Endangered Species Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Disturbance of threatened and endangered species from construction noise or activities	Direct harm (injury or death) or harassment of threatened and endangered species
Loss or reduction in the functionality of habitat that supports listed species	For example, if construction results in erosion and there is a subsequent increase in sedimentation or turbidity, the resulting degradation in water quality or quality of spawning gravels may reduce the ability of habitats to function normally
Disturbance of threatened and endangered species from increased noise levels and human activity associated with project operation	Direct harm (injury or death) or harassment of threatened and endangered species Reduce long-term viability of threatened and endangered populations in the vicinity

4.9.2 Summary of Impacts

The No Action Alternative would result in continuation of current conditions, which could result in detrimental long-term impacts to listed species in the Cle Elum and upper Yakima rivers. These detrimental long-term impacts are associated with declines in instream flows, which could continue to provide limited spawning and migration habitat. Because no construction would occur, no construction-related impacts would occur.

For Alternatives 2 and 3, the increased reservoir level would have minor negative and positive effects on bull trout. Higher reservoir levels would temporarily increase productivity, but could also increase turbidity. Reclamation expects changes in habitat functionality to be minor. Using the additional stored water for instream flows would provide a positive impact for bull trout. Under Alternatives 4 and 5, Reclamation would use the additional stored water for TWSA, resulting in increased summer flows and decreased winter flows. The timing of flow releases under this alternative would not occur at a time that would benefit spawning or migration for salmonids in the Yakima and Cle Elum rivers.

Under Alternatives 2 and 3, using the additional stored water for instream flows would provide a positive impact for bull trout and MCR steelhead in the Cle Elum River by increasing river flows in a manner that is more similar to unregulated conditions and by addressing documented low instream flow conditions that exist from October through March.

Reclamation expects no impacts to marbled murrelet and northern spotted owl, because these species are rarely in the vicinity of project construction, due to lack of suitable habitat at the current time.

4.9.3 Alternative 1 – No Action Alternative

Under the No Action Alternative, low winter flows in the Cle Elum and Yakima rivers would continue to provide degraded spawning and migration habitat for bull trout and steelhead (Section 4.6.3), which could contribute to continued declines of these species. Reconstruction of the existing interim fish passage facilities would not generate noise that would affect listed species (Reclamation, 2014d). The completed interim fish passage facilities would improve passage for coho and sockeye salmon and increase nutrient levels and primary productivity for bull trout in the reservoir. No other activities would alter conditions for other listed species, so Reclamation anticipates there would be no impacts to threatened and endangered species using habitats in the reservoir area.

Alternative 1 is not consistent with the Purpose and Need for the project in that it does not provide improved aquatic resources for fish habitat, rearing, and migration in the Cle Elum and upper Yakima rivers. Direct and indirect negative impacts on bull trout and MCR steelhead would continue.

4.9.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.9.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Construction to modify the radial gates would cause increased noise and human activity for approximately 6 to 9 months in the area surrounding the dam spillway gates. In general, construction noise would result in disturbance to northern spotted owl and marbled murrelet if birds were within 72 feet of construction activities. However, given the developed nature of the dam's spillway area, the fact that the closest marginally suitable habitat for northern spotted owl is over 800 feet from the spillway construction area, and the fact that no marbled murrelet habitat is present, construction necessary for spillway radial gate modifications would have no adverse impact on northern spotted owl or marbled murrelet. No impacts to habitat supporting either marbled murrelet or northern spotted owl would occur; therefore, Reclamation anticipates no adverse impacts to these species from construction.

Operation

Reclamation expects the operation of the new radial gates would not affect threatened and endangered species because there would be no habitat loss or disturbance, and no increases in noise.

Increased Reservoir Pool

Operation

Inundation of additional areas around the reservoir could affect habitat for bull trout, northern spotted owl, and marbled murrelet. No MCR steelhead occur above Cle Elum Dam and, therefore, additional inundation would not affect steelhead. Additional inundation is unlikely to affect terrestrial species, such as gray wolf, grizzly bear, and Canada lynx, because of their small numbers in the project area and their ability to move to avoid the inundation area (Section 3.9.5).

Bull Trout. Bull trout would experience both positive and negative effects from the increased reservoir pool. Potential positive effects include a temporary increase in productivity and habitat complexity resulting from inundation of terrestrial vegetation and organic matter and flooding of soil. This transient benefit would likely be small in magnitude, but may temporarily increase the availability of nutrients and increase the productivity of an otherwise oligotrophic reservoir. An increase in reservoir productivity would increase the abundance of invertebrates and other prey species consumed by bull trout. Potential negative effects include a temporary increase in turbidity as inundated areas without shoreline protection experience erosion. Higher turbidity can reduce the productivity of aquatic ecosystems (e.g., Henley et al., 2000) and provide a refuge for prey species from predatory fish, such as bull trout (Gregory and Levings, 1998). Section 4.6.4.1discusses the expected changes in productivity and turbidity resulting from inundation in more detail.

Both positive and negative effects associated with inundation are likely to be small in magnitude because of the relatively small scale of the proposed increase in storage. Reclamation does not expect tributary passage issues with Alternative 2 because proposed reservoir elevations would not result in significant backwatering into streams. Passage issues are typically associated with lowering of reservoir pool elevation and not raising pool elevations; however, Reclamation would evaluate the mouths of tributaries following the initial pool raise to confirm that there is no reduced passage.

Northern Spotted Owl and Marbled Murrelet. The proposed additional inundation around the perimeter of Cle Elum Reservoir would cause the loss of some vegetation over multiple decades as more flood-tolerant species replace less flood tolerant trees or shrubs. The project would inundate approximately 30 acres of conifer forest and 11 acres of deciduous tree and shrub habitats during June and July of some years, which represents less than 1 percent of the approximate 60,000 acres of forested habitat surrounding the reservoir. These areas support vegetation that may provide foraging, roosting, dispersal, and breeding habitat for northern spotted owls. A portion of the additional inundated 46 acres is currently designated critical habitat for northern spotted owl. This area is located along the west and north sides of the reservoir with a few small slivers adjacent to the east shoreline. The additional inundation would alter the vegetative characteristics of designated critical habitat similar to that discussed above.

In general, northern spotted owl usage of areas immediately adjacent to the Cle Elum River and along the shoreline of the reservoir for foraging and nesting habitat is extremely low due to the proximity to roads and also because the noise reduces foraging success. Under existing conditions, northern spotted owls would likely avoid the reservoir edge for breeding purposes because it constitutes an edge type habitat and one where predation would reduce the reproductive success of either species.

As mentioned above, Reclamation anticipates some tree loss within the 46 acres of additional inundation, although the potential for this occurrence is difficult to predict. This would be an adverse impact to marginally suitable northern spotted owl habitat. However, northern spotted owls are unlikely to use this area because of the existing disturbance and the presence of more suitable habitat around the reservoir (approximately 60,000 acres). Therefore, impacts to northern spotted owl would be minor.

Although the area around the reservoir includes vegetation that is suitable nesting habitat for marbled murrelets, there is no designated critical habitat near the reservoir and the reservoir is outside the expected range for marbled murrelets. Therefore, the project would not affect marbled murrelets.

4.9.4.2 Additional Stored Water Used for Instream Flow

Operation

The additional 14,600 acre-feet of reservoir storage capacity could help ameliorate existing seasonal instream flow issues by providing Reclamation with greater flexibility to meet target flow ranges. The additional release of an average of 36 cfs from October to March would represent a 20 percent increase in winter instream flows when releases are at the minimum level in Cle Elum River. These improved instream flows would benefit habitat conditions for bull trout and MCR steelhead as described generally for fish in Section 4.6.4.2.

Bull Trout. Flow augmentation resulting from Alternative 2 is likely to benefit bull trout downstream from Cle Elum Dam. There is no evidence that bull trout spawn below Cle Elum Dam. However, potential use of that area by fluvial juveniles and subadults from the Yakima River is possible. Higher flows during the fall and winter would improve habitat connectivity and promote access to side channel or off-channel habitats for bull trout. Increases in productivity or abundance of juvenile anadromous species that result from flow augmentation would also benefit bull trout by increasing the abundance of potential prey.

MCR Steelhead. Additional fall and winter flows would benefit MCR steelhead by improving habitat functions downstream from the dam. This includes improved rearing conditions resulting from increased habitat connectivity and access to side channel and off-channel habitats. Both adult and juvenile steelhead migrate during the fall and winter (Karp et al., 2009; WDFW, 2002) and additional flows could improve passage and overwintering conditions during that period (Reclamation and Ecology, 2012).

4.9.4.3 Rock Shoreline Protection

Construction

Construction to install shoreline protection measures would generate noise and activity that could displace wildlife. Impacted species could include bull trout, northern spotted owl, and marbled murrelet. No MCR steelhead are located above the dam and no terrestrial species, such as gray wolf, grizzly bear, and Canada lynx, are likely to be in the area based on a review of federal and state databases and literature.

Bull Trout. Bull trout may be present in nearshore littoral habitats that shoreline protection activities modify and the expected impacts are the same as anticipated for other fish species (Section 4.6.4.2). These include minor potential positive and negative effects on habitat processes that provide cover and forage for reservoir fish species. However, the limited overlap between the proposed shoreline protection areas and the reservoir itself would minimize any positive or negative impacts on fish. Reclamation would conduct most construction and material placement above the limits of the existing reservoir so as to not affect fish. All construction would occur in the dry and when the reservoir is drawn down, reducing the potential for impacts to fish species, including bull trout.

Northern Spotted Owl and Marbled Murrelet. Construction of shoreline protection measures would generate increased noise, which has the potential to affect species such as the northern spotted owl and marbled murrelet. More information on noise impacts on the northern spotted owl is available than for other species so information is reported here as an example of potential noise impacts on wildlife. The information provides a baseline for analyzing impacts.

Threshold distances have been established where a target species (in this case the northern spotted owl and marbled murrelet) elicit a specific response to noise (Service, 2003). Threshold distances used are from a Biological Opinion for the Olympic National Forest Program of Activities, and may not necessarily apply in all situations, especially since the forest practices generally use equipment that differs from construction equipment and includes the use of noise-reducing conservation measures (Service, 2003).

The threshold distances include the following:

- *Noise-only detectability threshold* (where the noise is detectable to a spotted owl, but the owl does not show a response) – 4 dBA above baseline or ambient noise levels)

- *Noise-only alert threshold* (where the northern spotted owl shows an apparent interest by turning its head or extending its neck) – 57 dBA

- *Noise-only disturbance threshold* (where the spotted owl shows avoidance of the noise by hiding, defending itself, moving its wings or body, or postponing a feeding) – 70 dBA

- *Noise-only injury threshold* (where the spotted owl is actually injured, which can be defined as an adult being flushed from a nest or young missing a feeding) – 92 dBA

The detectability, alert, and disturbance threshold distances differ as baseline noise differs, but the injury threshold of 92 dBA remains constant.

Construction noise is a point source noise. Noise from a point source spreads spherically over distance, traveling in all directions equally from the source. The standard reduction for point source noise is 6 dB per doubling of distance from the source (Service, 2003). An additional 1.5 dB reduction to the 6 dB occurs when soft site conditions exist, such as ground cover or normal unpacked earth between the source and the receptor. Dense vegetation can reduce noise levels by 5 dB for every 100 feet of vegetation, up to a maximum of 10 dB.

The expected, combined noise level of construction equipment (e.g., excavator, backhoe, dump truck) operating together during installation of shoreline protection is 84 dBA at distance of 50 feet from the source. In general, soft site conditions exist on the site, which means that calculated noise levels would be 7.5 dB less per doubling of distance. An additional 10 dB due to dense vegetation would reduce each calculation further. Estimated ambient noise in the vicinity of Cle Elum Reservoir is approximately 40 dBA based on information obtained from the programmatic biological assessment for the Olympic National Forest where similar relatively undisturbed forested conditions occur (USDI, 2003). Spotted owl and marbled murrelet occurrence in the immediate project area is unlikely due to roads and residential development. However, construction noise may travel up to 1,145 feet before reaching background noise levels. The closest documented occurrence of an active reproducing pair of spotted owl is approximately 1.5 miles (about 7,900 feet) northeast of the top of the reservoir (USFS, 2014). Reclamation does not anticipate that marbled murrelets would be in the area as less than 6 percent of marbled murrelet detections occur more than 40 miles from the marine environment and the most inland nest documented in Washington is approximately 55 miles from the ocean (WDFW, 2013). The Cle Elum Reservoir is located approximately 57 miles due east of Puget Sound.

Noise levels would not result in harm or injury to spotted owls or marbled murrelets, if present. However, they may elicit disturbance behaviors within 72 feet of construction activities. Construction noise could have an adverse impact on northern spotted owl if they were located within 72 feet of construction; however, Reclamation knows of no nest or detection locations within 1 mile of any construction activities (USFS, 2014). Therefore, impacts to northern spotted owl and marbled murrelet as a result of increased noise and human activity are unlikely.

Operation

The proposed shoreline protection activities may permanently replace wildlife habitats, such as areas of conifer forest and deciduous shrub communities, with rock embankment. Impacts to wildlife habitat would be limited by the small scale of the shoreline protection projects (approximately 22 acres) compared to the total amount of shoreline along the reservoir (___ acres) and because most are located in previously disturbed areas. Expected impacts to listed species are minor since the areas with shoreline protection provide limited habitat for listed species. Marbled murrelets are not anticipated or known to use habitats surrounding the reservoir for nesting and the closest foraging habitat for murrelets is in the marine environment of Puget Sound over 57 miles west of the Cle Elum Reservoir. Suitable northern spotted owl habitat is located near the Cle Elum Reservoir; however, owls are unlikely to use habitats in the area proposed for shoreline protection measures due to the increased level of human activity in these areas and because the areas are located in edge type habitats which are typically unsuitable for nesting due to increased risk of predation.

Impacts to bull trout are unlikely because reservoir levels would last approximately 40 days, limiting the exposure time to the shoreline protection areas. There are no MCR steelhead in the reservoir and thus there would be no impacts to MCR steelhead.

4.9.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Raising the elevation of the saddle dikes near the dam and right abutment of the dam would result in construction noise and increased human activities intermittently for approximately 6 to 9 months. Temporary impacts to threatened and endangered fish and wildlife species would be similar to rock shoreline protection, although the extent of impacts may be less since these areas are in more developed areas around the reservoir and construction would occur in the dry.

Operation

Impacts to listed species would be similar to rock shoreline protection. The saddle dikes and right dam abutment are located above the reservoir high pool level, preventing exposure to fish of the completed projects. No impacts would occur to other species after construction because the completed facilities are not located near suitable habitat.

4.9.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

Construction impacts at the recreational facilities and Salmon La Sac Road would result in construction noise and increased human activities for approximately 2 months. Temporary impacts on threatened and endangered fish and wildlife species would be similar to rock shoreline protection (Section 4.9.4.3).

Operation

Similar to rock shoreline protection, no impacts would occur to listed species following construction.

4.9.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.9.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.9.4.1).

4.9.5.2 Additional Stored Water Used for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.9.4.2).

4.9.5.3 Hybrid Shoreline Protection

Construction

Construction impacts associated with hybrid shoreline protection would be similar to those for rock shoreline protection (Section 4.9.4.3).

Operation

Impacts to bull trout would be similar to those for rock shoreline protection (Section 4.9.4.3). In the long-term, hybrid shoreline protection may support the succession and function of typical riparian habitats, providing cover and forage for bull trout in littoral habitats. However, the limited overlap between the proposed shoreline protection areas and the reservoir itself and the limited shoreline areas that would receive bioengineered shoreline protection would minimize any positive or negative impacts on bull trout.

Because no MCR steelhead are present in the reservoir, there would be no impact to that species. Impacts to northern spotted owl and marbled murrelet would be the same as for rock shoreline protection described for Alternative 2 (Section 4.9.4.3).

4.9.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.9.4.4).

4.9.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.9.4.5).

4.9.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.9.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.9.4.1).

4.9.6.2 Additional Stored Water Used for TWSA

Operation

Under Alternative 4, Reclamation could distribute the additional stored water between irrigation needs and instream flows. If the water were to benefit irrigation, the increased summer flows and decreased winter flows would not benefit bull trout or MCR steelhead in the lower Cle Elum or upper Yakima rivers (Section 4.6.4.2). Under operational scenarios in which there are reduced instream flows in the summer and increased instream flows in October through March, the benefits described for Alternative 2 in Section 4.9.4.2 would occur.

Use of the water for TWSA or instream flows would not impact other listed species.

4.9.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.9.4.3).

4.9.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.9.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.9.4.1).

4.9.7.2 Additional Stored Water Used for TWSA

Impacts would be the same as for Alternative 4 (Section 4.9.6.2).

4.9.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.9.6.3).

4.9.8 Mitigation Measures

Mitigation measures such as construction BMPs identified in Sections 4.3.8 and 4.4.8 would minimize impacts to threatened and endangered species during construction of the shoreline protection measures by reducing erosion and sedimentation. Construction would occur when the reservoir is drawn down, minimizing impacts to bull trout in the reservoir and bull trout and MCR steelhead in the lower Cle Elum River.

Reclamation has initiated ESA consultation with the Service and NMFS. Reclamation would implement specific mitigation for listed fish and wildlife species that the agencies require as part of consultation. At a minimum, Reclamation would conduct preconstruction surveys for listed fish and wildlife species prior to construction of the radial gate modification and shoreline protection areas. Reclamation would implement the conservation measures and recommendations provided by the Service in the *Fish and Wildlife Coordination Report* (see Section 5.4.2).

4.10 Visual Quality

4.10.1 Methods and Impact Indicators

The analysis of visual quality impacts primarily entails identification and description of changes to visual quality of the landscape from existing conditions. The USFS landscape character goal for the Cle Elum Reservoir area is to maintain a natural appearing to slightly altered landscape character that expresses predominately-natural processes in the scenic viewsheds. In this context, adverse visual impacts are modifications to the environment that interrupt the visual character and integrity of the landscape or that disrupt and encroach upon the harmony of the basic visual elements. Similarly, Reclamation evaluates the visual impact of the Cle Elum Pool Raise Project based on the relative contrast it would have with the landscape compared to the existing landscape without the project. Elements in a project that have contrast are those that are unlike or in opposition to the forms, lines, colors, and textures that combine in the native landscape to form a visual pattern. Greater visual contrasts result in impacts more adverse to the aesthetic quality of the setting.

Based on the above considerations, Table 4-15 lists the indicators for determining potential impacts to visual quality and their significance criteria. The basis for determination of an impact is knowledge of the affected environment, types of viewers involved, and professional judgment. Changes can be localized but significant if visible to residents, recreational users, and others familiar with the preexisting visual quality of the area.

Table 4-15. Visual Quality Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Introduction of new facilities or modifications to existing facilities at the dam	Substantially contrast with, or change the overall appearance of the existing dam, or detract from the visual quality of the area
Changes in reservoir inundation and drawdown patterns	Renders the reservoir a less dominant element of the landscape, or results in an unnatural appearing shoreline over the long-term such that it would make the area less desirable for recreation
Modifications to the reservoir environment related to shoreline protection	Long-term and distinct contrasts with the visual character and integrity of the existing reservoir shoreline
Changes to instream flows	Erosion of riverbanks or flows outside the range of existing flows
Consistency with relevant Federal visual quality management plans and policies	Modifications substantially conflict with Visual Quality Objectives established in the 1990 Wenatchee National Forest Plan and the USFS Scenery Management System (USFS, 1995).

4.10.2 Summary of Impacts

The No Action Alternative would result in visual quality conditions that are the same as those currently experienced. No construction or changes in lake level would occur, and therefore, views would be largely unchanged.

From a short-term perspective, the Cle Elum Pool Raise Project would involve visual quality impacts to local residents and visitors during construction activities, as local views change accompanying construction. None of these short-term impacts would be significant. Long-term, the project would involve localized visual quality impacts from dam modifications, shoreline protection, and reservoir pool changes. Dam modifications would not substantially contrast with existing dam elements or detract from the visual quality of the area. Shoreline protection, under any of the alternatives, would not constitute a strong contrast with the reservoir shoreline. Reservoir pool changes would preserve the character and dominance of the reservoir on the landscape. Therefore, these changes would not result in significant adverse visual quality changes. None of the alternatives would change the visitor perception of natural appearance or the overall dominant element of the reservoir on the landscape. Therefore, Reclamation expects the project to meet the Visual Quality Objective of Retention and the Scenic Integrity Level of High prescribed in the USFS Forest Plan (Section 3.10). The landscape would continue to retain its High Scenic Integrity. The project would not affect the views from the Mountains to Sound Greenway or the National Scenic Byway.

4.10.3 Alternative 1 – No Action Alternative

Reclamation anticipates no short-term impacts because the No Action Alternative would construct no new facilities at the reservoir. Fish passage facility reconstruction would occur on the downstream end of Cle Elum Dam and would not be visible to most viewers during construction. Following reconstruction, the fish passage facility would appear the same, or similar, to the existing facility. There would be no changes to the appearance of Cle Elum Dam and no changes to the reservoir visual quality from higher inundation or shoreline protection measures.

4.10.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.10.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Construction of the modified radial gates at the spillway would create short-term, minor, localized, and temporary visual impacts for approximately 6 to 9 months in the area surrounding the dam spillway gates. The radial gates are located on the downstream side of the dam. Small areas of the dam crest may be visible from roads and bridges near Ronald to the south (see Photo 3-15), but radial gates are not visible. Because access to and views of these facilities from the downstream side are limited, few people would notice the construction.

Operation

Visual impacts would relate to modifications to the radial gates and spillway. Once complete, the modified spillway would alter the appearance of the dam on the downstream side, but would not be visible to residents and recreationists from the upstream, reservoir side. The modified gates would blend in with the overall dam structure and would not detract from the visual quality of the reservoir and surrounding areas (Figures 2-1 and 2-2 illustrate the before and after appearance of the spillway gates). Because access to and views of these facilities are limited, few people would notice the modification.

Increased Reservoir Pool

Operation

The project would inundate land around the reservoir to a higher level than the existing full pool for about 40 days per year. The project would inundate approximately an additional 46 acres around the reservoir. The majority of users of the reservoir are recreational users who visit the reservoir for short periods. In most areas, it is unlikely that the casual viewer would notice the 3-foot increase in the water level. The increase would be most noticeable in the upper reservoir and along inundated, narrow segments of flatter areas of shoreline. These areas would generally be limited to undeveloped Federal lands where no shoreline protection is proposed. In these areas, the increased reservoir pool would represent noticeable changes to the visual environment but would not impair the overall visual quality of Cle Elum Reservoir because they would be consistent with the existing character. Views would be slightly altered from access roads and campsites raised to accommodate the higher pool level at Cle Elum River Campground and Wish Poosh Campground, but the overall appearance of the reservoir and campgrounds would remain the same. The reservoir would remain the dominant element on the landscape.

A body of water generally is visually pleasing to most individuals. However, as the reservoir is drawn down, exposed mud flats around the more shallow parts of the newly inundated reservoir areas may detract visually. These newly inundated areas would experience loss or change in vegetation as well as erosion, but would not change the overall, long-term visual character of the area which would still appear as a reservoir surrounded by forest. The expected loss of shoreline vegetation and increase in eroded area would be noticeable in the immediate area, especially in the early years of increased erosion, but the changes should remain naturally appearing as they follow the natural line of the reservoir shore. Any newly exposed areas would appear more natural over time, likely within a span of a few years. In the short term, the visual impact of exposed mud flats or shoreline would be negligible in many areas due to the duration and angle of view. Further, these areas would be limited as Reclamation would not draw down the reservoir below current low levels and proposed shoreline protection would limit the segments of the flatter shoreline areas exposed to inundation.

The increased reservoir pool would be acceptable in this area of Retention VQO and Partial Retention VQO. The reservoir would be within the setting of other reservoirs in the area, and the increased reservoir pool would not change the visitor perception of natural appearance or the overall dominant element of the reservoir on the landscape.

4.10.4.2 Additional Stored Water Used for Instream Flow

Operation

Using additional stored water to improve instream flows in the Cle Elum and Yakima rivers would not affect visual quality. Different scenarios for how Reclamation would allocate the additional stored water could cause fluctuations in the reservoir level, but the reservoir currently fluctuates during the year and from year to year. Release of additional stored water would occur during fall and winter (October to March). The additional release would not occur during high spring flows or winter floods when channel erosion occurs. The increased seasonal flows would be within the range of existing flows in the Cle Elum and Yakima rivers.

4.10.4.3 Rock Shoreline Protection

Construction

Construction of the rock shoreline protection would result in temporary visual impacts for approximately 2 months during each construction year in the area surrounding the proposed protection area. Construction would occur in the late summer and early fall when the reservoir is drawn down. Some people would notice mechanized equipment, grading activity and material movement, construction of rock shoreline protection, and human activity in the construction areas, which could detract visually from the setting. However, impacts would be short-term and limited to only a few areas of the reservoir shoreline during any one construction season. Construction activities would also require temporary access roads to access areas to the west and east of the dam, and along certain shorelines where stabilization is proposed. After construction, Reclamation would restore the temporary roads with in-kind, native vegetation. The appearance of some areas would change from forested to cleared land. However, forested lands would remain predominant around these areas and the cleared land would not be noticeable to most viewers at the reservoir.

Operation

Rock shoreline protection measures would alter views of approximately 2 miles of reservoir shoreline by installing rock and rootwads on the shoreline and grading the slopes. The design would grade existing banks to a less steep slope than under existing conditions. Shoreline protection would be a long-term visual change along the shoreline. However, the alteration would not represent a strong contrast with existing conditions. When reservoir levels are high, the rock shoreline protection would not be visible. When reservoir levels are low, the rock shoreline protection would provide little contrast with the existing drawn down shoreline. Reclamation would revegetate banks that are regraded and not covered by riprap with native plants, which would reduce the visibility of the embankments.

By matching the rock protection material to the native rock, regrading the shoreline to a gentle slope, and revegetating areas with native plants, the shoreline protection measures would repeat the form, line, color and texture of the landscape and would meet the Retention VQO.

4.10.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Raising the elevation of Saddle Dikes 1, 2 and 3, and the right dam abutment would be limited to areas near the dam. Because access near the dam is restricted, and Speelyi Beach and Lake Cabins Road would close for the duration of construction, most people would be viewing the construction activity from a distance. Small areas of the dam crest may be visible from roads and bridges near Ronald (see Photo 3-15), but the saddle dikes and the right dam abutment are not visible. Construction equipment, materials, and activity would be visible from the reservoir and surrounding shorelines. Because construction would not occur during the peak recreation season, fewer people would see the construction activities.

Operation

The addition of a layer of riprap on the upstream face of the dikes would not be noticeable to residents or the casual visitor at most distances. The material would blend with the surrounding area and would be marginally visible to people who are viewing the dam from the reservoir. These changes would not substantially contrast with existing dam elements, and would not detract from the visual quality of the reservoir and surrounding areas.

4.10.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

Construction of shoreline protection at the three recreation facilities would result in the same type of visual impacts as described previously for rock shoreline protection. Construction would occur during the recreation off-season (between Labor Day and Memorial Day) when the reservoir is drawn down and there are fewer visitors to the reservoir. Construction activity at Wish Poosh and Cle Elum River Campgrounds may be noticeable to some people. However, the campgrounds would be closed for the season when construction occurs, so construction activities would only be visible from a distance. Construction activity to raise portions of Salmon La Sac Road would be highly visible to travelers along the road and visitors to the upper reservoir. However, impacts would be minor due to the duration and angle of view.

Operation

Following restoration activities, the net effect to visual quality in comparison to current conditions would be largely unnoticeable to the casual visitor. Long-term, the shoreline protection at the three recreation facilities would result in the same type of visual impacts as described previously for rock shoreline protection.

4.10.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.10.5.1 Radial Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.10.4.1).

4.10.5.2 Additional Stored Water Used for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.10.4.2).

4.10.5.3 Hybrid Shoreline Protection

Construction

Construction of hybrid shoreline protection measures would have the same general short-term, minor, localized, and temporary visual quality impact as the rock shoreline protection measures under Alternative 2 (Section 4.10.4.3).

Operation

Under this alternative, Reclamation would use shoreline protection treatments from a variety of protection measures, both alone and in combination with rock shoreline protection measures, depending on the site characteristics of the shoreline.

Hybrid shoreline protection incorporates natural materials and features and would have little contrast with the existing shoreline. In general, where hybrid techniques are used, they would appear as part of the natural landscape. Perched beaches would replicate the variable slopes and materials found in natural beaches (Figure 2-10 illustrates the appearance of a perched beach). Like natural beaches, Reclamation would surface flatter beach slopes with fine-grained sand and small gravel, and use cobbles for steeper slope surfaces. Other protection techniques (riprap, rockery wall) would result in the same type of long-term visual impacts as described previously for rock shoreline protection under Alternative 2 (Section 4.10.4.3).

4.10.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.10.4.4).

4.10.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.10.4.5).

4.10.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.10.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.10.4.1).

4.10.6.2 Additional Stored Water Used for TWSA

Use of the additional water for TWSA would not have visual quality impacts at the reservoir.

4.10.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.10.4.3).

4.10.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.10.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.10.4.1).

4.10.7.2 Additional Stored Water Used for TWSA

Impacts would be the same as for Alternative 4 (Section 4.10.6.2).

4.10.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.10.5.3).

4.10.8 Mitigation Measures

Reclamation would design shoreline protection to blend with the surrounding areas by using native rock, replanting with native species, and restoring access areas.

4.11 Air Quality

4.11.1 Methods and Impact Indicators

The project area lies within Kittitas County, which is in attainment for criteria pollutants listed in the Clean Air Act (CAA) so Federal General Conformity requirements do not apply. Therefore, the air quality analysis is limited to a qualitative evaluation of the construction and operational characteristics of the project and their potential to approach the General Conformity *de minimis* thresholds as specified in 40 CFR 93.153. The analysis uses *de minimis* thresholds as the metric for identifying adverse environmental impacts. In attainment and maintenance areas, *de minimis* thresholds for all pollutants, except lead, are

100 tons per year; the *de minimis* threshold for lead is 25 tons per year. Table 4-16 lists air quality impact indicators and significance criteria.

Table 4-16. Air Quality Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Increased vehicle and equipment emissions and generation of fugitive dust during construction	Violation of air quality standards
Exposure of sensitive receptors to substantial pollutant concentrations or odors	Violation of air quality standards

4.11.2 Summary of Impacts

The No Action Alternative would not result in air quality impacts because there would be no construction at the reservoir and no additional inundation of the shoreline.

For Alternatives 2 through 5, construction emissions would be minor and, with BMPs in place, would not violate air quality standards. No sensitive receptor would be exposed to substantial concentrations of pollutants or odors under any of the alternatives. Placement of asphalt at Speelyi Beach would generate odors; however, the odors generated would dissipate over the course of a few days after the placement of the asphalt. None of the alternatives would generate emissions once construction is complete.

4.11.3 Alternative 1 – No Action Alternative

Under the No Action Alternative, Reclamation and Ecology would not implement the Pool Raise Project. The projects identified as occurring under the No Action Alternative, as described in Section 2.3, would not generate new sources of emissions; therefore, Reclamation and Ecology do not anticipate any impacts to air quality. Air quality conditions would largely continue as they currently occur, with no influence from the proposed project.

4.11.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.11.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Emissions from construction of the radial gate modifications would be minor and, with BMPs in place, would not violate air quality standards. Trucks delivering materials to construction sites would generate exhaust emissions, but vehicle emissions readily disperse within a short distance from the vehicle.

Because Kittitas County is in attainment for all priority pollutants and the construction period would be short (6 to 9 months), vehicle emissions from trucks are not anticipated to cause exceedances of the NAAQS. To exceed the NAAQS during construction, a large number of vehicles would need to be operating at low speeds (or idling) for long periods of times (on the order of months), which is not anticipated.

Heavy trucks and construction equipment powered by gasoline and diesel engines would generate carbon monoxide (CO) and nitrogen oxides (NO_x) in exhaust emissions. These emissions would be temporary and limited to the immediate area surrounding the construction site. Reclamation does not expect the temporary use of heavy trucks and construction equipment to cause exceedance of the applicable NAAQS because there would be only a relatively small number of heavy trucks and other types of construction equipment in operation at any one time. The use of diesel construction equipment would result in a temporary increase in mobile source air toxics (MSAT) emissions, especially diesel particulate matter. However, all emissions from construction activities, including vehicle emissions such as CO, NO_x, and MSATs, and all emissions from temporary facilities, such as asphalt batch plants, would cease at the conclusion of construction.

The dam is not located near sensitive receptors such as residential properties or recreational facilities.

Operation

Operation of the modified gates would use electricity similar to the existing gates and would not generate new emissions or dust.

Increased Reservoir Pool

Operation

Inundation of additional areas around the reservoir would not cause air quality impacts. The Cle Elum Pool Raise Project would increase the inundated area for about 40 days per year. The additional inundation area would slightly increase the area of shoreline exposed when the reservoir is drawn down. The additional shoreline could increase the amount of windblown dust. The total new inundation area would be approximately 46 acres. However, shoreline materials are mostly stable and exposure to elements would be temporary (Section 4.3.4.3). Therefore, the increased reservoir pool would not cause air quality impacts.

4.11.4.2 Use of Additional Stored Water for Instream Flow

Use of the additional stored water for instream flows would not affect air quality as no emissions generating activities would be required to release the additional stored water.

4.11.4.3 Rock Shoreline Protection

Construction

Emissions from construction of rock shoreline protection would be minor and, with BMPs in place, would not violate any air quality standards. Construction activities would temporarily generate PM_{10} and $PM_{2.5}$ (mostly dust) and small amounts of other pollutants associated with earthwork activities. Trucks delivering materials to construction sites would generate exhaust emissions, but vehicle emissions readily disperse within a short distance from the vehicle. Trucks would haul riprap and other materials to the sites where Reclamation is installing protection measures. Most existing roads are paved and truck traffic would occur on existing roads, minimizing the potential for generating dust. Approximately 4,270 truck trips would be required, but trips would extend over approximately 5 years, reducing the truck trips to a maximum of approximately 900 per construction season. Construction emissions would vary from day to day, depending on the timing and intensity of construction. Most of the materials hauled to the site are located within 30 miles of the reservoir. Trucks would transport the materials along SR-903 or Lake Cle Elum Dam Road to and from I-90. Because Reclamation would install protection measures when the reservoir is drawn down, trucks may transport some materials and equipment over the dry reservoir shoreline. This could cause minor and temporary increases in fugitive dust. Dust emissions may be noticeable by recreational users and nearby residents. Because Kittitas County is in attainment for all priority pollutants and the construction period would be relatively short, Reclamation does not anticipate vehicle emissions from trucks to cause exceedances of the NAAQS. To exceed the NAAQS during construction, a large number of vehicles would need to be operating at low speeds (or idling) for long periods of times (on the order of months), which is not anticipated.

Heavy trucks and construction equipment powered by gasoline and diesel engines would generate CO and NO_x in exhaust emissions. These emissions would be temporary and limited to the immediate area surrounding the construction site. Construction would occur approximately 3 miles south of Alpine Lakes Wilderness Area, a federally designated Class I area. However, Reclamation does not expect construction emissions to impact the area due to the distance, prevailing wind patterns, and the small level of emissions anticipated.

Emissions from construction sites would be exempt from air quality permitting requirements. However, contractors would be required to comply with WAC 173-400-040, using BMPs to minimize construction-related emissions.

Operation

Over the long-term, the shoreline protection measures would stabilize the shoreline and reduce the potential for erosion and dust.

4.11.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Air quality impacts from construction to raise the elevation of the saddle dikes and the right dam abutment would be similar to impacts from construction of rock shoreline protection, but with less vehicle emissions because fewer truck trips would be required and the material would come from a nearby borrow site. The placement of asphalt at Speelyi Beach Day Use Area would generate odors; however, the odors generated would dissipate over the course of a few days after placement of the asphalt.

Operation

The additional riprap would stabilize shoreline erosion over the long-term and reduce the potential for erosion and dust.

4.11.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

Air quality impacts from construction of shoreline protection at the USFS campgrounds and Salmon La Sac Road would be similar to impacts from construction of rock shoreline protection, but with less vehicle emissions because fewer truck trips would be required. Reclamation would obtain the construction materials from both nearby borrow areas and an off-site quarry (approximately 30 miles away).

Operation

Over the long-term, the shoreline protection measures would stabilize the shoreline and reduce the potential for erosion and dust.

4.11.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.11.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.11.4.1).

4.11.5.2 Use of Additional Stored Water for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.11.4.2).

4.11.5.3 Hybrid Shoreline Protection

Operation

Air quality impacts from construction of hybrid shoreline protection would be similar to impacts from construction of rock shoreline protection.

Construction

Over the long-term, the soft shoreline protection measures would stabilize the shoreline and reduce the potential for erosion and dust.

4.11.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.11.4.4).

4.11.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.11.4.5).

4.11.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.11.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.11.4.1).

4.11.6.2 Use of Additional Stored Water for TWSA

Use of the additional stored water for TWSA would not affect air quality as no emissions generating activities would be required to release the additional stored water.

4.11.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.11.4.3).

4.11.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.11.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.11.4.1).

4.11.7.2 Use of Additional Stored Water for TWSA

Impacts would be the same as for Alternative 4 (Section 4.11.6.2).

4.11.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.11.5.3).

4.11.8 Mitigation Measures

Overall, existing air quality in the project area meets the national standards for criteria pollutants. The scope of construction in any one location is relatively limited, and the contractor would employ BMPs required by WAC 173-400-040 for construction activities. For these reasons, construction impacts on air quality would be temporary, relatively minor, and not expected to cause exceedances of national standards. BMPs the contractor could use to reduce construction impacts include the following:

- Complying with the BMPs required in WAC 173-400-040 (general standards for maximum emissions)

- Complying with applicable dust control policies and plans
- Spraying dry soil with water to reduce dust
- Using temporary ground covers
- Minimizing idling of equipment when not in use
- Planning construction areas to minimize exposing areas of earth for extended periods
- Covering dirt and gravel piles
- Sweeping paved roadways to reduce mud and dust
- Replanting exposed areas as soon as possible after construction

4.12 Climate Change

4.12.1 Methods and Impact Indicators

The analysis of greenhouse gas (GHG) emissions considers that construction of the project elements would generate GHG emissions through truck shipments of materials to the project sites and use of construction equipment. The GHG emissions were estimated using Ecology guidance and emission factors from the Climate Registry. (The Climate Registry is a nonprofit collaboration among North American states, provinces, territories and Native Sovereign Nations that sets consistent and transparent standards to calculate, verify and publicly report greenhouse gas emissions into a single registry.) Ecology presumes that greenhouse gas emissions of less than 25,000 metric tons per year are not significant (Ecology, 2011). Operation of the project would not generate more than negligible emissions, thus this analysis does not discuss them in detail.

The assumed GHG emissions generated would result from the use of diesel fuel, which has higher carbon dioxide equivalent (CO_2e) emissions than gasoline. Total GHG emissions include the total expected CO_2e emissions from every gallon of diesel fuel burned (Ecology, 2011). The three major emitted GHGs are CO_2, methane (CH_4), and nitrous oxide (N_2O). Therefore, Reclamation calculated the total CO_2e emissions using the amount of diesel fuel required for the project and the expected CO_2e GHG emissions anticipated for every gallon of diesel fuel consumed (10.3074 kilograms/gallon [kg/gal]). Table 4-17 presents the expected emissions from 1 gallon of diesel fuel burned, which are emission factors (Climate Registry, 2013a and 2013b). To convert CH_4 and N_2O into CO_2e, the team compared the global warming potential of each gas to the global warming potential of CO_2 (that is, one unit of CH_4 warms the atmosphere at 21 times the rate of CO_2). In other words, every unit of CH_4 emitted is the equivalent of 21 units of CO_2. As shown in Table 4-17, the expected CO_2e emissions for all three gases would be 10.3074 kg/gal of diesel fuel burned.

Table 4-17. CO_2 Equivalents and Emission Factors per 1 Gallon of Diesel Fuel

Greenhouse Gas	Emission Factor (kg/gal)	Global Warming Potential	CO_2 Equivalent Emission Factor[a] (kg CO_2e/gal)
Carbon Dioxide	10.21	1	10.21
Methane	0.0008	21	0.0168
Nitrous Oxide	0.00026	310	0.0806
		Total	10.3074

[a] Emission factors from The Climate Registry (2013a, 2013b).

To calculate the GHG emissions from truck shipments, Reclamation estimated the number of trucks required for each project element, the distance each truck would be required to travel, and the fuel efficiency. For purposes of analysis, Reclamation used an upper bound of 200 miles for each truck trip and a fuel efficiency of 8.0 miles per gallon. To calculate the GHG emissions from construction equipment, Reclamation estimated the amount of fuel required for each project element. A summary of the calculations performed for each alternative and the results follows.

Climate change could affect the Proposed Action through changes in precipitation, snowmelt, and runoff that could affect the project facilities and operations. The potential for these changes were evaluated using climate change and hydrologic modeling described in Section 3.12. As the climate change scenarios described in Section 3.12 would occur independently from the Proposed Action, there are no impact indicators that apply to this portion of the analysis. Rather, the described impacts on the project from climate change are in recognition that reservoir operations could change under the climate change scenarios.

Table 4-18 lists climate change impact indicators and significance criteria.

Table 4-18. Climate Change Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
The production of GHG emissions	GHG emissions of greater than 25,000 metric tons per year

4.12.2 Summary of Impacts

The No Action Alternative would generate conditions that do not differ from the current baseline conditions.

The project would not generate a high enough mass of carbon emissions to have an impact on climate change under Ecology and EPA guidelines. Changes in runoff timing and volume associated with climate change would adversely impact the project. Under Alternatives 2 through 5, the enlarged reservoir capacity would fill less frequently. When the reservoir fills to the enlarged capacity, the additional storage would provide a slightly increased supply of stored water to allow water managers to respond to the much larger adverse impacts of climate change on water supply and instream flow conditions.

4.12.3 Alternative 1 – No Action Alternative

The No Action Alternative would not increase carbon emissions beyond those that currently occur. Construction associated with reconstructing the interim fish passage facility would generate increased carbon emissions. However, the level of those emissions would be far below Ecology's significance level.

Section 3.12 describes the impacts of climate change on the project area under the No Action Alternative. Climate change would affect the project area, and the No Action Alternative does not increase flexibility to adapt to these changes. The No Action Alternative would not meet the Purpose and Need of the project to increase the capacity of the reservoir or improve aquatic resource conditions. Figure 4-6 illustrates the baseline condition (No Action Alternative) under climate change conditions, compared with the action alternatives.

4.12.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

The construction activities proposed under Alternative 2 would generate approximately 1,400 metric tons of total CO_2e emissions. This would be well below the 25,000 metric tons significance threshold established by Ecology. Operations would generate negligible emissions under this alternative.

The effects of climate change could alter temperature and precipitation in the Yakima River basin and affect water management throughout the region. Changes in runoff and precipitation would require Ecology, Reclamation, and other agencies to adapt water management to respond to changing conditions as they occur.

Figure 4-6 illustrates a comparison of simulated enlarged Cle Elum Reservoir water surface elevation under the historic hydrology and under adverse climate hydrology. Figure 4-6 represents Baseline (or No Action) simulated water surface elevation using historical and adverse climate hydrology, for comparison. On average, the predicted enlarged reservoir is 16 feet lower due to the effects of the adverse climate change scenario. The adverse climate change scenario causes lower simulated water surface elevations and results in the enlarged Cle Elum Reservoir filling less frequently.

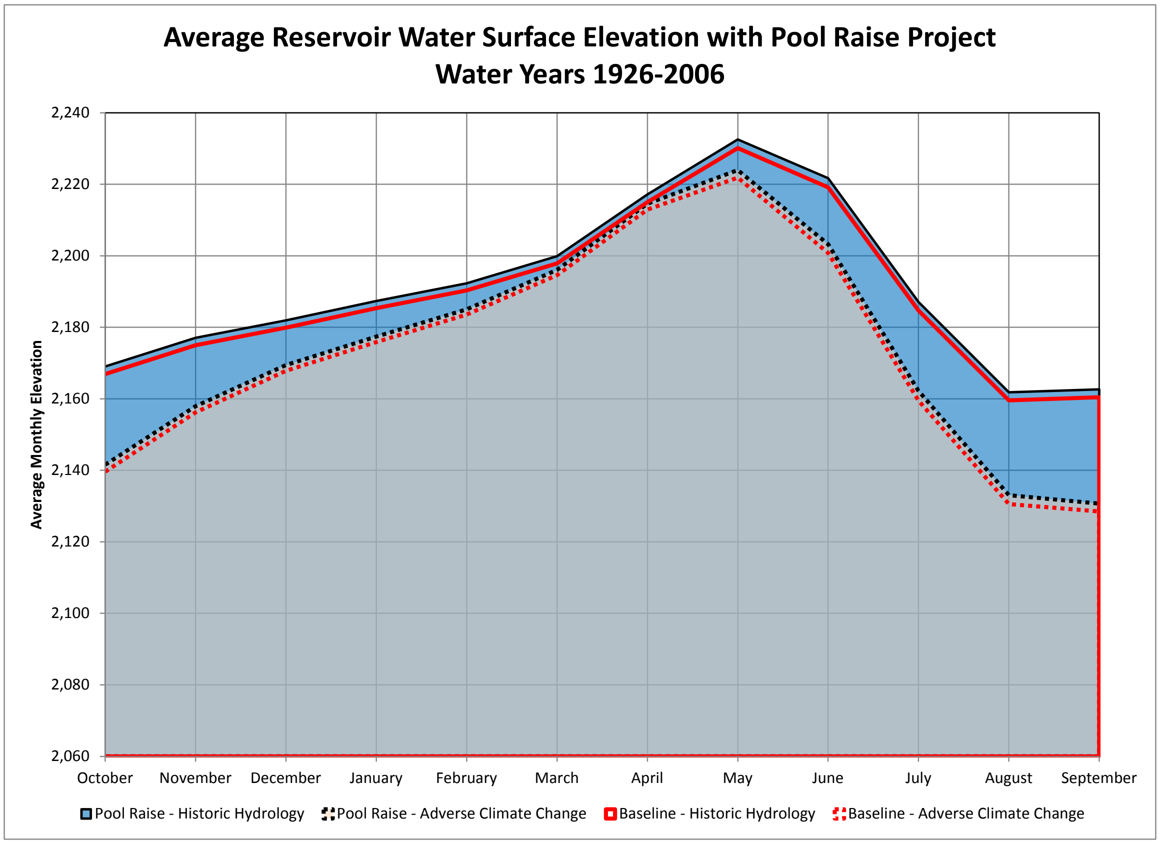


Figure 4-6. Comparison of Average Monthly Cle Elum Reservoir Water Surface Elevation between Action Alternatives (Historical and Adverse Climate) and No Action (Historical and Adverse Climate)
(Source: Reclamation and Ecology, 2014b)

Climate change may also affect water related resources in the overall Yakima River basin, including flood control, hydropower, fish and wildlife, and surface water quality.

A number of climate change related factors could affect the availability of water related recreation in the Cle Elum watershed and the Yakima River basin, including changes in snowpack and changes in the timing and quantity of streamflow. Expected climate change would result in a decline in the quantity and quality of freshwater habitat for salmonid populations across Washington State (Mantua et al., 2010). Studies have predicted increasing water temperatures and thermal stress for salmonids in eastern Washington that are minimal for the 2020s, but increase considerably later in the century (Mantua et al., 2010).

Based on projections for the 2040s, climate change may significantly alter the temperature, amount, and timing of runoff and fish habitat in the Yakima River basin. Average expected annual air temperature would increase with accompanying increased water temperatures and more precipitation would fall as rain rather than snow, according to the CIG. These temperature changes could affect fish in the Cle Elum watershed and the Yakima River basin, including two federally listed threatened fish species, MCR steelhead and bull trout.

Climate change would have a direct impact on water temperature and indirect impact on DO. In general, an increase in air temperature caused by climate change would cause water temperatures to increase. In the upper Yakima River, climate change models predict that the number of weeks when average water temperatures exceed 21°C may rise from less than 5 weeks in historic conditions to over 10 weeks in the 2040s (Mantua et al., 2009). Warmer water can hold less DO than cooler water, so DO would decrease as air and water temperatures increase due to climate change (Karl et al., 2009).

Although the effects of the project on storage, water supply, and fish habitat would be relatively minor, the project would have a small, positive impact on the ability of water agencies, the agriculture sector of the economy, and fish and wildlife agencies to better withstand and adapt to changing conditions, including the changes associated with climate change. The predicted changes in snowpack and runoff associated with climate change would alter Cle Elum Reservoir operations by producing larger and more frequent drawdowns, and the reservoir would fail to refill completely more frequently. These changes could somewhat reduce the effectiveness of this alternative.

4.12.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

The construction activities proposed under Alternative 3 would generate approximately 385 metric tons of total CO_2e emissions. Similar to Alternative 2, this would be well below the 25,000 metric tons significance threshold established by Ecology. Operations would generate negligible emissions under this alternative.

The impacts to the project from climate change are the same as discussed under Section 4.2.4for Alternative 2.

4.12.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

The construction activities proposed under Alternative 4 would generate approximately 1,200 metric tons of total CO_2e emissions. Similar to Alternative 2, this would be well below the 25,000 metric tons significance threshold established by Ecology. Operations would generate negligible emissions under this alternative.

The impacts to the project from climate change are similar to those discussed under Section 4.2.4for Alternative 2, but use of additional stored water for TWSA would provide Reclamation with greater flexibility in responding to water shortages for proratable water users that are a result of climate change. Conversely, if Reclamation uses the additional stored water to improve proratable water rights, Reclamation would not be able to use it to help meet instream flows which could otherwise slightly offset the adverse impact of climate change on instream flow and fish habitat.

4.12.7 Alternative 5 – Additional Stored Water Used for TWSA and Soft Shoreline Protection

The construction activities proposed under Alternative 5 would generate approximately 160 metric tons of total CO_2e emissions. Similar to Alternative 2, this would be well below the 25,000 metric tons significance threshold established by Ecology. Operations would generate negligible emissions under this alternative.

The impacts to the project from climate change are similar to those discussed under Section 4.2.4for Alternative 2, but use of additional stored water for TWSA would provide Reclamation with greater flexibility in responding to climate change.

4.12.8 Mitigation Measures

The project would not generate carbon emissions at a level above Ecology and EPA's threshold for significance, so no mitigation measures are required. Alternatives 2 through 5 of the Cle Elum Pool Raise Project would slightly increase water available for instream flows or irrigation and provide a small offset for the larger predicted changes to snowpack and runoff in the Yakima River basin.

4.13 Noise and Vibration

4.13.1 Methods and Impact Indicators

This analysis used standard information about noise levels from typical construction equipment to present a generalized, qualitative discussion of short-term changes in noise during construction. Impacts could result from exposure to ground-borne vibration, exceedances of the maximum permissible noise levels presented in Table 3-11, or violations of noise standards associated with construction of the Cle Elum Pool Raise Project facilities. Quantitative noise modeling was not conducted because construction noise is exempt from regulation if conducted between 7 a.m. and 10 p.m. (daytime hours) per WAC 173-60-050. In addition, noise created by traffic (including heavy construction vehicles) on public roads is exempt from regulation under WAC 173-60-050. Further, there would be no operational noise generated by the project requiring modeling. However, the analysis considers the noise generated during construction and compares it to the noise levels presented in Table 3-11 to provide context for the levels of noise expected.

The analysis of potential noise generated during construction is based on noise levels of typical construction equipment at 50 feet from the source (Table 4-19). Depending on the activity, peak noise levels from equipment shown in Table 4-19 would range from 76 to 110 dBA at 50 feet from the source. However, noise levels decrease with distance from the source at a rate of approximately 6 to 7.5 dBA per doubled distance, so noise levels farther from construction activities would be lower than those listed in Table 4-19. In general, soft site conditions exist in the reservoir area, which means that noise levels would be 7.5 dB less per doubling of distance. An additional 10 dB due to dense vegetation would further reduce noise levels. For example, at 200 feet from the noise source, noise levels from construction equipment would range from 64 to 96 dBA.

Table 4-19. Construction Equipment Average Maximum Noise Level (L_{max})

Equipment	Examples	Actual Measured Average L_{max}[a] at 50 ft
Earth Moving	Compactors	83
	Front end loader	79
	Backhoe	78
	Tractors	84
	Graders	89
	Pavers	77
Materials Handling	Concrete mixer truck	79
	Concrete pump truck	81
	Crane	81
Stationary	Pumps	81
	Compressors	78
	Generators	81
Hauling	Dump truck	76
Impact Equipment	Pile drivers	110
Sand Blasting	Sand blasters	96

Source: Washington State Department of Transportation measured data. Federal Highway Administration (FHWA) Roadway Construction Noise Mode Database (2006).

[a]Lmax is the maximum value of a noise level that occurs during a single event.

Construction activities have the potential to produce vibration levels that may be annoying or disturbing to humans and cause damage to nearby structures. These activities include using jackhammers and soil compacting machinery. Measurements of vibration are expressed in terms of the peak particle velocity (PPV), the maximum velocity experienced by any point in a structure during a vibration event. It is an indication of the magnitude of energy transmitted through vibration. PPV is an indicator often used in determining potential damage to buildings from stress associated with blasting and other construction activities.

Table 4-20 summarizes the levels of vibration and the usual effect on people and buildings based on the U.S. Department of Transportation guidelines for vibration levels from construction-related activities. Table 4-21 presents the vibration levels for typical construction equipment used to assess potential vibration impacts from the project. There are no regulatory guidelines for assessing impacts from vibration; however, for purposes of this analysis, vibration impacts would occur if sustained vibration occurs at a level which would cause building damage or would be unpleasant for people (typically above 3.0 in/sec).

Table 4-20. Summary of Vibration Levels and Effects on Humans and Buildings

Peak Particle Velocity (in/sec)	Effects on Humans	Effects on Buildings
<0.005	Imperceptible	No effect.
0.005 to 0.015	Barely perceptible	No effect.
0.02 to 0.05	Level at which continuous vibrations begin to annoy people in buildings	No effect.
0.1 to 0.5	Vibrations considered unacceptable for people exposed to continuous or long-term vibration	Minimal potential for damage to weak or sensitive structures.
0.5 to 1.0	Vibrations considered bothersome by most people, however tolerable if short-term in length	Threshold at which there is a risk of architectural damage to buildings with plastered ceilings and walls. Some risk to ancient monuments and ruins.
1.0 to 2.0	Vibrations considered unpleasant by most people	U.S. Bureau of Mines data indicates that blasting vibration in this range would not harm most buildings. Most construction vibration limits are in this range.
>3.0	Vibration is unpleasant	Potential for architectural damage and possible minor structural damage.

Source: Hajek et al., 2006

Table 4-21. Vibration Levels for Typical Construction Equipment

Equipment		PPV at 25 ft (in/sec)
Pile Driver (impact)	Upper range	1.518
	Typical	0.644
Pile Driver (sonic)	Upper range	0.734
	Typical	0.170
Large Bulldozer		0.089
Loaded Truck		0.076
Small Bulldozer		0.003
Vibratory roller		0.210
Jackhammer		0.035

Source: FTA, Transit Noise and Vibration Impact Assessment, May 2006

Table 4-22 lists impact indicators and significance criteria for noise and vibration.

Table 4-22. Noise and Vibration Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Noise from construction	Noise outside of daylight hours or construction near sensitive receptors
Vibrations from construction	Damage to buildings or unpleasant for people
Increase in noise from project operation	Exceeds State noise standards

4.13.2 Summary of Impacts

The No Action Alternative would cause minor increases in noise from reconstruction of the interim fish passage facility on the dam. Noise and vibration levels would be similar to those currently experienced in the area.

Noise impacts from Alternatives 2, 3, 4, and 5 would be similar and cause temporary increases in noise that would exceed the maximum allowable noise levels described in Table 3-11. However, the increase in noise would be temporary and limited to the construction period; therefore, it would not be significant. Perceptible vibration under all four build alternatives would result from trucks operating on roadways and from soil compaction activities; however, the vibration would be temporary and limited to daytime hours. None of the alternatives would generate long-term noise or vibration.

4.13.3 Alternative 1 – No Action Alternative

Under the No Action Alternative, Reclamation and Ecology would not implement the Cle Elum Pool Raise Project. There would be no noise and vibration impacts associated with construction or operation of project facilities. The projects identified as occurring under the No Action Alternative as described in Section 2.3, would not result in any significant noise generating activities; therefore, Reclamation anticipates no noise impacts.

4.13.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.13.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Construction to modify the spillway radial gates would cause temporary increases in noise in the immediate vicinity of the dam that exceed the maximum allowable noise levels described in Table 3-11. However, the increase in noise would be temporary and limited to the construction period; therefore, it would not be significant. Construction equipment would be limited to a small number of trucks to deliver the new gates. The major noise source would be from sandblasting the radial gates. The expected maximum noise of the construction equipment used is 81 dBA at distance of 50 feet from the source. The dam site is isolated from residential and recreational areas, so few people would experience the construction noise. Construction duration would be short and limited to one dry season. Further, construction noise would occur between the permissible hours of 7 a.m. and 10 p.m. and would usually end at 5 p.m. Therefore, there is no anticipated violation of any noise standards and no impacts would be anticipated.

Reclamation does not expect sand blasting to generate perceptible vibration levels; trucks delivering materials to the construction site would generate vibration levels of 0.076 in/sec at 25 feet from the source. At this level, the vibrations would be perceptible as trucks drive along roadways, but the temporary nature of the source would limit adverse effects. Reclamation anticipates no vibration levels that would have effects on buildings.

Operation

The modified spillway gates would operate similar to existing conditions and would not cause additional noise or vibration during operation.

Increased Reservoir Pool

There would be no increased noise or vibration associated with inundating additional areas around the reservoir.

4.13.4.2 Use of Additional Stored Water for Instream Flow

Release of additional stored water for instream flow would not result in any changes to noise or vibration levels in the project area.

4.13.4.3 Rock Shoreline Protection

Construction

Installation of rock shoreline protection measures would require earth moving and materials hauling. Construction would cause temporary increases in noise that exceed the maximum allowable noise levels described in Table 3-11; however, construction noise would be temporary, localized, and limited to daytime hours. The expected combined noise level of all construction equipment (e.g., soil compactor, excavator, backhoe, dump truck) operating together during installation of shoreline protection would be 84 dBA at distance of 50 feet from the source, which is the approximate distance that the closest receptor would be to the construction area. Further, construction noise would occur between the permissible hours of 7 a.m. and 10 p.m. and would generally end at 5 p.m. Therefore, there is no anticipated violation of noise standards and Reclamation anticipates no adverse noise impacts.

Construction vibration would be temporary, localized, and limited to daytime hours. Soil compaction would create the highest vibration levels, with levels anticipated at 0.210 in/sec at 25 feet from the source. At this level, if exposure were long-term or continuous, Reclamation would consider the vibrations unacceptable. However, since the soil compaction activities would be temporary, localized, and limited to daylight hours, Reclamation anticipates minor effects. The agency anticipates no vibration levels that would have effects on buildings.

Truck trips would also cause noise and vibration during construction. Approximately 4,270 truck trips would be required, spread out over approximately 5 years of drawdown seasons, reducing the number of trips at one time. Truck trips would occur only during daylight hours. Trucks delivering materials to the construction site would generate vibration levels of 0.076 in/sec at 25 feet from the source. At this level, the vibrations would be perceptible as trucks drive along roadways, but the temporary nature of the source would limit any adverse effects.

The increased noise and vibration would be most noticeable to residents of the properties near where the contractor is installing shoreline protection measures. In some of the locations where shoreline protection is proposed, this would be as close as 50 feet to the construction site. People recreating near the construction area would also be subject to construction noise and vibration. Construction would only occur during daylight hours and would be limited in duration; therefore, expected impacts are minor. Construction duration for any single shoreline protection project would be short and contained within one dry season, but projects could extend over several years. Noise and vibration at the staging areas would be limited to the operation of trucks carrying materials to and from the construction site and would be limited in duration; therefore, Reclamation anticipates no significant noise impacts.

Operation

The completed rock shoreline protection would not cause additional noise or vibration during operation.

4.13.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Noise and vibration impacts for raising the elevation of the saddle dikes and right dam abutment would be similar to those described for the Rock Shoreline Protection in Section 4.13.4.3.

Operation

The completed facilities would not cause additional noise or vibration during operation.

4.13.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Noise and vibration impacts for construction of shoreline protection at Cle Elum River and Wish Poosh Campgrounds and Salmon La Sac Road would be similar to those described for the rock shoreline protection in Section 4.13.4.3. Because the facilities and road are not located near residential areas, construction noise would affect few people. Construction in the campgrounds would occur in the fall when the campgrounds are closed and recreation use of the reservoir decreases. Therefore, there would be reduced noise impacts on recreation users.

Operation

The completed rock shoreline protection would not cause additional noise or vibration when completed.

4.13.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.13.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.13.4.1).

4.13.5.2 Use of Additional Stored Water for Instream Flow

Release of additional stored water for instream flow would not result in any changes to noise levels in the project area.

4.13.5.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.13.4.3).

4.13.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.13.4.4).

4.13.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.13.4.5).

4.13.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.13.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.13.4.1).

4.13.6.2 Use of Additional Stored Water for TWSA

Use of the additional water for TWSA would not cause noise impacts.

4.13.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.13.4.3).

4.13.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.13.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.13.4.1).

4.13.7.2 Use of Additional Stored Water for TWSA

Impacts would be the same as for Alternative 4 (Section 4.13.6.2).

4.13.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.13.5.3).

4.13.8 Mitigation Measures

The project would comply with applicable noise regulations by restricting construction activities to daytime hours. Although not required, Reclamation would implement BMPs to reduce construction noise to the extent feasible. Those measures could include regular notification to affected property owners, use of broadband back-up alarms, designing site access to minimize the need for backing up trucks, and keeping heavy equipment maintained to minimize noise to the greatest extent feasible. Construction workers would comply with safety regulations regarding noise. Because the expected noise impacts are minor and temporary, no other mitigation is proposed.

4.14 Recreation

4.14.1 Methods and Impact Indicators

This analysis identified potential short-term impacts by identifying potential construction activities that could limit or disrupt recreational facilities and long-term impacts by evaluating the recreational facilities and activities the higher reservoir levels would inundate as well as what facilities and activities shoreline protection measures would affect. Negative impacts are changes that would diminish recreational use of or access to developed recreation sites and dispersed recreation sites in the study area. Table 4-23 lists impact indicators and significance criteria for recreation.

Table 4-23. Recreation Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Loss of developed recreational facilities	Any of the developed facilities become unusable during the recreation season
Loss of access to developed recreation	Access to developed recreation sites is lost as a result of construction or operation of the project during the recreation season
Loss of dispersed recreation	Loss of dispersed camping sites
Disturbance to recreation from construction noise	Construction noise loud enough to decrease visitor enjoyment

4.14.2 Summary of Impacts

The No Action Alternative would not result in impacts to recreation because there would be no construction or changes to the reservoir and its operation or changes to recreation facilities. Reconstruction of fish passage facilities would not affect recreational facilities, because the disruption is minor and involves existing fish passage facilities. Conditions would remain largely unchanged from current conditions.

Impacts to recreation from Alternatives 2 through 5 would be similar. All four alternatives would disrupt recreation during construction of shoreline protection measures and spillway radial gate modifications, but disruption would be minor and short-term. Increased inundation would displace dispersed camping. Once construction is complete, new reservoir levels would not impact recreation, and shoreline protection measures at USFS recreational facilities would protect recreational uses and access.

4.14.3 Alternative 1 – No Action Alternative

The No Action Alternative would cause no impacts to recreation at Cle Elum Reservoir because minimal construction would occur and there would be no changes in reservoir levels. Recreational patterns and use would continue as they currently occur. There may be some impact to recreationists on the lake in future years if the lake takes longer to refill, and lake levels remain lower than currently occurs for longer periods of time.

4.14.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.14.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Construction to modify the radial gates would be limited to the area surrounding the dam spillway gates. Because recreational activities near the dam are restricted, construction is not likely to disrupt recreation activities. Construction would not cause access restrictions to recreational facilities because no developed recreational facilities are located in the vicinity. Recreationists in the vicinity may hear construction noise, but expected noise increases are minor.

Operation

Operation of the modified radial gates would not affect recreation because no recreational facilities or activities are located in the vicinity.

Increased Reservoir Pool

Operation

Elevated water levels from the Cle Elum Pool Raise Project would last about 40 days a year, but these higher levels would inundate some recreational facilities at Cle Elum River and Wish Poosh campgrounds. The higher water levels would occur during summer camping season. Higher reservoir levels would also flood dispersed camping, fishing, and boating access areas at the north end of the reservoir.

At Wish Poosh Campground, the higher reservoir level would inundate access roads to a wellhouse and to the boat ramp, limiting access to the boat ramp during this period if not mitigated. In the Cle Elum River Campground, the additional inundated areas include a gravel access road, day use areas, and three campsites. Higher reservoir levels would inundate some sections of Salmon La Sac Road, which provides access to recreational facilities along the east side of the reservoir. The higher reservoir levels would also partially inundate the Speelyi Beach Day Use Area.

Reclamation proposes to protect all of these areas from additional inundation. Section 2.4.3.7 describes the proposed shoreline protection projects for Wish Poosh and Cle Elum River Campgrounds and for Salmon La Sac Road. These proposed shoreline protection projects would maintain access to and use of developed recreational facilities during higher pool level periods. Reclamation would address inundation of the Speelyi Beach area as part of the improvements to Saddle Dikes 2 and 3 (Section 2.4.3.6). Because Reclamation would provide shoreline protection for the inundated recreation areas, there are no anticipated impacts to recreation in those areas.

Higher water levels would occur at informal boat launch areas located along the east bank of the Cle Elum River. About 400 feet of riverbank located at the river delta and the south end of the recreation area would be temporarily unavailable for up to 40 days for launching small boats during June and July when reservoir levels peak. However, there is over 800 feet of additional riverbank along the east bank to launch small boats. The predicted higher inundation level would not flow over the banks in those areas, and higher water levels would not affect the ability to launch small boats.

No change in fishing or boating opportunities on Cle Elum River or in the reservoir would occur during the higher inundation period. Small boats could still launch on the east bank of the river within Cle Elum River Campground and larger boats would still be able to use the concrete boat launch at Wish Poosh Campground. Boats launched in either area could access the reservoir and river.

Inundation would not limit use of Cle Elum River for whitewater rafting or kayaking. The Pool Raise Project would not impact the Forest Road 4308 bridge, which rafters use as a take-out point.

Reclamation would address impacts of the increased reservoir pool at formal recreational facilities as part of the project design by raising and maintaining access to facilities that the project would otherwise inundate. Therefore, there are no impacts anticipated for Wish Poosh or Cle Elum River Campgrounds. The higher water could affect informal recreation areas, such as dispersed camping at the northern end of the reservoir and informal boat launches, about 40 days a year. Dispersed camping that would otherwise occur in the additional inundated areas could relocate to and impact other areas not currently affected by dispersed camping. According to the USFS, unregulated camping, day use, and motor vehicle use along the reservoir have contributed to localized water temperature increases, riparian soil and vegetation damage, littering and dumping, and physical damage to aquatic and shoreline channels, habitats, wetlands, and floodplain environments.

4.14.4.2 Additional Stored Water Used for Instream Flow

Operation

A small increase of instream flows in the Cle Elum and Yakima rivers would not affect recreation. Different scenarios for how Reclamation would use the additional stored water could cause fluctuations in the reservoir level, but the reservoir level currently fluctuates from year to year, and these fluctuations would not differ significantly from current fluctuation levels. Increased flows in the rivers would not affect recreation because the increases would be small relative to existing river flows (a 20 percent increase in winter instream flows when releases are at the minimum level) and would occur in winter, when fewer recreational activities occur on the river.

4.14.4.3 Rock Shoreline Protection

Construction

Construction of rock shoreline protection could temporarily disrupt the activities of anglers, hikers, and dispersed campers within sight and sound of the construction area by causing increased noise and dust. Construction would also temporarily disrupt landowner access to the reservoir shoreline. However, construction impacts would be minor and temporary and would generally occur from August through October over approximately five construction seasons. Anticipated construction would require limited vehicle access, so there are no anticipated access limitations to recreation. During construction, reservoir users would be able to move to areas of the reservoir where disruption would be minimal. Reclamation would not construct shoreline protection measures simultaneously, reducing the level of construction and areas impacted at one time. Rock shoreline protection would occur mostly on private land, and would not affect public recreation. However, some rock shoreline protection measures could be located adjacent to public recreation areas. Construction in these areas could have a recreation impact as noise and dust would be noticeable at the public recreation areas; however, these impacts likely would not significantly affect recreational opportunities. Since construction would take place in the off-season, it unlikely to affect recreational users.

Operation

Rock shoreline protection measures would not have long-term impacts to recreation after construction because they would not disrupt recreational activities. For some private properties, the new rock shoreline protection could make access to shorelines more difficult. Reclamation would coordinate with property owners and install stairs, if needed.

4.14.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Construction of shoreline protection for Saddle Dike 1 and the right dam abutment would be limited to the area surrounding the dam. Because recreational activities near the dam are restricted, construction is not likely to disrupt recreational activities. Construction would not cause access restrictions. Noise increases may disturb recreationists in the vicinity, but the construction duration would be less than one month so impacts would not be significant.

Construction of shoreline protection for Saddle Dikes 2 and 3 would disrupt recreation at Speelyi Beach. Speelyi Beach would close for a period of less than 2 months, and recreationists would not be able to use the beach facilities during that time. Construction would close portions of Lake Cabins Road for approximately 2 weeks. Other access would be available for properties and recreation facilities located on Lake Cabins Road. Construction would occur when the reservoir is drawn down and would last approximately 2 months. While this impact would be noticeable and would be an inconvenience for some individuals, it is not a permanent or significant impact.

Operation

Shoreline protection at Saddle Dike 1 and the right dam abutment would have no long-term impact on recreation. Shoreline protection at Saddle Dike 2 would replace the existing paved boat ramp at Saddle Dike 2 with a concrete boat ramp. Reclamation would also provide new asphalt paving in the Speelyi Beach Day Use Area.

4.14.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

Construction at Wish Poosh and Cle Elum Campgrounds would occur after Labor Day when the campgrounds close for the season. Therefore, construction would not disrupt recreational use of the areas. Construction on portions of Salmon La Sac Road at the north end of Cle Elum Reservoir would require restricted travel to a single lane. The road would remain open during construction, but construction would cause minor traffic delays.

Operation

Once completed, shoreline protection measures at USFS recreational facilities would protect recreational uses and access. Reclamation would replace or improve any recreational facilities removed during construction, such as interpretive signs or picnic tables. At Wish Poosh Campground, Reclamation would disconnect water and electrical services to Picnic Island and the boat launch area. Reclamation would remove the existing toilets at Picnic Island and install new vault toilets on the island and at the boat launch. Reclamation would replace campfire rings and picnic tables at the three campsites in the Cle Elum River Campground. These activities would be coordinated with the USFS.

4.14.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.14.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.14.4.1).

4.14.5.2 Additional Stored Water Used for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.14.4.2).

4.14.5.3 Hybrid Shoreline Protection

Impacts of Hybrid Shoreline Protection measures would be similar to the impacts of Rock Shoreline Protection under Alternative 2 (Section 4.14.4.3).

4.14.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.14.4.4).

4.14.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.14.4.5).

4.14.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.14.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.14.4.1).

4.14.6.2 Additional Stored Water Used for TWSA

Operation

Use of the additional water for TWSA would not affect recreation in the reservoir area. Different scenarios for how Reclamation would use the additional stored water could cause fluctuations in the reservoir level, but the reservoir level currently fluctuates from year to year and these fluctuations would not impact recreation. Increased flows in the rivers would not affect recreation because the increases would be small relative to existing river flows.

4.14.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.14.4.3).

4.14.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.14.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.14.4.1).

4.14.7.2 Additional Stored Water Used for TWSA

Impacts would be the same as for Alternative 4 (Section 4.14.6.2).

4.14.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (4.14.5.3).

4.14.8 Mitigation Measures

Reclamation would coordinate with the USFS on the design and construction of all shoreline protection measures at USFS facilities. Reclamation would start the construction work at Wish Poosh and Cle Elum River Campgrounds after Labor Day when they close for the season. Construction would not occur during peak recreation times and would only occur on weekdays to reduce the number of campers affected. The shoreline protection measures installed at USFS facilities as part of the project would maintain access for inundated areas.

Reclamation would implement construction BMPs to minimize the impact on recreational facilities and their users from nuisance dust, noise, and conflicts with construction traffic during temporary construction activities. Reclamation would complete the work when the reservoir is drawn down to minimize the potential for sediment to enter the reservoir. Because Reclamation would provide shoreline protection for the inundated recreational facilities, no additional mitigation measures are required.

Existing dispersed camping, day use, and unauthorized motor vehicle access near the north end of the reservoir have contributed to degradation of the terrestrial, nearshore, and aquatic habitat and caused impacts on water quality, visual quality, and the human environment. The proposed higher pool elevation could displace this dispersed recreation to adjacent areas during a portion of the year, resulting in additional damage to new areas. To mitigate these impacts, Reclamation would take the following actions:

- Install guardrails in specific locations to prevent unauthorized vehicle access of Cle Elum River and Reservoir (Figure 4-6);
- Construct a parking area near the NF-4308 bridge over the Cle Elum River for approximately 30 vehicles to allow for walk-in camping and day use recreational activities;
- Install portable toilet facilities in heavily used recreation areas; and
- Install signage in dispersed recreation areas, providing information about National Forest dispersed camping regulations and how to reduce resource degradation.

Reclamation would also implement mitigation measures at specific sites as follows:

- *French Cabin Creek Dispersed Recreation Area*: Reclamation would install barrier guardrails 150 feet from the ordinary high water mark, restore roads, install a parking area, and restore the dispersed camping area.
- *Sandelin Trail OHV Illegal Access*: After using Sandelin Trail for construction access, Reclamation would permanently close and restore the road.
- *Morgan and Dry Creek Dispersed Camping and Informal Boat Launch Areas*: Reclamation would install barriers to prohibit vehicles from parking in the forested area and improve the roadway to accommodate boat launching.
- *Speelyi Beach*: Reclamation would improve the boat launch (as described in Chapter 2) and install barriers to impede access to the reservoir bed, the off highway vehicle (OHV) trail, and the saddle dikes.

The proposed recreation mitigation would affect earth, vegetation, visual quality, noise and vibration, recreation, land use, and cultural resources. The intent of these mitigation measures are to reduce the severity of resource degradation and enable habitat restoration and enhancement, while preserving or improving opportunities for compatible recreation activities. Potential adverse effects of implementing these measures relate to visual quality, noise and vibration, recreation, and cultural resources. Impacts due to noise and vibration during construction would be localized and of limited duration. Impacts on visual quality and changes in recreation access would be permanent, but Reclamation does not expect them to be significant.

Reclamation does not consider these effects significant because minimal ground disturbance or vegetation removal would be required; opportunities for the same or similar recreational opportunities would be available in the general area and the overall intensity of effects would be localized and minor. Reclamation would conduct a cultural resources survey prior to construction activities to determine the presence of historic properties and would take appropriate mitigation measures for impacts to any cultural resources as described in Section 4.19.8).

4.15 Land and Shoreline Use

4.15.1 Methods and Impact Indicators

For this analysis, Reclamation examined changes in land use, including conversion of land use from residential or shore-based recreational uses of the reservoir, and acquisitions of private property and easements. Reclamation reviewed the Proposed Action for compatibility with applicable Federal, State, and local land use plans and regulations. Table 4-24 lists impact indicators and significance criteria for land use.

Table 4-24. Land and Shoreline Use Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Conversion of land use from one form to another	Undesirable changes in land use
Acquisitions of private property or easements	Change or disruption in current use of private property as a result of acquisitions
Compatibility with applicable Federal, State, and local land use plans and regulations	Incompatible or conflicts with applicable plans and regulations
Irrigation water supply	Increased or decreased reliability of irrigation water

4.15.2 Summary of Impacts

The No Action Alternative would not impact land use because no activities would occur at the reservoir to change land use or conflict with applicable plans and regulations.

Alternative 2 through 5 would inundate some areas of USFS-managed land and some private property. The increased inundation would not change the ability of Federal agencies or private property owners to use the land because the project would only inundate a small portion of land for a short duration of about 40 days a year and because Reclamation is providing shoreline protection for those properties. Reclamation would acquire some real property or easements to construct and maintain the shoreline protection measures. The acquired areas would be in narrow strips along the shoreline and would not change or disrupt the current use of the properties impacted. Use of the water for TWSA (Alternatives 4 and 5) would slightly improve the reliability of water supply for irrigators in proratable districts and help ensure continued agricultural use of irrigated lands.

4.15.3 Alternative 1 – No Action Alternative

Under the No Action Alternative, Reclamation would not construct the Cle Elum Pool Raise Project and there would be no property acquisition or changes to land use at Cle Elum Reservoir. Reconstruction of the interim fish passage facilities would take place on Reclamation managed property and would not change the use of the property. Existing land use patterns and development trends would continue, unaffected by construction or operational activities at the reservoir.

4.15.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

A number of Federal, State, and local plans and policies guide management of Cle Elum Reservoir and the surrounding lands. Because Cle Elum Reservoir is located within the Okanogan-Wenatchee National Forest, Reclamation and the USFS share jurisdiction for much of the affected Federal lands and resources. Reclamation is exercising its primary authority as delegated by Congress to implement the Cle Elum Pool Raise Project. Therefore, Reclamation would adhere to the laws and regulations that govern its own actions in implementing the proposal.

The project would not impact the Alpine Lakes Wilderness Area, which includes the headwaters of the Cle Elum River, because it is outside the project area. No Wild and Scenic Rivers are located near the Cle Elum Reservoir. The Integrated Plan recommends that the USFS consider Wild and Scenic River designation of the upper Cle Elum, Waptus, and Cooper rivers. Inundation from the Pool Raise Project would not affect the Waptus or Cooper rivers. Section 4.15.4.1 discusses potential impacts on designations of the upper Cle Elum River.

4.15.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Construction to modify the radial gates would be limited to the area around the dam spillway gates, which is Federal property managed by Reclamation. Construction and operation of the modified radial gates would not cause changes to land use. Construction impacts would be minor and would not cause detours or other impacts that could affect use of adjacent properties.

Operation

Operation of the modified radial gates would not affect land use.

Increased Reservoir Pool

Operation

The Cle Elum Pool Raise Project would inundate additional lands around the reservoir as shown in Figures 2-3 to 2-7. The additional area inundated by the higher reservoir levels includes federally owned facilities, such as the existing dam embankment, developed USFS campground areas, and undeveloped Federal property around the perimeter of the reservoir. Some privately owned residential properties would also experience increased inundation. The estimated additional inundated area is approximately 46 acres of federally owned lands and less than 3 acres of privately owned property. Table 4-25 provides a description of these areas. Information on inundation of lands in the Wish Poosh and Cle Elum River Campgrounds and other recreational facilities is included in Section 4.14, Recreation. The increased inundation would not change the ability of the Federal agencies or private property owners to use the land because the project would only inundate a small portion of land for a short duration of about 40 days a year.

Additional inundation of the upper Cle Elum River where it enters the reservoir could affect designation of this portion of the river as a Wild and Scenic River. As discussed in Section 3.15.1.6, the Wenatchee National Forest Plan recommends designation of the Cle Elum River between Lake Tucquala and Cle Elum Reservoir as recreational. As discussed in Section 4.14, inundation would not limit the use of Cle Elum River for recreation, and would not impact the Forest Road 4308 bridge. The project might inundate a short portion of the river as it enters the reservoir for approximately 40 days in some years.

The higher pool level would not inundate any residential structures. The project would primarily inundate beach or embankment areas. Reclamation has not yet confirmed ownership of the property the project would inundate and is currently working to survey property boundaries to confirm the ownership. Reclamation would address impacts to private property as part of the project design through construction of shoreline protection measures.

Table 4-25. Location of Additional Inundated Areas

Description of Area	Figure Number(s)	Additional Private Area Inundated (acres)	Additional Public Area Inundated (acres)
Northern portion, including Cle Elum River Campground and informal campgrounds on the east and west sides of Cle Elum River	2-3		17.25
Northern portion, including small portion of Cle Elum River Campground	2-3		3.28
East bank, including small portion of Cle Elum River Campground	2-3		0.34
West bank	2-3, 2-4		0.11
Northern portion, including some private property on eastern bank	2-3, 2-4	0.39	2.81
East bank, including some private property	2-3, 2-4	0.13	0.66
West bank	2-4		1.11
Small portion of west bank	2-4		0.40
East bank	2-4	<0.01	1.54
Small portion of west bank	2-4		0.12
Small portions of west and east banks	2-4		1.27
East bank, including private properties	2-4	0.74	0.66
West bank	2-4, 2-5		1.58
East bank, including private properties, boat ramp, and Wish Poosh Campground	2-4, 2-5, 2-6	0.16	4.87
Small portion of east bank, including private properties	2-6	0.04	
West bank	2-5	<0.01	0.87
South portion, including private properties on west bank	2-5, 2-6	0.14	0.39
East bank, including private properties and White Fir Drive Boat Ramp	2-6	0.55	2.68
Southwest portion, including private properties	2-5, 2-6	0.16	0.38
Southern portion, including private properties on west bank and dam area	2-6	0.18	0.19
Southeast portion, including private properties and Speelyi Beach Day Use Area	2-6	0.07	1.85
Southern portion, including Cle Elum Dam and spillway	2-6		0.92
Total additional inundation area		2.6	43.3

4.15.4.2 Additional Stored Water Used for Instream Flow

Operation

Use of the additional stored water for instream flows would not have an impact on land use because the additional instream flows would not cause changes to land use or be incompatible with applicable plans or regulations.

4.15.4.3 Rock Shoreline Protection

Construction

Construction of rock shoreline protection could temporarily disrupt use of private residential properties for the duration of construction by causing noise and blocking access to the shoreline. Access to some sites could require construction of new access roads, but the project would not disrupt access from existing roads.

Operation

The requirements of the Kittitas County Shoreline Master Plan (SMP) and Critical Areas Ordinance (CAO) would apply to shoreline protection on private land. Reclamation and Ecology would apply for the appropriate permits and coordinate with Kittitas County to ensure that shoreline protection measures meet the guidelines and requirements of the SMP and the CAO.

4.15.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Construction to raise Saddle Dikes 2 and 3 would close portions of Lake Cabins Road for approximately 2 weeks. This road closure would not restrict landowner access, as there are alternate routes to properties to the north and south of the closure. Construction at Saddle Dike 1 and the right dam embankment would not impact land use because it would occur on federally owned land managed by Reclamation and would not change Reclamation’s use of land in the area.

Operation

The increased freeboard at the three saddle dikes and the right dam abutment would not change how these areas are used and would not have long-term impacts on land use.

4.15.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction of shoreline protection would disrupt use of recreation facilities as described in Recreation (Section 4.14.4.5).

4.15.4.6 Land Acquisition for Shoreline Protection

Construction of shoreline protection would require acquisition of private land or easements on narrow strips of land approximately 20 feet to 50 feet wide along the shoreline where Reclamation would install protection measures. Reclamation would survey properties before construction to determine whether acquisition is required, and would work with property owners on a site-by-site basis to determine the best approach for each site. The expected acquisitions and installation of shoreline protection would not render the private properties unsuitable for their existing uses because the acquisition would be on a narrow strip of land adjacent to the shoreline and the project would not disturb the remaining property.

The extent of land Reclamation would acquire would depend on the specific site and the design of shoreline protection for that site. Reclamation would need to acquire land to excavate the shoreline and to install the shoreline protection measures. Reclamation anticipates that acquisition would consist of a strip of land extending 25 to 50 feet shoreward of the ordinary high water mark. Reclamation may also need to acquire land or easements to allow access for construction and to maintain the shoreline protection. Reclamation estimates that the total area of property acquisition for this alternative would be approximately 20 acres.

Reclamation would only acquire property from willing sellers. Reclamation would work with property owners to determine what shoreline protection measures are appropriate and the extent of acquisition required. Reclamation would follow the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 USC 4601) and the procedures described in the Reclamation Manual Directives and Standards (LND 06-01, 2003) for any property or easement acquisition.

Reclamation would hire certified contractors to conduct all Appropriate Inquiries surveys related to environmental site assessments prior to acquiring any land interests, easements, and acquisitions. These assessments evaluate a property's environmental conditions and determine the likelihood of any contamination. Components of the surveys include interviews with past and present landowners or occupants; searches for recorded environmental cleanup liens; reviews of Federal, Tribal, State and local governments records; and visual inspections of the real property and adjoining properties. Reclamation would take any necessary remediation associated with the site into consideration as part of securing the land interest.

4.15.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

Alternative 3 would have the same impacts on Federal plans and policies as Alternative 2 (Section 4.15.4).

4.15.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.15.4.1).

4.15.5.2 Additional Stored Water Used for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.15.4.2).

4.15.5.3 Hybrid Shoreline Protection

Hybrid Shoreline Protection measures would have the same land use impacts as Rock Shoreline Protection measures, described for Alternative 2 (Section 4.15.4.3).

4.15.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.15.4.4).

4.15.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.15.4.5).

4.15.5.6 Land Acquisition for Shoreline Protection

Impacts of land acquisition for hybrid shoreline protection would be similar to rock shoreline protection. Reclamation would follow the same procedures for land acquisition for hybrid shoreline protection as for rock shoreline protection (Section 4.15.4.3).

4.15.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

Alternative 4 would have the same impacts on Federal plans and policies as Alternative 2 (Section 4.15.4).

4.15.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.15.4.1).

4.15.6.2 Additional Stored Water Used for TWSA

Operation

If Reclamation uses the additional stored water for TWSA, the reliability of water supply for irrigators would slightly improve. The project would not increase the amount of irrigated land. The improved reliability of water supply to existing irrigated lands could encourage irrigators in prorationed districts to plant crops that are more permanent. Because the amount of water resulting from the Cle Elum Pool Raise Project would be small relative to the amount of water needed to reduce prorationing (an additional 1.6 percent in drought years), the project would have minor indirect effects to land use.

4.15.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.15.4.3).

4.15.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

Alternative 5 would have the same impacts on Federal plans and policies as Alternative 2 (Section 4.15.4).

4.15.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.15.4.1).

4.15.7.2 Additional Stored Water Used for TWSA

Impacts would be the same as for Alternative 4 (Section 4.15.6.2).

4.15.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.15.5.3).

4.15.8 Mitigation Measures

Reclamation would continue to coordinate with the USFS on mitigation for inundation of USFS-managed land. Reclamation would work with shoreline property owners to determine the appropriate type of shoreline protection for their properties and to reduce the amount of property acquisition or easements required. For any property or easement acquisition, Reclamation would comply with applicable Federal regulations.

4.16 Utilities

4.16.1 Methods and Impact Indicators

The determination of potential effects on utilities relies on identifying the existing utilities, including electricity, telecommunications, sewer, water, and solid waste, in the project area; comparing them to the utility requirements of the proposed facilities; and making a determination as to the sufficiency of the existing utilities to meet the needs of the project. The analysis also considers interruption of existing utilities and whether the Proposed Action would require any utilities to relocate.

Potential impacts to OSS and groundwater wells are described in Section 4.5.4.1. Table 4-26 lists impact indicators and significance criteria for utilities.

Table 4-26. Utilities Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Sufficiency of existing utilities for the project	Existing utilities do not meet the needs of the project
Interruption of existing utilities	Existing utilities are interrupted to an unacceptable level or need to be rebuilt

4.16.2 Summary of Impacts

The No Action Alternative would not result in impacts to utilities because there would be only minor reconstruction of fish passage facilities, and no construction associated with or changes to operations at Cle Elum Reservoir.

None of the project components under Alternative 2 through 5 would require access to existing utilities or would generate solid waste; therefore, there is no potential for the projects to exceed to the existing capacity of those utilities. Under all action alternatives, Reclamation would remove vault toilets at Speelyi Beach and Wish Poosh and Cle Elum River Campgrounds and replace them with portable toilets. Reclamation would also permanently remove the water and electrical services to Picnic Island and the boat launch area at Wish Poosh Campground. Reclamation would coordinate with the Forest Service on utility work at these locations to minimize any potential impacts to service.

4.16.3 Alternative 1 – No Action Alternative

Reclamation and Ecology would not implement the Cle Elum Pool Raise Project under the No Action Alternative. Therefore, no changes to utilities would occur in the project area. The projects identified as occurring under the No Action Alternative, as described in Section 2.3, would not impact utilities because they would not require utility connections and would not interrupt any existing utilities.

4.16.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.16.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Construction activities associated with the radial gate modifications would not require access to existing utilities, would not generate solid waste, and would not disrupt or require relocation of any existing utilities. Therefore, Reclamation and Ecology do not anticipate any impacts on utilities.

Operation

Operation of the modified radial gates following construction would not increase the power requirements to operate the gates, would not generate solid waste, or require access to additional utilities. Therefore, Reclamation and Ecology do not anticipate any impacts on utilities.

Increased Reservoir Pool

Operation

Reclamation does not anticipate that increased water levels would affect utilities because the only utilities located in the newly inundated areas are those at Wish Poosh Campground. Section 4.16.8 describes measures to reduce impacts to those utilities.

4.16.4.2 Use of Additional Stored Water for Instream Flow

The use of water for instream flows would not affect utilities because it would not conflict with existing utilities, would not generate solid waste, or require access to additional utilities; therefore, Reclamation anticipates no utility impacts from the use of additional stored water for instream flow.

4.16.4.3 Rock Shoreline Protection

Construction

Construction activities associated with installation of rock shoreline protection would not require access to existing utilities, and would not disrupt or require relocation of any existing utilities. Shoreline protection measures would be located in a narrow strip (25 to 50 feet wide) on the reservoir shoreline and it is unlikely that they would impact any utilities. It is possible that private utility lines could be located in the shoreline areas proposed for protection. Reclamation would identify these locations during final design and take appropriate measures to minimize the effects of any conflicts.

Operation

The completed project would not conflict with existing utilities, would not generate solid waste, or require access to additional utilities; therefore, Reclamation anticipates no utility impacts from rock shoreline protection.

4.16.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Construction activities associated with the saddle dikes and right dam abutment would not require access to existing utilities, and would not disrupt or require relocation of existing utilities. It is unlikely that utility lines are located in the construction areas, but Reclamation would confirm the location of utilities during final design and take appropriate measures to minimize disruption of any utilities identified. Reclamation would remove the existing vault toilets at Speelyi Beach Day Use Area and replace them with portable toilets.

Operation

The completed project would not conflict with existing utilities, would not generate solid waste, or require access to additional utilities; therefore, Reclamation and Ecology do not anticipate any impacts.

4.16.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

Construction activities associated with shoreline protection would not require access to existing utilities and would not generate solid waste. Construction would require closure of the vault toilet at the Picnic Island day use area within the Wish Poosh Campground and removal of the water and electrical services to the island and boat launch area. Reclamation would replace the vault toilet with portable toilets and permanently remove the electrical and water services from the site, as they would no longer be necessary. Reclamation would also remove the two vault toilets at the Cle Elum River Campground and replace them with portable toilets. Reclamation would coordinate all utility service removals with the USFS to minimize any potential impacts to service.

Operation

The completed project would not require access to additional utilities, would not disrupt existing utilities, and would not generate solid waste. Reclamation would replace the vault toilets at Wish Poosh and Cle Elum River Campgrounds with portable toilets, and removal would not cause long-term impact to campground facilities.

4.16.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.16.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.16.4.1).

4.16.5.2 Use of Additional Stored Water for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.16.4.2).

4.16.5.3 Hybrid Shoreline Protection

Construction activities associated with the hybrid shoreline protection would be similar to those for rock shoreline protection (Section 4.16.4.3).

4.16.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.16.4.4).

4.16.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.16.4.5).

4.16.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.16.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.16.4.1).

4.16.6.2 Use of Additional Stored Water for TWSA

Use of additional stored water for TWSA would not impact utilities.

4.16.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.16.4.3).

4.16.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.16.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.16.4.1).

4.16.7.2 Use of Additional Stored Water for TWSA

Impacts would be the same as for Alternative 4 (Section 4.16.6.2).

4.16.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.16.5.3).

4.16.8 Mitigation Measures

Reclamation would conduct utility surveys during final design and take appropriate measures to minimize conflicts with any utilities identified in the construction areas. Any potential conflicts or relocation would be coordinated with the affected utility. Reclamation also would coordinate with the USFS to relocate or replace affected utilities, as appropriate. Because there are no anticipated impacts to utilities, no other mitigation measures are required.

4.17 Transportation

4.17.1 Methods and Impact Indicators

Analysis of impacts to transportation includes evaluating potential increases in vehicle traffic levels and traffic flow disruptions, inundation of roads and bridges; interruptions to emergency service vehicle response, and disruptions to the use or accessibility of other means of transportation (e.g., snowmobiles, pedestrians, or bicycles). Impacts would be anticipated if the project were to result in road or lane closures or roadways exceeding their capacity leading to an increase in traffic delays or interruptions in the response time for emergency responders; if any roads would be inundated by the pool raise leading to a road closure or relocation; or, if the project would lead to any changes in the use or accessibility to other means of transportation. Table 4-27 lists impact indicators and significance criteria for transportation. Discussion of the number of truck trips represents the number of round trips (each trip includes a trip to the construction site and back).

Table 4-27. Transportation Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Increase in vehicle traffic levels or traffic flow disruptions	Increase in traffic delays Interruption of emergency service vehicle response
Inundation of roads and bridges	Road or bridge closures as the result of inundation

4.17.2 Summary of Impacts

The No Action Alternative would not result in impacts to transportation because construction would be limited to reconstruction of fish passage facilities at Cle Elum Reservoir, which would generate only minor traffic.

Impacts to transportation from Alternatives 2 through 5 would be similar. The increase in construction vehicle traffic would represent a temporary, negligible change over existing traffic levels and traffic levels would return to normal following construction. There are no weight or height limitations that are likely to restrict access of construction equipment to the site, and no oversized vehicles would be required during construction. None of the alternatives would result in inundation of roads or bridges at the reservoir site or downstream. Construction would not interrupt emergency vehicle response or disrupt the use or accessibility of other means of transportation (e.g., bicycles, snowmobiles, or pedestrians). All action alternatives would require temporary closure of a portion of Lake Cabins Road for less than 2 weeks during construction at Saddle Dikes 2 and 3. The closure would not restrict landowner access, as there are alternate routes to properties to the north and south of the closure. Construction to increase shoreline protection on portions of Salmon La Sac Road would temporarily restrict traffic to one lane, but Reclamation would maintain access. Once construction is complete, the project would not require additional trips for maintenance or operation.

4.17.3 Alternative 1 – No Action Alternative

Under the No Action Alternative, Reclamation and Ecology would not implement the Cle Elum Pool Raise Project. The projects identified as occurring under the No Action Alternative, as described in Section 2.3, would not generate new traffic sources; therefore, Reclamation and Ecology do not anticipate any impacts to transportation.

4.17.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.17.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction

Modification of the existing radial gates on the Cle Elum Dam spillway would require minimal truck shipments of construction materials and transportation of construction workers to work sites. Construction worker trips would be limited to the 6- to 9-month period of construction. Local access to the work site would be on existing local roadways, including SR-903 (Salmon La Sac Road), Lake Cabins Road, and County Road 25010 (Lake Cle Elum Dam Road). Construction does not require oversized vehicles and no weight or height limitations are likely to restrict access of construction equipment to the site. The minimal expected vehicle trips would not disrupt traffic in the area or exceed the ability of the roads to handle the increased traffic. The ability of emergency responders to respond to an incident would not be affected because no increases in delays and no road closures would occur. No changes to existing access for pedestrians, snowmobiles, or bicycles along local roadways would occur.

Operation

There are no anticipated transportation impacts during operation and maintenance because the project would result in no additional traffic on local or regional roadways.

Increased Reservoir Pool

Operation

The increased reservoir pool would not inundate roads in the project area; therefore, no impacts to transportation would occur. The higher pool level would not affect SR-903 (Salmon La Sac Road) and the NF-4308 bridge over the Cle Elum River. As discussed in Section 4.17.4.3, Reclamation would install additional shoreline protection at stretches of Salmon La Sac Road to prevent erosion.

4.17.4.2 Additional Stored Water Used for Instream Flow

Release of additional stored water for instream flow would not result in any changes to transportation in the project area. Increased flows in the river would be small relative to existing river flows and would not impact downstream transportation infrastructure.

4.17.4.3 Rock Shoreline Protection

Construction

Construction of rock shoreline protection would require truck shipments of construction materials and transportation of construction workers to work sites. Construction at the

Speelyi Beach Day Use Area and WSDOT pullout would require use of local materials, eliminating the need for hauling to the site. For construction at the other locations described in Section 2.4.3.1, Reclamation would import up to an estimated 38,400 cubic yards of rock riprap for construction at each location. Reclamation proposes to acquire the rock material from a commercial quarry approximately 15 to 30 miles from the reservoir. Delivery of the materials would require approximately 4,270 truck trips, each hauling 20 tons of rock. Over the course of the construction period (generally August through October), this would equate to up to 50 trucks per day travelling along SR-903 or Lake Cle Elum Dam Road to and from I-90. Along SR-903, this would result in approximately a 0.7 percent increase in traffic along the busiest portion of the road (from the reservoir to the highway) to a 5 percent increase along the portion with the least amount of traffic (from the south end of the reservoir to the north). This would represent a negligible increase over existing traffic levels. Reclamation expects that construction would occur over a period of 5 years as funding becomes available, reducing the expected truck trips during any one construction year.

The expected increased truck shipments and transportation of construction workers would not disrupt traffic in the area or exceed the ability of the roads to handle the increased traffic. The 0.7 percent increase in traffic along the busiest portion of SR-903 would not markedly change traffic patterns as this would represent a negligible increase in traffic. Although the 5 percent increase in traffic along the least travelled portion of SR-903 would be a greater percentage increase, this would also not markedly change traffic patterns as the baseline traffic levels on the road are small. There are no weight or height limitations that are likely to restrict access of construction equipment to the site, and no oversized vehicles would be required during construction. Reclamation anticipates no impacts to the ability of the emergency vehicles to respond to an incident. There would be no impact on the access for pedestrians, snowmobiles, and bicycles to local roadways.

Operation

The completed project would result in little or no additional traffic on local or regional roadways, so there would not be transportation impacts during operations and maintenance.

4.17.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Construction

Raising the elevation of the saddle dikes would require truck shipments of construction materials and transportation of construction workers to work sites. Reclamation would access construction at Saddle Dike 1 from the paved Lake Cle Elum Dam Road and then north 800 feet along the gravel-surfaced main dike to a cleared area. From the cleared area, Reclamation would construct an access road roughly 330 feet long and 20 feet wide. Salvaged riprap as well as imported riprap would be required. Trucks would haul the imported riprap via public roads; less than 20 truckloads would be required. Reclamation expects that this work would take less than 2 weeks with approximately two trucks per day travelling along Lake Cle Elum Dam Road. This would represent a temporary, negligible increase over existing traffic levels and traffic levels would return to normal following construction.

Access to Saddle Dikes 2 and 3 would be via Lake Cabins Road. Construction would require closure of Lake Cabins Road from 100 feet south of Saddle Dike 2 to 100 feet north of Saddle Dike 3. The closure would not restrict landowner access, as there are alternate routes to properties to the north and south of the closure. Existing asphalt surfacing and removal of miscellaneous improvements (ecology block retaining walls) at the day use area would require 15 dump truck loads. To raise Saddle Dike 2, approximately 78 truck trips would be required to transport material to the site, a short distance along Lake Cabins Road. To raise Saddle Dike 3, approximately 43 truck trips would be required to transport material from the borrow area a short distance along Lake Cabins Road. This would represent a temporary, negligible increase over existing traffic levels and traffic levels would return to normal following construction.

To construct the new boat ramp, cement mixers would transport concrete to the site; less than 10 trips would be required along Lake Cabins Road. Hauling riprap to the site would require less than 110 truck trips over a 2-month period. Approximately 100 truck trips would be required to transport material to construct the armored berm on the right abutment of the dam with an additional 50 loads required to haul gravel. All materials would be transported from the borrow area via Lake Cabins Road. This would represent a temporary, negligible increase over existing traffic levels as traffic levels would return to normal following construction.

The expected increased truck shipments and transportation of construction workers to work sites would not disrupt traffic in the area or exceed the ability of the roads to handle the increased traffic because the increase would represent a temporary, negligible change over existing traffic levels and traffic levels would return to normal following construction. No oversized vehicles would be required during construction, and there are no weight or height limitations that are likely to restrict access of construction equipment to the site. There are no anticipated impacts on the ability of emergency responders to respond to an incident. There are no anticipated changes to existing access for pedestrians, snowmobiles, and bicycles along local roadways.

Operation

There are no anticipated transportation impacts during operation and maintenance because the project would cause little or no additional traffic on local or regional roadways.

4.17.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Construction

Construction access to install shoreline protection at Wish Poosh Campground and Cle Elum River Campground would be via the paved Salmon La Sac Road. Raising the Wish Poosh boat launch and wellhouse access roads would utilize materials from onsite, so no truck trips would be required. In Cle Elum River Campground, construction would utilize materials from onsite so no truck trips would be required. Construction would occur during seasonal closure of the campground, so the project would not affect access to the campground.

Reclamation would install additional riprap along the three segments of the Salmon La Sac Road embankment (Section 2.4.3 and Figure 2-8). Access would be via the existing road and construction staging and equipment would be located on the reservoir side lane of the road. Reclamation would maintain through traffic, although at times travel would be restricted to a single lane. Less than 500 truckloads would be required to transport materials to the site. This would represent a temporary, negligible increase over existing traffic levels as traffic levels would return to normal following construction.

The expected increase in truck shipments and transportation of construction workers to work sites would not disrupt traffic in the area or exceed the ability of the roads to handle the increased traffic. No oversized vehicles would be required during construction, and there are no weight or height limitations that are likely to restrict access of construction equipment to the site. Reclamation does not anticipate that raising the pool elevation of Cle Elum Reservoir would impact local roadways or the ability of emergency responders to respond to an incident. There would be no impact on the access for pedestrians, snowmobiles, and bicycles to local roadways.

Operation

The project would result in little or no additional traffic on local or regional roadways, so there would not be transportation impacts during operations and maintenance.

4.17.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.17.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.17.4.1).

4.17.5.2 Additional Stored Water Used for Instream Flow

Impacts from using the additional stored water would be the same as Alternative 2 (Section 4.17.4.2).

4.17.5.3 Hybrid Shoreline Protection

Under Alternative 3, Reclamation would provide shoreline protection for the same areas as described under hybrid shoreline protection (Section 2.5.3.3). The impacts in these areas would be similar to those described for Alternative 2 (Section 4.17.4.3). Hybrid shoreline protection construction activities would result in an additional 1,900 truck trips hauling materials to constructions sites. Together with the 4,270 truck trips described under Alternative 2, there would be a total of 6,170 truck trips anticipated under hybrid shoreline protection. Over the course of the construction period (generally August through October), this would equate to up to 75 trucks per day travelling along SR-903 or Lake Cle Elum Dam Road to and from I-90. Along SR-903, this would cause a to 1.1 percent increase in traffic along the busiest portion of the road (from the reservoir to the highway) to an 8 percent increase along the portion with the least amount of traffic (from the south end of the reservoir to the north). This would represent a small increase over existing traffic levels. Reclamation expects that construction would occur over a period of 5 years as funding becomes available; therefore, the actual truck trips during any one construction seasons would be less than the estimates presented here.

The expected increased truck shipments and transportation of construction workers would not disrupt traffic in the area or exceed the ability of the roads to handle the increased traffic. The 1.1 percent increase in traffic along the busiest portion of SR-903 would not markedly change traffic patterns as this would represent a negligible increase in traffic. Although the 8 percent increase in traffic along the least-travelled portion of SR-903 would be a greater percentage increase, this would also not markedly change traffic patterns as the baseline traffic levels on the road are small. No oversized vehicles would be required during construction, and no weight or height limitations are likely to restrict access of construction equipment to the site. Reclamation does not anticipate any impacts on the ability of the emergency vehicles to respond to an incident. There would be no impact to access for pedestrians, snowmobiles, and bicycles to local roadways.

4.17.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.17.4.4).

4.17.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.17.4.5).

4.17.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.17.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.17.4.1).

4.17.6.2 Additional Stored Water Used for TWSA

Use of the additional stored water for TWSA would not impact transportation. Increased flows in the river would be small relative to existing river flows and would not impact downstream transportation infrastructure.

4.17.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.17.4.3).

4.17.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.17.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.17.4.1).

4.17.7.2 Additional Stored Water Used for TWSA

Use of the additional stored water for TWSA would be the same as Alternative 4 (Section 4.17.6.2).

4.17.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.17.5.3).

4.17.8 Mitigation Measures

Mitigation measures to reduce transportation impacts would include maintaining access to properties, installing signs, marking detour routes, flagging, and providing information to the public, including notifications in advance of construction activities. Reclamation would provide temporary signage for closures and construction access along Lake Cabins Road in accordance with the Federal Highway Administration Manual of Uniform Traffic Control Devices and the Washington State supplement.

4.18 Socioeconomics

4.18.1 Methods and Impact Indicators

The socioeconomic analysis developed for this study consists of estimates of the major impacts generated by the alternatives. An economic impact analysis focuses on estimating alternative-specific economic impacts to the study region’s local economy. The socioeconomic analysis reported here examines two elements of the Cle Elum Pool Raise Project that likely would generate economic impacts in the region and across the state: (1) spending associated with construction, operation, and maintenance; and (2) economic activity associated with changes in agricultural production during severe drought years attributable to increased water availability. This analysis does not quantify the market or nonmarket values of goods and services generated under the alternatives. It does describe these effects on values when relevant.

The analysis includes not only the initial or direct impact on the primary affected industries, but also the secondary impacts (multiplier effects) resulting from those industries, providing inputs to the directly affected industries (indirect effects) as well as household spending of income earned by those employed in the directly or indirectly impacted sectors of the economy (induced effects).

This analysis uses IMPLAN (Impact Analysis for PLANning) modeling software to examine the economic impacts of the project. IMPLAN is an input-output (IO) model that works by tracing how spending associated with a specific project circulates through the defined impact area. The analysis describes economic impacts in the 4-county study area (Kittitas, Benton, Yakima, and Franklin Counties), and across the rest of the State of Washington. As described in Section 3.18, Reclamation built IO models for both study areas using 2012 IMPLAN data, the most recent available data.

Impact indicators include the following types of economic impacts attributable to the project:

- ***Direct Impacts***. These impacts describe changes in economic activity directly tied to spending associated with the project (e.g., wages paid to local construction workers).

- ***Indirect Impacts***. These impacts occur as businesses buy from other businesses, oftentimes referred to as “supply-chain” impacts. They begin with changes in economic activity for businesses that supply directly affected businesses (e.g., the welding supply business that supplies or rents equipment to construction contractors). They continue as these businesses, in turn, purchase goods and services necessary to operate.

- ***Induced Impacts***. These impacts describe changes in economic activity attributable to changes in household income generated by direct and indirect impacts of the project (e.g., spending by local construction workers on consumer goods and services).

Three variables that measure economic activity (output, personal income, and jobs) describe each type of economic impact. Increases in these measures are positive impacts, while decreases in these measures correspond to negative impacts.

Section 3.18 further describes these measures. Reclamation measured impacts by alternative compared to the No Action Alternative. Table 4-28 lists impact indicators and significance criteria for socioeconomics.

Table 4-28. Socioeconomic Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Changes in output (the value of production)	Increase or decrease in output
Changes in personal income	Increase or decrease in personal income
Changes in employment	Increase or decrease in jobs

4.18.2 Summary of Impacts

There would be no direct impacts associated with the No Action Alternative, although existing trends in the region would result in some indirect impacts to the regional economy.

For the action alternatives, socioeconomic impacts are positive, resulting in a gain in regional economic activity. Construction would increase output in the short term. Alternatives 4 and

5 would increase agricultural production and market value during severe drought years, relative to the No Action Alternative.

4.18.3 Alternative 1 – No Action Alternative

Under the No Action Alternative, Reclamation and Ecology would not implement the project and the project would not generate impacts from construction costs or from additional water available for agricultural production. There would also be no direct increases in local employment associated with new construction jobs and support services. Existing trends in the region would continue with no influence from the Cle Elum project. As Table 4-29 shows, agriculture employment is 36,100 and construction employment is 13,100 in the four-county area as of 2012. These levels are a slight decline from the 2009 employment numbers of 38,200 and 13,500, respectively. As the national and regional economy continues to recover, it is likely that these employment levels would stabilize and possibly improve. Demand for vacation and residential housing and infrastructure would likely continue as regional amenities (outdoor recreation opportunities, high percentage of sunny days, etc.) improve and experience greater recognition and demand, which would support the construction industry. Growth in the wine industry and other high value crops should also contribute to strength in the regional agriculture industry. Increased unreliability associated with uncertain proratable supply for irrigation could result in a shift toward crops with lower irrigation needs, and potentially lower economic value.

4.18.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

Economic impacts associated with Alternative 2 would be minor, temporary, and primarily construction related. Additional stored water for instream flow would have some currently unquantified but minor benefit for fish populations due to increased areas suitable for rearing during drought years.

4.18.4.1 Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Construction expenditures associated with the project would fuel economic activity in the 4-county study area and across the state of Washington. These expenditures likely would also support economic activity outside of Washington. However, those impacts lie beyond the scope of this analysis.

Reclamation distributed these expenditures among the aggregate industry sectors of the economies in the four-county study area and the State of Washington. Reclamation then applied the IMPLAN multipliers and calculated the direct, indirect, and induced impacts on output, personal income, and jobs in these two economies.

Table 4-29 summarizes the economic impacts associated with radial gate modifications in the project. The impacts summarized in the table represent the sum of economic impacts of construction expenditures during the expected 1-year construction period. Direct output represents spending on labor, materials, equipment, and related items that take place in the two areas, totaling about $1.3 million within the 4-county study area, and about $0.4 million across the rest of Washington. Direct personal income is a subset of direct output. It represents the portion of direct output going toward labor. In this case, labor includes workers on the construction site as well as the workers responsible for manufacturing and supplying the materials and equipment purchased for construction. Direct job years represent the years of full- and part-time employment supported by construction expenditures, including both workers on the construction site as well as the workers responsible for manufacturing and supplying the materials and equipment purchased for construction. Indirect impacts represent output, personal income, and employment responsible for supporting the direct economic impacts. Induced impacts represent the spending flowing from direct and indirect output and income.

Reclamation split impacts in the table above into three geographic categories in terms of where the impacts would take place: those that would occur within the 4-county study area, those that would occur elsewhere in Washington, and those that would occur in Washington as a whole. The large majority of direct impacts occur in the 4-county study area. A larger share of the indirect and induced impacts occurs elsewhere in Washington, which illustrates the economic linkages between the economy in the 4-county study area and the rest of the state.

Table 4-29. Summary of Economic Impacts, by Type, from Construction Expenditures for the Radial Gate Modification Portion of the Project

Region/Impact Measure	Direct	Indirect	Induced	Total
4-County Region				
Output	$1,323,000	$77,000	$206,000	$1,606,000
Personal Income	$1,088,000	$34,000	$66,000	$1,188,000
Jobs	17	1	2	20
Rest of Washington				
Output	$372,000	$152,000	$673,000	$1,197,000
Personal Income	$123,000	$50,000	$228,000	$401,000
Jobs	2	1	5	8
Total Washington State				
Output	$1,695,000	$229,000	$879,000	$2,803,000
Personal Income	$1,211,000	$84,000	$295,000	$1,590,000
Jobs	19	2	6	27

Note: Calculated with cost estimates for radial gate portion of Pool Raise Project and 2012 IMPLAN base data. Total Washington State is the sum of the first two categories. Totals may not sum due to rounding.

Table 4-30 shows the distribution of all impacts (direct, indirect, and induced) across different industry sectors within the 4-county study area. Note that these impact measures are gross, and not net of some other potential expenditure of the cost funds. Given that the majority of the State and Federal funding would not likely be spent in the region but for the project, these impacts are likely quite comparable to final net impacts. Similarly, because the magnitude of these impacts is quite low relative to the overall amount of employment, income, and output in the region, it is unlikely, on net, to have crowding effects on other economic activity. Consequently, these economic impact indicators likely do represent a strong estimation of the impact of the project, and these are positive market-based economic impacts.

The 20 estimated jobs represent a small portion of the overall labor force in the region, and of the overall temporary housing capacity. In addition, it is unlikely that all labor would require housing. It is possible that one or two establishments might experience higher than usual occupancy during construction, but this seems unlikely, and if so, limited. While the construction season would correlate to tourism periods, the vicinity holds several motels in Cle Elum, Ellensburg, Yakima and elsewhere along Interstate 90 and 82.[1]

Table 4-30. Distribution of Construction Impacts from Radial Gate Modification Portion of the Project Across Aggregate Industry Sectors, 4-County Study Area

Aggregate Industry Sector	Output	Personal Income	Jobs
Agriculture	$61,000	$19,000	1
Mining	$7,000	$1,000	0
Construction	$1,010,000	$981,000	15
Manufacturing	$74,000	$15,000	0
Transportation, Information, Utilities	$33,000	$8,000	0
Trade	$238,000	$101,000	2
Service	$173,000	$59,000	1
Government	$9,000	$4,000	0
Total	$1,606,000	$1,188,000	20

Note: Calculated with cost estimates for radial gate portion of Pool Raise Project and 2012 IMPLAN base data. Totals may not sum due to rounding.

Table 4-31 shows the comparison of job impacts summarized in the table above with the total employment in the 4-county study area, by aggregate industry sector. The radial gate portion of the project would have minor impacts on employment in the 4-county study area. The percent of total for other impacts varies slightly. However, they are comparable to employment impacts relative to totals for the 4-county study area.

[1] There are 10 hotels and motels, 3 RV parks, and 29 campgrounds in Cle Elum. Including Ellensburg and Yakima increases the number of hotels and motels by an additional 26, based on Google Maps data.

Table 4-31. Employment Impacts of Radial Gate Modification Portion of the Project as a Percentage of Total Employment, 4-County Study Area

Aggregate Industry Sector	Total Employment - 4-county Region	Jobs	Percent of Total
Agriculture	36,130	1	0.00
Mining	1,636	0	0.00
Construction	13,114	15	0.11
Manufacturing	16,228	0	0.00
Transportation, Information, Utilities	12,699	0	0.00
Trade	37,022	2	0.01
Service	115,551	1	0.00
Government	43,021	0	0.00
Total	275,402	20	0.01

Note: Totals may not sum due to rounding.

4.18.4.2 Use of Additional Stored Water for Instream Flow

The additional water stored for instream flow would have minor, unquantified beneficial effects on fish populations. The additional water would increase the areas suitable for rearing during dry years. This might possibly increase recreational or commercial fishing activity. However, data are not available that quantify this impact resulting from potential improvements in fish populations.

4.18.4.3 Rock Shoreline Protection

Table 4-32 summarizes the economic impacts associated with constructing the rock shoreline protection portion of the project. These impacts would happen over a 5-year construction period.

Table 4-33 summarizes the distribution of construction impacts for rock shoreline portion of the project across aggregate industry sectors in the 4-county study area.

Table 4-32. Summary of Economic Impacts, By Type, from Construction Expenditures for the Rock Shoreline Portion of the Project

Region / Impact Measure	Direct	Indirect	Induced	Total
4-County Region				
Output	$6,493,000	$753,000	$1,177,000	$8,424,000
Personal Income	$4,137,000	$243,000	$379,000	$4,758,000
Jobs	71	6	10	86
Rest of Washington				
Output	$1,395,000	$682,000	$2,216,000	$4,293,000
Personal Income	$472,000	$202,000	$749,000	$1,423,000
Jobs	9	3	15	28
Total Washington State				
Output	$7,888,000	$1,435,000	$3,394,000	$12,717,000
Personal Income	$4,609,000	$445,000	$1,128,000	$6,181,000
Jobs	81	9	25	115

Note: Calculated with cost estimates for rock shoreline portion of the Project and 2012 IMPLAN base data. Totals may not sum due to rounding.

Table 4-33. Distribution of Construction Impacts for Rock Shoreline Portion of Project Across Industry Sector, 4-County Study Area

Aggregate Industry Sector	Output	Personal Income	Jobs
Agriculture	$44,000	$15,000	0
Mining	$743,000	$135,000	4
Construction	$2,989,000	$2,966,000	44
Manufacturing	$353,000	$32,000	1
Transportation, Information, Utilities	$1,021,000	$321,000	7
Trade	$1,943,000	$800,000	19
Service	$1,253,000	$450,000	10
Government	$78,000	$39,000	1
Total	$8,424,000	$4,758,000	86

Note: Calculated with cost estimates for rock shoreline portion of the Project and 2012 IMPLAN base data. Totals may not sum due to rounding.

The employment impacts of the rock shoreline portion of the project expressed as a percentage of total employment by the aggregate industry sector are significantly less than 0.4 percent. The rock shoreline portion of the project would have minor impacts on employment in the 4-county study area. The percent of total for other impacts varies slightly. However, they are comparable to employment impacts relative to totals for the 4-county study area.

Given the 5-year spread of these labor impacts, they would be less than 20 per year, so less than the employment impact described above for radial gate construction. Therefore, the same reasoning holds in that these impacts are likely strong indicators of the net impacts, and therefore represent positive impacts. The same reasoning holds that the employment would not place a strain on the labor or housing supply. The employment associated with the shoreline portion of the project would not be particularly specialized, and therefore is likely to be available locally and represent a large portion of the labor pool.

4.18.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.18.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.18.4.1).

4.18.5.2 Use of Additional Stored Water for Instream Flow

Impacts would be the same as for Alternative 2 (Section 4.18.4.2).

4.18.5.3 Hybrid Shoreline Protection

Table 4-34 summarizes the economic impacts associated with constructing the hybrid shoreline protection portion of the project. These impacts would happen over a 5-year construction period. They do not represent annual impacts.

Table 4-34. Summary of Economic Impacts, By Type, from Construction Expenditures for the Hybrid Shoreline Portion of the Project

Region/Impact Measure	Direct	Indirect	Induced	Total
4-County Region				
Output	$6,507,000	$755,000	$1,177,000	$8,439,000
Personal Income	$4,221,000	$257,000	$379,000	$4,856,000
Jobs	71	6	10	87
Rest of Washington				
Output	$1,340,000	$646,000	$2,270,000	$4,256,000
Personal Income	$460,000	$197,000	$767,000	$1,424,000
Jobs	8	3	16	28
Total Washington State				
Output	$7,848,000	$1,400,000	$3,447,000	$12,695,000
Personal Income	$4,680,000	$454,000	$1,146,000	$6,280,000
Jobs	80	9	25	115

Note: Calculated with cost estimates for hybrid shoreline portion of the Project and 2012 IMPLAN base data. Totals may not sum due to rounding.

Table 4-35 summarizes the distribution of construction impacts for the hybrid shoreline portion of the project across aggregate industry sectors in the 4-county study area. These impacts are of similar magnitude to those under Alternative 2, and consequently similarly represent positive impacts that are unlikely to generate noticeable undesirable crowding effects on the labor or housing markets.

Table 4-35. Distribution of Construction Impacts for Hybrid Shoreline Portion of Project Across Industry Sector, 4-County Study Area

Aggregate Industry Sector	Output	Personal Income	Jobs
Agriculture	$143,000	$46,000	1
Mining	$733,000	$132,000	4
Construction	$3,112,000	$3,090,000	46
Manufacturing	$261,000	$17,000	0
Transportation, Information, Utilities	$996,000	$313,000	7
Trade	$1,865,000	$771,000	18
Service	$1,251,000	$450,000	10
Government	$77,000	$38,000	1
Total	$8,439,000	$4,856,000	87

Note: Calculated with cost estimates for hybrid shoreline portion of the Project and 2012 IMPLAN base data. Totals may not sum due to rounding.

The employment, output, and personal income impacts of the hybrid shoreline portion of the project, expressed as a percentage of total by aggregate industry sector, are comparable to those for the rock shoreline protection alternative. The hybrid shoreline portion of the project would have minor impacts on employment, output, and personal income in the 4-county study area.

4.18.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.18.6.1 Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.18.4.1). Similarly, these impacts on net would be positive with any undesirable labor or housing impacts unlikely.

4.18.6.2 Use of Additional Stored Water for TWSA

Changes in Agricultural Production

The additional stored water for TWSA would increase the overall water supply so the amount of water available to proratable irrigators during severe drought years rises, on average, from 48.1 percent to 48.6 percent of their full entitlement. With more water available during severe drought years, this alternative would increase agricultural production and market value during severe drought years, relative to the No Action Alternative. To model the economic impacts of changes in agricultural output during severe drought years, the analysis includes estimates of the Alternative’s effect on gross farm earnings, distribution across the appropriate types of crops, and allocation to the corresponding agricultural industry sectors in the IMPLAN model. Note that the model run utilized for this analysis does not incorporate any conservation or trading activity beyond what is already occurring in the basin.

Table 4-36 summarizes the economic impacts associated with the change in agricultural production attributed to the additional stored water for TWSA in a typical severe drought year. Since the entirety of the change in agricultural production occurs within the 4-county study area, by definition, all direct economic impacts also occur within this area. Direct output represents the difference between gross farm earnings during a severe drought year with this alternative and gross farm earnings without it. IMPLAN modeling included changes in direct output for each affected agricultural sector, and estimated the associated changes in direct personal income and jobs.

Table 4-36. Summary of Economic Impacts, by Type, from Agricultural Production Associated with Increased Water Storage During a Severe Drought Year

Region/Impact Measure	Direct	Indirect	Induced	Total	Multiplier
4-County Region					
Output	$5,523,000	$1,951,000	$2,122,000	$9,596,000	1.74
Personal Income	$944,000	$938,000	$594,000	$2,476,000	2.62
Jobs	27	28	17	72	2.68
Rest of Washington					
Output	$0	$408,000	$239,000	$647,000	N/A
Personal Income	$0	$72,000	$59,000	$130,000	N/A
Jobs	0	2	1	3	N/A
Total Washington State					
Output	$5,523,000	$2,359,000	$2,361,000	$10,243,000	1.85
Personal Income	$944,000	$1,010,000	$653,000	$2,606,000	2.76
Jobs	27	30	19	75	2.80

Note: Calculated using a spreadsheet model of direct irrigation benefits and 2012 IMPLAN base data. Totals may not sum due to rounding.

To calculate the indirect and induced impacts of this change in agricultural production, Reclamation ran direct impacts through IMPLAN. The impacts in the table do not include downstream impacts tied to agricultural production during drought years, such as food processing, transportation, and restaurant sales. In total, the Alternative's impact on agricultural production during a severe drought year would generate about $9,596,000 in output within the 4-county study area. Of that output, about $2,476,000 would go toward personal incomes that would support about 72 jobs.

Table 4-37 shows distribution of these impacts (direct, indirect, and induced) in the 4-county study area during a severe drought year across different industry sectors. Most of the economic impacts associated with an increase in agricultural production during drought years would stay in the agricultural sector, accounting for roughly 65 percent of the total change in output, 66 percent of the increase in personal income, and 68 percent of jobs created. A large share of the impacts would also accrue to the service sector, with roughly 20 percent of the total increase in output, personal incomes, and jobs.

Table 4-37. Distribution of Economic Impacts Associated with Increased Agricultural Production, by Industry Sector, 4-County Study Area, During a Severe Drought Year

Aggregate Industry Sector	Output	Personal Income	Jobs
Agriculture	$6,190,000	$1,627,000	49
Utilities	$133,000	$9,000	0
Construction	$81,000	$28,000	1
Manufacturing	$459,000	$35,000	1
Transportation, Information, Utilities	$134,000	$44,000	1
Trade	$503,000	$166,000	5
Service	$1,925,000	$498,000	14
Government	$171,000	$69,000	1
Total	$9,596,000	$2,476,000	72

Note: Calculated using a spreadsheet model of direct irrigation benefits and 2012 IMPLAN base data. Totals may not sum due to rounding.

Note that, despite the relatively small percentage increase in water made available to prorated irrigators, any amount of relief provided under severe drought conditions creates an outsize impact on agricultural output, given that Reclamation allocates the water to only the most efficient and highest value uses. The value of increased agricultural output for a similar change, but under less severe conditions (for example, an 80.0 percent to 80.5 percent increase in availability), would likely be less than the current scenario.

These impacts are all likely to be positive. The agricultural production effects would occur during drought conditions, which would occur roughly once every five years. Therefore, the industry would generally be organized for nondrought levels of production, and the project would facilitate production closer to nondrought conditions than under the No Action Alternative. Therefore, labor and housing crowding effects, as well as general market demand crowding, would not take place. These impacts then are of high likelihood to be positive and representative of the net impacts.

4.18.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.18.4.3). Similarly, these impacts on net would be positive with undesirable labor or housing impacts unlikely.

4.18.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.18.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.18.4.1). Similarly, these impacts on net would be positive with any undesirable labor or housing impacts unlikely.

4.18.7.2 Use of Additional Stored Water for TWSA

Impacts would be the same as for Alternative 4 (Section 4.18.6.2). Similarly, these impacts on net would be positive with any undesirable labor or housing impacts unlikely.

4.18.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.18.5.3). Similarly, these impacts on net would be positive with any undesirable labor or housing impacts unlikely.

4.18.8 Mitigation Measures

All of the short-term and long-term cost based socioeconomic impacts are positive (i.e., they result in a gain in regional economic activity). Thus, all of the action alternatives are unlikely to result in adverse impacts on socioeconomic resources. Therefore, there would be no mitigation measures needed.

4.19 Cultural Resources

4.19.1 Methods and Impact Indicators

As defined by Federal regulations, cultural resources deemed significant are subject to additional determination of effects and the design of special mitigation measures. The Criteria of Adverse Effect (36 CFR 800.5) is used to determine whether a proposed action would affect a historic property. Any element of an action would have an adverse effect if it changes the characteristics that qualify a historic property for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of that property. Potential adverse effects include the following:

- Physical impact on an historic property or cultural resource, through agents such as inundation and shoreline fluctuation

- Damage or alteration of a portion of a historic property, or removal or modification of a portion of the property

- Introduction of audible, visible, or atmospheric elements that are out of character with the historic property or alter its setting

Each of these adverse effects could accompany implementation of the action alternatives Reclamation and Ecology consider in the Cle Elum Pool Raise project.

Reclamation analyzed impacts to cultural and historic resources by conducting a literature review, an NRHP effects assessment of Cle Elum Dam, and a preliminary, on-the-ground cultural resource survey of the Lake Cle Elum shoreline to estimate the extent the alternatives would have on impacting cultural or historic resources

Cultural resource surveys described in Section 3.19 provided the impact indicators used in this analysis to report potential for impact to cultural resources. Table 4-38 shows these indicators.

Table 4-38. Cultural Resources Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Impact to defining historic characteristics of Cle Elum Dam with the modifying of radial gates and associated construction activities.	Alternatives are compared by quantifying the relative potential for impacts according to these indicators. At this level of study, the exact nature, location and potential significance of all impacts cannot be quantified.
Areas of shoreline protection and associated construction where cultural resources exist.	
Additional acreage where cultural resources exist, impacted by increased reservoir pool at Cle Elum Reservoir, and additional shoreline fluctuation.	

4.19.2 Summary of Impacts

The No Action Alternative would have no potential for impacts beyond those currently occurring from existing operations and reservoir management at Cle Elum Dam.

The action alternatives, since they involve similar structural elements, would adversely impact cultural resources to an equal extent. It is Reclamation’s policy to prevent impacts to cultural resources whenever possible. However, to meet the purpose and need of the project, some impacts are unavoidable. Section 4.19.8 describes the process to resolve adverse effects.

All of the action alternatives involve significant changes to a historic structure (Cle Elum Dam). The increased reservoir pool and associated shoreline protection measures, whether the additional water is used for instream flows or for TWSA, would similarly impact archaeological resources along the shoreline of Cle Elum Reservoir.

The Yakama Nation Cultural Resource study identifies the likelihood that existing reservoir operations impact cultural resources, including Traditional Cultural Properties TCPs. Each of the proposed action alternatives would contribute to the impacts. Section 4.19.8 addresses these impacts, and the measures taken by Reclamation to resolve them.

4.19.3 Alternative 1 – No Action Alternative

There would be no new facilities or features constructed under this alternative, so Reclamation anticipates no short-term impacts under the No Action Alternative.

The No Action Alternative would have no additional impact on cultural and historic resources beyond those occurring due to current operations; this alternative involves no change in reservoir drawdown patterns.

4.19.4 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

4.19.4.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Radial Gate Modifications

Anticipated construction (i.e., short-term) impacts related to the radial gate modifications are limited and in and of themselves pose little or no impact to cultural resources. However, as indicated in Section 3.19, Cle Elum Dam, including the radial gates and spillway, is eligible for inclusion on the NRHP (NRHP-eligible). The existing radial gates, also known as the "Tainter Gates," have remained relatively unchanged since installation and, as indicated in Section 3.19.3, are character-defining historic features of Cle Elum Dam. The structural modification changes the original design of the Tainter Gates and the appearance of the spillway. Therefore, the proposed action constitutes an Adverse Effect to the character-defining features of the dam. Section 4.19.8describes the process to resolve adverse effects.

Increased Reservoir Pool

Raising the reservoir pool would result in increased inundation and shoreline fluctuation, as indicated in Section 4.19.2. The physical impacts from these agents can result in archaeological and historical site degradation, if sites exist in areas of additional inundation. The preliminary survey identified one NRHP-eligible archaeological site in the Area of Potential Effect (APE), currently impacted by inundation and shoreline fluctuation. The increased water level and inundation posed by the proposed action would compound the impacts to the archaeological site. It is possible that subsequent surveys would identify additional cultural resources impacted by increased water level and inundation. Reclamation considers these effects adverse. Section 4.19.8 describes the process to resolve adverse effects.

4.19.4.2 Use of Additional Stored Water for Instream Flow

Using the additional stored water for instream flow would not impact cultural resources.

4.19.4.3 Rock Shoreline Protection

Preliminary surveys have not identified cultural resources in the areas subject to rock shoreline protection. However, Reclamation has not yet evaluated the full APE of the protection (including rock sources and construction impacts). Reclamation would conduct additional surveys as necessary. If a planned action could adversely affect a NRHP-eligible archeological, historical, or traditional cultural property site, Reclamation would investigate options to avoid the site, such as selecting an alternate materials source or redesigning the structural features. In the event that avoidance is not possible, protective or mitigative measures would be developed and considered, as described in Section 4.19.8.

4.19.4.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Preliminary surveys have not identified cultural resources in the areas subject to construction to raise the saddle dikes and right dam abutment, and Reclamation anticipates construction would pose little or no impact to cultural resources. However, Reclamation has not yet evaluated the full APE of the construction (e.g., borrow and riprap sources and access roads) and additional surveys may be required. If Reclamation identifies cultural resources, the agency would follow the procedures described under Rock Shoreline Protection.

As indicated in Section 3.19, Cle Elum Dam is eligible for inclusion to the NRHP. For NHPA purposes, the right dam abutment is associated with the modification of the radial gates as described under Section 4.19.4.1.

4.19.4.5 Shoreline Protection for Federal Recreation Facilities and Access

Preliminary surveys have not identified cultural resources in the areas subject to shoreline protection for recreational facilities and access. However the full APE of the protection (including construction impacts) has not yet been evaluated and additional surveys are ongoing. If Reclamation identifies cultural resources, the agency would follow procedures as described under Rock Shoreline Protection.

4.19.5 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

4.19.5.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.19.4.1).

4.19.5.2 Use of Additional Stored Water for Instream Flow

Using the additional stored water for instream flow would not impact cultural resources.

4.19.5.3 Hybrid Shoreline Protection

Reclamation has identified no cultural resources in the areas subject to hybrid shoreline protection. However, surveys thus far are preliminary and Reclamation has not yet evaluated the full APE of the shoreline protection (including lakebed soil sources, log salvage locations, and construction impacts). Reclamation would conduct additional surveys as necessary. If Reclamation identifies cultural resources, the agency would follow procedures as described under Rock Shoreline Protection.

4.19.5.4 Increase Freeboard of Saddle Dikes and Right Dam Abutment

Impacts would be the same as for Alternative 2 (Section 4.19.4.4).

4.19.5.5 Shoreline Protection for Federal Recreation Facilities and Access

Impacts would be the same as for Alternative 2 (Section 4.19.4.5).

4.19.6 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

4.19.6.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.19.4.1).

4.19.6.2 Use of Additional Stored Water for TWSA

Use of the additional water for TWSA would not impact cultural resources.

4.19.6.3 Rock Shoreline Protection

Impacts would be the same as for Alternative 2 (Section 4.19.4.3).

4.19.7 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

4.19.7.1 Spillway Radial Gate Modifications to Raise the Reservoir Level

Impacts from radial gate modifications and from the increased reservoir pool would be the same as for Alternative 2 (Section 4.19.4.1).

4.19.7.2 Use of Additional Stored Water for TWSA

Use of the additional water for TWSA would not impact cultural resources.

4.19.7.3 Hybrid Shoreline Protection

Impacts would be the same as for Alternative 3 (Section 4.19.5.3).

4.19.8 Mitigation

Reclamation would refine the cultural resources impacts analysis as a result of forthcoming surveys. For instance, the entire Cle Elum shoreline, and all of the shoreline protection features, has yet to be fully inventoried. However, the existing analysis is sufficient to characterize the scale of impacts and to evaluate the alternatives in relationship to each other. And, as indicated in Section 3.19, the Yakama Nation Cultural Resources Program, in its preliminary cultural resources survey, suggests that the lake and associated precontact archaeological resources may qualify as TCPs. However, the Proposed Action has no immediate effect on nonarchaeological TCPs. Rather the effects to TCP values are cumulative in nature.

Reclamation is completing additional field surveys and studies to identify cultural and historic resources as project designs are refined. Reclamation is conducting all necessary consultation with the SHPO, the USFS, and involved Tribes in the event the agency makes a decision to implement one of the action alternatives. As indicated above, it is Reclamation's policy to prevent impacts to historic resources whenever possible. In the event that avoidance is not possible, Reclamation would develop and consider protective or mitigative measures.

For those cultural resources immediately and unavoidably affected by project implementation, as displayed under the impact indicators above, Reclamation would develop and implement a treatment plan. In the case of the modifications to the Tainter Gates, this may involve examining ways to reduce impacts through design modifications or Level II Documentation performed to DAHP Standards, or both. In the case of archaeological resources, treatment would involve 1) additional site documentation and mapping to better determine the nature and extent of the affected resource, followed by 2) site stabilization or archaeological data recovery as determined necessary. Reclamation would precede any proposed actions to resolve adverse effects by consultation with SHPO, the USFS, involved Indian Tribes, and the Federal Advisory Council on Historic Preservation, as necessary.

For those cultural resources affected by the long-term management or cumulative effects, Reclamation would prepare and implement a Cultural Resources Management Plan to address ongoing and future operational and land management implications if one of the action alternatives is carried forward. This would address the long-term and cumulative effects to the full range of cultural resources, including archaeological sites, historic structures and objects, and TCPs. Through this regulatory effort, Reclamation would define appropriate impact avoidance and mitigation, and long-term management objectives.

Reclamation would develop and maintain a Cultural Resources Management Plan (CRMP) for Cle Elum Reservoir. The CRMP would include the following elements, as recommended in part by the YCIP study:

- Within a schedule determined through consultation and as conditions allow, survey the drawdown zone of the reservoir to accurately determine the effects of reservoir drawdown, including studies which measure soil displacement and sorting caused by operations and the resultant effects on archaeological sites.

- Update the previously known sites within the drawdown zone. DAHP and USFS would provide site data and make it available to the archaeological community.

- In addition to site updates, determine eligibility for each site. The drawdown zone of the reservoir reportedly contains numerous potentially eligible sites that Reclamation has not fully evaluated.

- The lake and associated precontact archaeological resources may qualify as TCPs. Reclamation would conduct a study to identify and evaluate TCP values of the lake and environs and examine associations of precontact habitation and resource procurement sites at Cle Elum Lake to each other; and to examine the linkage with the occupation of the ethnographic village of Tle'lam.

- In regards to historic Euro-American structures and sites, record or update site records to reflect their historic associations, making maximum use of General Land Office (GLO) maps and other archival sources. Record historic homesteads in a manner that appropriately reflects the community the resources represent.

- Management prescriptions based upon site condition and risk of damage, including a decision matrix to assist in appropriate treatment measures.

- Reclamation and Ecology can add elements of a CRMP and integrate them as appropriate if the agencies carry forward other components of the Yakima Integrated Plan, such as the Keechelus-to-Kachess Conveyance and Kachess Drought Relief Pumping Plant.

In all cases, cultural resources management actions would be implemented using methods consistent with the Secretary of the Interior's Standards and Guidelines.

4.20 Indian Sacred Sites

4.20.1 Methods and Impact Indicators

Impact indicators for Indian sacred sites are the potential for disturbing or limiting access to such sites.

4.20.2 No Action Alternative

Reclamation anticipates no impacts to Indian sacred sites under the No Action Alternative. There would be no construction or other activities that could disturb such sites.

4.20.3 Cle Elum Pool Raise Project

To date, Reclamation has identified no Indian sacred sites in the project area. However, consultation with affected Tribes is ongoing and may result in future identification. If this occurs, Reclamation would evaluate impacts on these resources further.

4.20.4 Mitigation Measures

Reclamation's policy is to avoid impacts on Indian sacred sites whenever possible. Additional efforts to identify sacred sites would occur as a part of the cultural resources survey described in Section 4.19. Consultation with the Yakama Nation and the Umatilla and Colville Tribes would identify how to protect sacred sites if they were identified and provide continued access if any such sites were affected by construction.

4.21 Indian Trust Assets

4.21.1 Methods and Impact Indicators

Impact indicators for Indian Trust Assets (ITAs) are the potential for affecting ITAs. To identify ITAs in the project area, Reclamation consulted with the Yakama Nation, the Colville Tribes, and BIA who identified no ITAs.

4.21.2 No Action Alternative

Reclamation anticipates no impacts on ITAs because Reclamation and the affected Tribes identified none in the project area.

4.21.3 Cle Elum Pool Raise Project

Because consultation has not identified ITAs in the project area, Reclamation anticipates no impacts to ITAs under any of the action alternatives.

4.21.4 Mitigation Measures

If Reclamation identifies ITAs during future consultation, Reclamation would comply with its Indian Trust Assets Policy (July 2, 1993) that states impacts on ITAs would be avoided whenever possible.

4.22 Environmental Justice

4.22.1 Methods and Impact Indicators

This analysis evaluates the following issues to determine potential impacts regarding environmental justice:

- Do minority or low-income populations use affected resources?
- Do adverse environmental, human health, or economic impacts disproportionately impact minority or low-income populations?
- Do the resources affected by the project support subsistence living?

This analysis uses census data to determine the demographic makeup of residents of the project area (Section 3.22). Negative impacts would occur if the project disproportionately impacts minority or low-income populations residing in the area. The analysis also considers whether the project disproportionately impacts minority or low-income populations recreating in the area.

Table 4-39. Environmental Justice Impact Indicators and Significance Criteria

Impact Indicator	Significance Criteria
Minority or low-income populations in the area would be disproportionally impacted	Construction adjacent to minority or low-income populations but not other populations Disproportional acquisition of private property or easements from minority or low-income populations

4.22.2 Summary of Impacts

The No Action Alternative would not cause direct impacts to environmental justice, but could cause indirect impacts through reduced opportunity for subsistence fishing, associated with reduced instream flows in the Cle Elum River.

Alternative 2 through 5 would not result in impacts that would disproportionately affect minority or low-income populations, or both. The project would affect all populations present in the area equally.

4.22.3 Alternative 2 – Additional Stored Water Used for Instream Flow and Rock Shoreline Protection

Impacts associated with the Cle Elum Pool Raise Project would be minor, temporary, and primarily construction related. The project would affect resources including earth, fish, threatened and endangered species, land use, and recreation. The immediate geographic area potentially affected by the Cle Elum Pool Raise Project has lower percentages of minority and low-income populations than the Yakima River basin counties or the State of Washington. The project would have no disproportionate adverse impact to those populations; the project would affect everyone in the area equally.

The higher reservoir levels would inundate some areas of private property and potentially increase the potential for shoreline erosion. Reclamation would provide shoreline protection for erosion and would acquire property or easements for inundated private land. No information is available on demographics of property owners. The project would have no disproportionate impact to minority or low-income populations; the project would affect everyone in the area equally.

Recreational users of the reservoir could potentially include minority and low-income populations, but no information is available on their demographics. The project would not cause long-term impacts to established recreational facilities or uses. Reclamation address potential impacts to recreational facilities from inundation with shoreline protection measures included as part of the project. Reclamation and Ecology would not address impacts to dispersed camping areas from inundation as part of the project. Low-income populations may be more likely to use dispersed camping areas. However, Reclamation does not expect the project to have an impact on low-income users of dispersed camping areas because the short period of inundation would not substantially restrict their ability to camp in the area.

Members of the Yakama Nation and other Tribes may use natural resources in the Cle Elum Reservoir area currently and in the future. They may use these resources disproportionately to the total population. Reclamation has not quantified the subsistence use of renewable natural resources (such as fish, wildlife, and vegetation) by Tribes or other populations in the construction area and downstream. Improvements to fish abundance from improved habitat conditions downstream of the dam may increase the potential for subsistence use of these resources.

The project would not affect resources disproportionately used by minority or low-income populations, and minority and low-income populations would not be disproportionately subject to adverse environmental, human health, or economic impacts. Any potential impacts to resources used to support subsistence living would be positive as increased instream flows would improve fish habitat.

4.22.4 Alternative 3 – Additional Stored Water Used for Instream Flow and Hybrid Shoreline Protection

Impacts would be the same as for Alternative 2 as described in Section 4.22.3.

4.22.5 Alternative 4 – Additional Stored Water Used for TWSA and Rock Shoreline Protection

Impacts would be the same as for Alternative 2 as described in Section 4.22.3, though using the additional stored water for TWSA instead of exclusively instream flows would cause less increase in the potential for subsistence use of renewable natural resources downstream of Cle Elum Dam. However, this would not be a negative impact to subsistence use of fish resources over baseline conditions.

4.22.6 Alternative 5 – Additional Stored Water Used for TWSA and Hybrid Shoreline Protection

Impacts would be the same as for Alternative 4 as described in Section 4.22.5.

4.22.7 Mitigation Measures

The project would not have adverse environmental justice impacts, so no mitigation measures would be necessary.

4.23 Relationship of the Pool Raise Project to the Integrated Plan

This section is included for SEPA purposes to summarize how the Cle Elum Pool Raise Project meets the goals of the Integrated Plan. As described in Section 1.7, Reclamation and Ecology identified the Cle Elum Pool Raise Project as one of the projects necessary to help address water needs in the Yakima River basin.

The Cle Elum Pool Raise Project supports the goals of the Integrated Plan by providing additional storage and increasing the volume of water available for instream flows to benefit fisheries or, if authorized, for proratable water users during drought years. Improved streamflows would benefit ESA listed bull trout and MCR steelhead. If Reclamation allocated the additional water for TWSA, it would increase the amount of water available to proratable water users by 1.6 percent. Listed below are the specific goals of the Integrated Plan that the Pool Raise Project supports:

- Provide opportunities for comprehensive watershed protection, ecological restoration, and enhancement, addressing instream flows, aquatic habitat, and fish passage.
- Improve water supply reliability during drought years for agricultural and municipal needs (if authorized).
- Improve the ability of water managers to respond and adapt to potential effects of climate change.
- Contribute to the vitality of the regional economy and sustain the riverine environment.

The Pool Raise Project is an important component of the Integrated Plan's proposed reservoir releases to meet reach-specific target flows for fish recommended by fish biologists and agency representatives (see Section 5.3.2.1 of the Integrated Plan PEIS). The Integrated Plan includes recommended instream flows for specific reaches of rivers and streams affected by the operation of the Yakima Project. Providing additional instream flow in the Cle Elum River during winter is a high priority. Typical fall and winter flows (October to March) in the Cle Elum River could be increased from a minimum of 180 cfs for the No Action Alternative to 220 cfs with the Pool Raise Project in years when the additional pool volume is available (on average 73 percent of the years of record.)

If Reclamation implemented the Cle Elum Pool Raise Project without implementing the other projects in the Integrated Plan, the additional storage would benefit instream flows in the Cle Elum or Yakima River or would contribute incrementally to meeting water supply goals during drought years. If Reclamation implemented the other projects included in the Integrated Plan without the Cle Elum Pool Raise project, these actions would diminish flow benefits to anadromous and resident species in the Cle Elum or Yakima River.

The 14,600 acre-feet of additional storage with the Pool Raise Project would help meet the Water Supply Facility Permit and Funding Milestone. If Reclamation met the Milestone, Reclamation would continue to manage the TCF to meet the goals of the Integrated Plan, including habitat protection and restoration.

4.24 Cumulative Impacts

Cumulative impacts are the effects that may result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). "Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). This analysis looks at whether the impacts of the Cle Elum Pool Raise Project could add to impacts from other projects in the area. It briefly describes the cumulative impacts of past actions related to agricultural development in the Yakima River basin. However, this cumulative impacts analysis focuses on the past, present, and reasonably foreseeable projects that could have additive or interactive effects in combination with the Cle Elum Pool Raise Project. For this DEIS, the analysis includes the Yakima River basin; however, for some resources, Reclamation defined the analysis area differently. This DEIS identifies these resource areas when relevant.

4.24.1 Past Actions

4.24.1.1 Land Use Practices

For the purpose of this discussion, the analysis area encompasses the Yakima River basin.

Agricultural development in the Yakima River basin over the past 150 years, including the Yakima Project, has caused impacts to surface water, water quality, fish, vegetation and wetlands, wildlife, and cultural resources (Sections 1.3 and 1.6 of the Integrated Plan PEIS (Reclamation and Ecology, 2012)). Timber harvest, mining, transportation, and residential and commercial development have further altered environmental conditions in the basin. Impacts from these past actions include altered stream channels and flows, degraded water quality, blocked fish passage, degraded riparian habitat, loss of forest and shrub-steppe habitat, and declines in fish and wildlife populations. The impacts that have degraded fish and wildlife habitat have led to listing of species such as the northern spotted owl, MCR steelhead, and bull trout as federally threatened or endangered species.

4.24.1.2 Water Management Practices

Past water management actions have caused cumulative impacts at the Cle Elum Reservoir area that have affected surface water, fish, vegetation, wildlife, and cultural resources. Construction of crib dams and Cle Elum Dam blocked fish passage to glacial Lake Cle Elum and the upper Cle Elum River and inundated forest habitat and cultural resources. Water storage and releases from the dam altered streamflows in the river below the dam, which in turn altered the stream channel. Residential, commercial, and recreational development have altered the reservoir shoreline and disturbed wildlife habitat. Cle Elum Dam created a reservoir larger than the historic lake and flooded forest areas. The reservoir also inundated traditional Native American hunting, fishing, and gathering areas that had been located on the historic lake shoreline. Cle Elum Dam, which has been determined as eligible for listing on the NRHP, has been modified over the years, which has altered the integrity of its historic status.

The baseline condition includes these cumulative impacts of past projects in the Affected Environment sections of this DEIS.

4.24.2 Present Actions

Reclamation and Ecology have characterized present actions as those that are currently ongoing within the Yakima River basin that could have additive or interactive effects in relation to the proposed action.

Within or near the Cle Elum Reservoir area, there are two current, major activities that could contribute to cumulative impacts in the reservoir area: construction activity along 1-90 and expanded development at the Suncadia resort. Construction activity along I-90 is outside of the area tributary to Cle Elum Reservoir, but would contribute increased traffic and associated noise, dust, and other traffic-related impacts to the area. Proposed expansion at Suncadia could result in increased water demands, along with removal of vegetation, increased traffic, and other impacts to the area associated with increased developmental density.

4.24.3 Reasonably Foreseeable Future Actions

4.24.3.1 Projects Included in the Analysis

Reclamation and Ecology have used the following criteria to identify reasonably foreseeable projects for this cumulative impact analysis. They include projects that:

- Occur within the defined boundary
- Have some level of design, planning, and are being actively pursued; and
- Have additive or interactive effects in relation to the proposed action.

Reasonably foreseeable future projects identified in the Cle Elum Reservoir area include three projects in the Integrated Plan Initial Development Phase—the Cle Elum Fish Passage Project, Keechelus to Kachess Conveyance Project (KKC), and Kachess Drought Relief Pumping Plant Project (KDRPP). The Initial Development Phase of the Integrated Plan is the period from the State's authorizing legislation for the Integrated Plan in 2013 through the year 2023. Projects included in the Initial Development Phase are those identified by Reclamation and Ecology that would quickly achieve tangible improvements in streamflow, habitat, and fish passage, as well as provide increased security of existing out-of-stream water supplies. These three projects meet the criteria for inclusion as reasonably foreseeable projects for this cumulative impact analysis.

Reclamation and Ecology have included other projects in the Integrated Plan Initial Development Phase, but those projects including water conservation and stream restoration projects would occur outside the defined boundary for affected resources and would not have additive or interactive effects with the Cle Elum Pool Raise Project. Thus, Reclamation does not consider these projects part of this cumulative impact analysis because they do not meet the criteria.

Construction associated with the ongoing I-90 project is outside the immediate Cle Elum Reservoir area, but construction vehicles accessing the reservoir would use I-90. Additive or interactive effects could occur, so Reclamation considers future I-90 construction as part of this cumulative impact analysis.

Suncadia Master Plan Resort has planned to implement its Phase 2 expansion for several years, which could add as much as 100 additional acres of residential development. At this time, there is no firm date for implementation of the expansion, but it remains a viable development option. This expansion could increase demands on water resources, add to traffic, dust, and noise within the area, and reduce the amount of habitat available. Additive or interactive effects could occur, so Reclamation considered the proposed Suncadia expansion for this cumulative impact analysis.

Utility companies have filed applications with the Federal Energy Regulatory Commission to study or develop hydropower at Cle Elum Dam in the past. Since there are no current applications, Reclamation does not consider future hydropower development at Cle Elum Dam a reasonably foreseeable future project. Reclamation has not identified other reasonably foreseeable projects for the Cle Elum Pool Raise Project.

4.24.3.2 Potential Cumulative Impacts

One purpose of the Cle Elum Pool Raise Project is to improve aquatic resources for fish habitat, rearing, and migration in the Cle Elum and upper Yakima rivers. The project provides additional stored water that would improve instream flows downstream from the dam and meet this purpose. The project would contribute incrementally to improving aquatic resources in the Yakima River basin.

If the Proposed Action or alternatives would have no direct or indirect effect on a resource, then they could not cause or contribute to potential cumulative effects on that resource, and the cumulative impacts analysis would not include them. The impacts identified for the Cle Elum Pool Raise Project are increased inundation of the shoreline, increased erosion potential, inundation of some dispersed recreation areas, and property acquisition. The project would also cause short-term construction impacts, including increased noise, vehicle emissions, and fugitive dust. If the reasonably foreseeable future projects create similar impacts, impacts of the Cle Elum Pool Raise Project could be a minor contribution to potential cumulative impacts of those projects.

Earth. The analysis boundary was the Cle Elum Reservoir shoreline. The Cle Elum Pool Raise Project would result in increased inundation of the shoreline, which would result in increased erosion potential. This increase would be additive to erosion that would otherwise be occurring within the reservoir, but the incremental increase is expected to be minor, and with proposed mitigation, these impacts are not expected to be significant.

Surface Water and Fish. The analysis boundary includes the Cle Elum Reservoir and Yakima River basin. The Cle Elum Pool Raise Project would increase the area inundated for short periods, which would add cumulatively to the amount of land inundated by reservoirs in the Yakima River basin. The increased inundation would not be significant because it would be short-term and limited in scale.

Reclamation expects the Proposed Action to have both minor negative and positive impacts for bull trout, the only listed species potentially affected by the project. Higher reservoir levels would temporarily increase productivity, but could also increase turbidity. Reclamation expects changes in habitat functionality to be minor. Using the additional stored water for instream flows would provide a positive impact for bull trout. These positive impacts could result in a positive cumulative impact for bull trout.

Vegetation and Wildlife. The analysis boundary is the Cle Elum Reservoir tributary area. The Cle Elum Pool Raise Project would increase the area of inundation by as much as 46 acres at maximum pool raise. This would reduce habitat in the shoreline area, which could result in relocation of some wildlife species, or mortality if increased predation or other factors occur during the approximately 40 days of inundation. This impact, while not expected to be significant, contributes to an overall trend of reduced habitat within the region, and could exacerbate stresses on species using shoreline habitats.

Recreation. The analysis boundary is the Yakima River basin. The Proposed Action would not cause long-term impacts to recreation at Cle Elum Reservoir because the project includes measures to protect recreation facilities from increased inundation. Some areas used for informal boat launching would be inundated and unavailable for up to 40 days when reservoir levels peak, but other areas are available nearby for boat launching. Reclamation does not consider these impacts to be significant and does not expect the impacts to represent a cumulative impact to recreation.

Cultural Resources. The analysis boundary is the area tributary to the Cle Elum Reservoir. Reclamation has not yet determined an APE for the project. The project would inundate an eligible archaeological resource and would further alter the historic integrity of Cle Elum Dam. This would be in addition to impacts that have occurred in the past and could occur associated with the Cle Elum Dam Fish Passage Project, as described below. Reclamation does not expect these impacts to be significant with the implementation of appropriate mitigation.

Cle Elum Dam Fish Passage Facilities Project

Under the Cle Elum Dam Fish Passage Facilities Project, Reclamation and Ecology would install upstream and downstream fish passage facilities for juvenile and adult salmonids. This would allow anadromous fish to access Cle Elum Reservoir and the upper Cle Elum River. The project is expected to allow continued restoration of extirpated sockeye salmon to the reservoir and improve conditions for federally listed MCR steelhead and bull trout populations. Reclamation and Ecology identified potential impacts of the fish passage facilities project as permanent loss of some shoreline vegetation, potential effects to cultural resources and the historic dam structure, and construction impacts including temporary wildlife disturbance; increased noise, dust, and vehicle emissions; and traffic disruptions (Reclamation and Ecology, 2011b). The project would also impact archaeological resources near the intake structure.

Surface Water and Fish. Under Alternatives 2 and 4, the Cle Elum Pool Raise Project would increase streamflows in the Cle Elum River downstream from the dam and have positive additive and interactive effects with the Cle Elum Fish Passage Project. Increased winter flows would improve rearing and migration habitat for salmonids, including the federally listed bull trout and MCR steelhead. Salmonids using the fish passage facilities would benefit from these improved conditions. Reclamation may use the additional stored water as carryover storage to improve operation of the proposed Cle Elum Fish Passage Facilities. Under Alternatives 3 and 5, Reclamation would allocate the water for TWSA, which would not provide the positive additive benefits to fish or fish passage.

Vegetation and Wildlife. The Cle Elum Pool Raise Project would cause small losses of vegetation from construction and inundation in addition to the estimated loss of approximately 20 acres of vegetation from the Fish Passage Facilities Project. These losses would be minor compared to the overall watershed; however, the loss of vegetation would add to the cumulative loss of vegetation in the project area that is occurring associated with overall watershed development and other proposed projects. Reclamation would restore most of the affected vegetation for the fish passage facilities.

Cultural Resources. The Cle Elum Pool Raise Project would further modify Cle Elum Dam and add cumulatively to impacts to its historic integrity. The Proposed Action would also impact one archaeological site and add cumulatively to cultural resources affected by the Fish Passage Facilities.

Construction. Construction for both projects would be in the same general area of the reservoir and would use the some of the same access roads. If construction of the two projects overlapped, construction impacts could be greater than for the single project. However, because construction associated with the Cle Elum Pool Raise Project is limited in scale and duration, it is unlikely that there would be significant cumulative impacts. Noise and disturbance of wildlife could slightly increase at the dam area if installation of the radial gates occurs during fish passage facilities construction, but the potential for wildlife disturbance from both projects is minor because of the degraded habitat near the dam. Construction could also cumulatively impact recreation if construction of the Cle Elum Pool Raise Project and Fish Passage Facilities occur concurrently or in consecutive seasons.

KKC and KDRPP Projects

Reclamation and Ecology are proposing to construct a conveyance line to divert water from Keechelus Reservoir to Kachess Reservoir and to build a pumping plant that would allow inactive storage to be withdrawn from Kachess Reservoir under the KKC and KDRPP Projects. Kachess and Keechelus Reservoirs are located approximately 5 and 10 miles west of Cle Elum Reservoir, respectively. Reclamation and Ecology are preparing an EIS to evaluate the potential impacts from the KKC and KDRPP Projects. Because the agencies have not yet identified the specific impacts of those projects, the KKC and KDRPP Projects EIS would evaluate the cumulative impacts of those projects combined with the Cle Elum Pool Raise Project in a subsequent project level evaluation. This cumulative impact analysis includes a brief description of two likely cumulative impacts associated with the KKC and KDRPP Projects.

Construction. Access to the three reservoirs is from I-90, so construction traffic on the roadway would increase if construction of all three projects occurred at the same time. Construction traffic on I-90 associated with the Cle Elum Pool Raise Project would be minor, so Reclamation anticipates no significant cumulative impacts to I-90. Because construction access from I-90 to the three project areas would be on different local roadways and construction traffic for the Cle Elum Pool Raise Project would be minor, Reclamation anticipates no significant cumulative impacts on local roadways.

Recreation. Disruptions from construction noise and traffic could cause reservoir users to seek similar recreation opportunities at other reservoirs. If construction occurs at all three reservoirs simultaneously, recreation users could have to travel farther to find similar reservoir recreation. The KKC project would result in reservoir drawdowns that could limit recreational use of Kachess Reservoir. Recreational users may choose to recreate at Cle Elum Reservoir during these drawdown periods, increasing the use of recreation facilities at Cle Elum which currently exceed capacity during peak periods.

Interstate-90 Construction

WSDOT has been constructing a corridor improvement project along I-90 to reduce congestion and improve safety along a 15-mile corridor from Hyak to Easton. The project would stabilize slopes, replace deteriorating pavement, add capacity, and improve bridges and culverts. The intent of the project is to reduce road closures due to avalanches. Construction on Phase One, Hyak to Keechelus Dam, began in 2009 with scheduled completion in 2018. The schedule for Phase Two, from Keechelus Dam to the Cabin Creek Interchange, is from 2015 to 2020. A third phase, from Cabin Creek Interchange to the Easton vicinity, has currently only been funded for scoping and planning. Construction activities have caused I-90 closures lasting at least one hour for rock blasting, lane closures in both directions, and rolling slowdowns that have caused traffic delays of up to 20 minutes. Bicyclists cannot use I-90 between Hyak and Stampede Pass, but can use John Wayne Pioneer Trail as an alternate route.

Construction. The Cle Elum Pool Raise Project results in impacts that would contribute to overall construction-related traffic, noise, and dust in the vicinity. This could result in impacts to noise-sensitive wildlife in the area; however, Reclamation does not expect the cumulative impacts to be significant. Construction vehicles for the Cle Elum Project would add to overall construction-related traffic delays; however, increased traffic on I-90 from the Cle Elum Pool Raise Project construction would be minor, so Reclamation does not anticipate significant cumulative impacts.

4.24.4 Cumulative Impacts Summary

The intent of the Cle Elum Pool Raise Project is to address some of the issues associated with past actions, providing improved aquatic habitat and improved instream flows downstream. The Proposed Action would not exacerbate the negative cumulative impacts of past actions, but Reclamation expects it would provide benefits to fish and streamflow conditions that would be beneficial at a basin-wide level when implemented with other proposed projects.

The Cle Elum Pool Raise Project could result in increased cumulative impacts to traffic on I-90, if construction occurs concurrently with major WSDOT corridor improvements. Dust, noise, and overall traffic would be additive, although these impacts would be limited to the period of construction.

Loss of shoreline habitat could contribute to regional trends toward reduced habitat; however, the relatively short period of inundation would minimize these cumulative impacts.

The Cle Elum Pool Raise Project would add cumulatively to impacts from the Fish Passage Facilities to historic and cultural resources. Reclamation would work closely with all affected parties to minimize these impacts.

The negative impacts of the Cle Elum Pool Raise Project are minor and limited in scale; therefore, the project is not likely to contribute to significant cumulative impacts of present and foreseeable future projects.

4.25 Unavoidable Adverse Impacts

Unavoidable adverse impacts are defined as environmental consequences of an action that cannot be avoided, either by changing the nature of the action or through mitigation if the action were undertaken. The proposed project design features, BMPs, and compensatory mitigation would avoid or minimize many of the potential adverse effects associated with the proposed alternatives. However, it would not be possible to avoid all adverse effects, nor would mitigation be 100 percent effective in remediating all impacts. There would be at least a minimal amount of unavoidable impact to most resources in the Cle Elum Reservoir area for at least a short time, due to the presence of equipment and humans in the area and the time necessary for restoration to be effective.

Unavoidable adverse impacts associated with the Cle Elum Pool Raise Project include the following:

- Increased inundation of approximately 46 acres of land around the reservoir for about 40 days,
- Increased erosion along approximately 8,300 feet of unprotected shoreline during higher water levels,
- Permanent loss of 2 to 5 acres of shoreline vegetation,
- Temporary loss of vegetation associated with access roads and staging areas,
- Inundation of vegetation communities, including wetlands;
- Inundation of areas of dispersed recreation, potentially causing expansion into undisturbed areas,
- Temporary disruptions to recreational use and private properties during construction;
- Property or easement acquisition to install shoreline protection;
- Permanent impacts to the historic features of Cle Elum Dam, constituting an “Adverse Effect”;

- Adverse impacts to one eligible archaeological site associated with increased inundation levels

4.26 Relationship between Short-Term Uses and Long-Term Productivity

NEPA requires considering "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). This occurs when an agency counterbalances short-term negative effects by a long-term positive effect (and vice-versa). As identified above, the Cle Elum Pool Raise Project would cause minor impacts to some resources. Benefits to instream flows, fish, and threatened and endangered species counterbalance these impacts.

4.27 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments are decisions affecting resources, such as wetlands and vegetation, where the resource is lost and replacement can only occur over a long period of time, or at great expense, or cannot be replaced at all (for example, minerals). Irretrievable commitments refer to loss of production or use of resources because of a decision, such as removal of trees, which eliminates another harvest until a new stand grows. They represent opportunities foregone for the period of time that a resource is not useable.

While there would be some temporary and permanent removal of vegetation with this project, overall the irreversible and irretrievable resources associated with that removal are minor relative to the amount of resources available in the basin. There would be an irreversible and irretrievable commitment of the energy used during the manufacture and mining of proposed project components and materials as well as during construction and operation of the project. Under all action alternatives, the physical alteration of Cle Elum Dam would have an irreversible effect on the historic integrity of that structure. Each action alternative would also have an irreversible effect on one identified archaeological site along the shoreline of Cle Elum Reservoir.

4.28 Energy and Depletable Resources

NEPA requires consideration of energy requirements and conservation potential for each EIS alternative (40 CFR 1502.16(e) and Executive Order 13514).

The action alternatives would require expenditures of energy, including natural and depletable resources, during construction of the spillway gate modifications and shoreline protection measures; however, the energy use would be short-term and have negligible impacts to energy resources. Each alternative would have similar energy expenditures and impacts.

The Cle Elum Pool Raise Project and its alternatives do not require additional energy for long-term operation.

4.29 Environmental Commitments

Environmental commitments are measures or practices adopted by a project proponent to reduce or avoid adverse effects that could result from project operations. Specific mitigation measures for project impacts are described for each resource in Chapter 4. The following summarizes major environmental commitments for the Cle Elum Pool Raise Project. Reclamation and Ecology share the responsibility to ensure obligations to protect natural resources are fulfilled.

- Construct all shoreline protection measures in the dry when the reservoir is drawn down to avoid in-water work.
- Complete all planned shoreline protection measures prior to raising the level of the reservoir.
- Continue the existing shoreline inventory to identify erosion problems and appropriate control measures.
- Obtain all applicable Federal, State and local permits.
- Coordinate with Ecology's water quality staff to ensure compliance with the State antidegradation policy.
- Install shoreline protection in locations on the west side of Cle Elum Reservoir to mitigate for erosion impacts.
- Install guardrails and other mitigation measures in specific locations to prevent unauthorized vehicle and dispersed camping access of Cle Elum River and Reservoir.
- Prior to construction, conduct cultural resource studies of all areas that would be disturbed by construction.
- Develop a treatment plan for all cultural resources directly impacted by the project.
- Develop a Cultural Resource Management Plan to address ongoing and future operational and land management implications of the proposed project.
- Prior to construction, conduct wetland surveys using current wetland delineation methodology. Design projects to avoid wetland impacts. If wetland impacts occur, comply with mitigation measures established in permit conditions to ensure no net loss.
- Prior to construction, coordinate with USFS to determine the presence of any Sensitive or Survey and Manage species and take steps to minimize impacts to those species.
- Prior to construction, survey utilities in construction areas and take appropriate measures to minimize conflicts with any identified utilities.

- Prior to raising the pool level, identify any potentially affected OSSs to establish baseline conditions.

- Develop mitigation strategies for any OSS that would become noncompliant as a result of the increased reservoir pool.

Reclamation will implement current BMPs when appropriate, to enhance resource protection and avoid additional potential affects to surface and groundwater quality, earth resources, fish, wildlife, and their habitats.

- Haul oils or chemicals to an approved site for disposal and use vegetable–based lubricants machinery when working in or near water to prevent petroleum products from entering surface or groundwater.

- Develop and implement a Stormwater Pollution Prevention Plan (SWPPP) per Ecology’s rules and regulations. The plan will include erosion control methods, stockpiling, site containment, shoreline protection methods, equipment storage, fueling, maintenance, and washing, and methods to secure a construction site under circumstances of an unexpected high water or rain event.

- Equip all construction equipment with environmental spill kits to contain petroleum products in the event of a leak.

- Require all contractors to have a Spill Prevention Plan and a Toxics Containment and Storage Plan.

- Develop a spill plan to implement containment of construction materials such as treated woods, contaminated soils, concrete, concrete leachate, grout, and other substances that may be deleterious or toxic to fish and other aquatic organisms.

- Develop a plan for safe handling and storage of potentially toxic construction materials, fuels, and solvents for staging sites in close proximity to receiving waters and riparian areas.

- Strategically place stockpiles of earthen materials to minimize runoff into nearby receiving waters.

- Require all contractors to inventory noxious weed populations by marking with temporary fencing to avoid spreading weeds to other areas in accordance with local, State, and Federal weed control requirements.

- Continue with ongoing weed control efforts on disturbed lands following construction and revegetation in accordance with Federal, State and local.

Chapter 5

PUBLIC INVOLVEMENT, CONSULTATION, AND COORDINATION

CHAPTER 5.0 PUBLIC INVOLVEMENT, CONSULTATION, AND COORDINATION

This chapter describes the public involvement, consultation, and coordination activities undertaken by Reclamation and Ecology to date, plus future actions that will occur during the processing of this document. Public information activities will continue through future development of this project.

5.1 Public Involvement

Public involvement is a process where agencies consult and include interested and affected individuals, organizations, agencies, and governmental entities in the decisionmaking process. In addition to providing information to the public regarding the DEIS, Reclamation and Ecology solicited responses regarding the public's needs, values, and evaluations of the proposed alternatives. Both formal input and informal input were encouraged and used.

5.1.1 Scoping Process

Reclamation and Ecology sought comments from the interested public, including individuals, organizations, and governmental agencies. The process of seeking comments and public information is "scoping." Scoping is a term used for an early and open process to determine the scope of issues for an EIS and to identify the significant issues related to a proposal.

On October 30, 2013, Reclamation published a Notice of Intent to prepare an EIS in the Federal Register. Reclamation and Ecology issued a joint press release to Washington State media on November 6, 2013, announcing the dates and locations of scoping meetings and requesting comments. Reclamation mailed meeting notices to interested individuals, Tribes, interest groups, and governmental agencies. Reclamation also posted the notice on its Integrated Plan website and associated pages, describing the project, requesting comments, and providing information about the public scoping meetings.

On November 4, 2013, Ecology published its SEPA Determination of Significance and public notices in area newspapers, requesting comments on the scope of the EIS. Ecology also notified by email all those registered on its Yakima Integrated Plan list-serve and posted the notice on its Office of Columbia River website.

On November 20, 2013, Reclamation and Ecology held two public scoping meetings at the Yakima Arboretum in Yakima, Washington - one in the afternoon and one in the evening. Twenty-three individuals attended the two meetings. At the meetings, Reclamation described the Cle Elum Pool Raise Project proposal and gave attendees the opportunity to discuss the proposal with Reclamation and Ecology staff as well as comment on the scope of the EIS, the EIS process, and resources the pending EIS would evaluate.

On November 21, 2013, Reclamation and Ecology held two public scoping meetings at the USFS headquarters in Cle Elum, Washington - one in the afternoon and one in the evening. Thirty-three individuals attended the two meetings. The meeting format followed that of the Yakima meetings.

5.1.1.1 Comments Received from the Public

The scoping comment period began October 30, 2013, and concluded December 16, 2013, during which time the agencies received 17 comment documents and telephone calls. The comments covered a wide range of topics and assisted in the following activities:

- Identifying the significant issues relevant to the proposal
- Identifying those elements of the environment that could be affected by the proposal
- Formulating alternatives for the proposed action

The following were major concerns reflected in the comments:

- Surface water and how the additional 14,600 acre-feet of water would be used
- Impacts to fish, vegetation, wetlands, wildlife, threatened and endangered species, and recreation
- Impacts to land use, transportation, and socioeconomics
- Cumulative effects

Reclamation and Ecology prepared a Scoping Summary Report that summarizes the comments received (Reclamation and Ecology, 2014a). The report is available from Reclamation upon request. It is also available at the Cle Elum Pool Raise Project website: http://www.usbr.gov/pn/programs/eis/cleelumraise/index.html; or from the Yakima River Basin Water Enhancement Project (YRBWEP) Integrated Plan website: http://www.usbr.gov/pn/programs/yrbwep/2011integratedplan/index.html.

5.2 Consultation and Coordination

The Council on Environmental Quality regulations (40 CFR 1501.6) emphasize agency cooperation early in the NEPA process and allow a lead agency (in this instance, Reclamation) to request the assistance of other agencies that either have jurisdiction by law or have special expertise regarding issues considered in an EIS. Reclamation requested that the BPA, NMFS, USFS, Service, and the Yakama Nation participate as cooperating agencies in the Cle Elum Pool Raise Project EIS. The BPA and Yakama Nation both responded that they would participate as cooperating agencies due to their special expertise regarding issues considered in the EIS. NMFS and USFS also responded that they would participate as cooperating agencies based on their jurisdictional responsibilities under the ESA and National Forest Management Act, respectively, as well as their special expertise regarding issues considered in the EIS. The Service requested that its participation in the EIS be through the Fish and Wildlife Coordination Act instead of acting as a cooperating agency. Reclamation agreed to the Service's request.

5.3 Tribal Consultation and Coordination

Reclamation and Ecology have determined that the project area lies within the ceded territory of the Yakama Nation and the CTUIR. Reclamation is also consulting with the Colville Tribes as part of the NHPA process. The Yakama Nation is a major partner in the overall Integrated Plan and has been involved in all aspects of it, including the Cle Elum Pool Raise Project. Additionally, the Yakama Nation is conducting Historic Resource surveys to assist Reclamation and Ecology with compliance activities associated with the NHPA and Washington State preservation laws.

Reclamation sent a letter on July 24, 2014, requesting Government-to-Government consultation with the CTUIR. Reclamation will schedule meetings to discuss the project with the CTUIR and will send copies of the DEIS and the FEIS to the Tribe.

5.3.1 Native American Graves Protection and Repatriation Act

The 1990 NAGPRA regulates Tribal consultation procedures in the event of inadvertent discoveries of Native American graves and other NAGPRA "cultural items." NAGPRA requires that agencies receiving Federal funds consult with Tribes during Federal project planning if graves and other NAGPRA cultural items are discovered. NAGPRA details procedures for repatriation of human skeletal remains and other cultural items to appropriate Tribes. Reclamation will comply with NAGPRA regulations (43 CFR Part 10) if any graves or other NAGPRA cultural items are discovered.

5.3.2 Executive Order 13175: Consultation and Coordination with Tribal Governments

Executive Order 13175 instructs Federal agencies to consult, to the greatest extent practicable and to the extent permitted by law, with Tribal governments prior to taking actions that affect federally recognized Tribes. Each agency assesses the impact of Federal Government plans, projects, programs, and activities on Tribal trust resources and assures consideration of tribal government rights and concerns during the development of such plans, projects, programs, and activities. As described in Section 5.2, Reclamation has consulted with the Yakama Nation, Colville Tribes, and the CTUIR. This DEIS evaluated potential impacts to cultural resources (Section 4.18), Indian sacred sites (Section 4.19), and Indian Trust Assets (Section 4.20).

5.3.3 Executive Order 13007: Indian Sacred Sites

Executive Order 13007 (May 24, 1996) instructs Federal agencies to promote accommodation of access to and protect the physical integrity of American Indian sacred sites. A "sacred site" is a specific, discrete, and narrowly delineated location on Federal land. An Indian Tribe or an Indian individual determined to be an appropriately authoritative representative of an Indian religion must identify a site as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion. However, the EO includes the proviso that the Tribe or authoritative representative has informed the agency of the existence of such a site. As described in Section 4.19, Reclamation has determined the project would not impact Indian sacred sites because the Tribes have not identified any in the project area. Reclamation will continue to coordinate with affected Tribes and, if they identify any Indian sacred sites in the future, Reclamation will consult with affected Tribes to determine how to protect the sacred sites.

5.3.4 Secretarial Order 3175: Department Responsibilities for Indian Trust Assets

ITAs are legal interests in property held in trust by the United States for federally recognized Indian Tribes or individual Indians. ITAs may include land, minerals, federally reserved hunting and fishing rights, federally reserved water rights, and instream flows associated with trust land. The United States allotted some Tribes land under the General Allotment Act of 1887, and allotted others land through treaty or specific legislation until 1934, when Congress prohibited further allotments. These allotments are ITAs.

Federally recognized Indian Tribes with trust land are beneficiaries of the Indian trust relationship. The United States acts as trustee. By definition, no one can sell, lease, or otherwise encumber ITAs without approval of the U.S. Government.

Reclamation contacted the BIA, Yakima Office, to identify the presence of ITAs or trust land (allotments) in the project area. BIA personnel indicated that there are no allotments in the Cle Elum Reservoir area. Reclamation also contacted personnel at the BIA Colville Tribal Office, who also indicated that there is no trust land in the project area (Wolf, 2014).

Reclamation has determined that the project area does not include land held in trust by the United States for Tribes or individual allottees, nor does the project area include trust land or allotments. However, in the past, some Tribes have stated that habitat for fishing, hunting, and gathering located on federally owned land may constitute an ITA. While this is not Reclamation's position, the Government respects and acknowledges this Tribal perspective.

5.4 Compliance with Federal and State Laws and Executive Orders

In addition to the agency and Tribal coordination and consultation laws, Executive orders, and regulations described above, Reclamation will comply with the following laws and Executive orders on the Cle Elum Pool Raise Project.

5.4.1 Endangered Species Act

The Endangered Species Act (ESA) requires all Federal agencies to ensure that their actions do not jeopardize the continued existence of ESA-listed species, or destroy or adversely modify their critical habitat. As part of the ESA's Section 7 process, an agency must request a list of species from the Service and the NMFS that identifies threatened and endangered species within or near the action area. The agency then must evaluate impacts to those species. If the action may impact any ESA-listed species, the agency must consult with the Service or NMFS, or both. Reclamation will prepare biological assessments to initiate consultation with the Service and NMFS.

Reclamation has reviewed lists of ESA species provided by the Service and NMFS as described in Sections 3.9 and 4.9. Reclamation has initiated Section 7 consultation with the agencies and the process is ongoing. Additional information on the ESA consultation process will be included in the FEIS.

5.4.2 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) provides for equal consideration of wildlife conservation in coordination with other features of programs on water resource development. The FWCA requires that any plans to impound, divert, control, or modify any stream or other body of water must be coordinated with the Service and State wildlife agency through consultation directed toward prevention of fish and wildlife losses and development or enhancement of these resources.

Reclamation consulted with the Service regarding the Integrated Plan. The Service completed the Final Fish and Wildlife Coordination Act Report for the Integrated Plan in February 2012; and Reclamation posted it on the Yakima River Basin Water Enhancement Project Integrated Plan website at http://www.usbr.gov/pn/programs/yrbwep/2011integratedplan/index.html. Reclamation consulted with the Service regarding the need for further FWCA consultation for the Cle Elum Pool Raise Project. Appendix F contains the email correspondence from the Service, responding that there was no additional consultation needed.

5.4.3 National Historic Preservation Act

The National Historic Preservation Act of 1966 (NHPA), as amended, requires that Federal agencies consider the effects that their projects have on properties eligible for or on the National Register of Historic Places (the Register). The 36 CFR 800 regulations provide procedures that Federal agencies must follow to comply with the NHPA. For any undertaking, Federal agencies must determine if there are properties of National Register quality in the project area, the effects of the project on those properties, and the appropriate mitigation for adverse effects. In making these determinations, Federal agencies are required to consult with the SHPO, Native American Tribes with a traditional or culturally-significant religious interest in the study area, the interested public, and the Advisory Council on Historic Preservation (in certain cases).

Reclamation has determined that Cle Elum Dam is eligible for inclusion to the Register and that modification of the radial spillway gates constitutes an Adverse Effect to the character-defining features of the dam. Reclamation has also determined that the project would impact one identified archaeological site (Section 4.18). Reclamation has initiated consultation with the SHPO and with Native American Tribes (Section 5.3). Reclamation will continue consultation regarding impacts to historic and cultural resources and will develop and implement a treatment plan and a Cultural Resources Management Plan to define appropriate impact avoidance and mitigation.

5.4.4 Clean Water Act

Section 404 of the Clean Water Act (CWA) regulates the discharge of dredged or fill materials into waters of the United States, including wetlands. The Corps evaluates applications for Section 404 permits. Permit review and issuance follows a sequence process that encourages avoidance of impacts, followed by minimizing impacts, and, finally, requires mitigation for unavoidable impacts to the aquatic environment. The guidelines at Section 404(b)(1) of the CWA describe this sequence.

Section 4.4 describes potential impacts to water quality. Reclamation will implement best management practices and other techniques to minimize the potential for erosion and sedimentation during construction, the most likely impact to water quality. Reclamation will consult with the Corps regarding impacts to water quality and will comply with permit conditions.

As described in Section 4.7, Reclamation will survey all construction areas prior to construction to determine the presence of wetlands. Reclamation will design shoreline protection measures to avoid or minimize impacts to wetlands and will locate construction staging areas, roads, and other facilities outside wetlands to the extent possible. If wetland impacts are unavoidable, Reclamation will consult with the Corps and will comply with mitigation measures established by permit conditions.

5.4.5 Executive Order 11990: Protection of Wetlands

Executive Order 11990 (May 24, 1977) directs Federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial value of wetlands in carrying out programs affecting land use. Reclamation's actions to comply with the CWA, described in Section 5.4.4, meet the requirements of this Executive Order.

5.4.6 Executive Order 12898: Environmental Justice

Executive Order 12898 (February 11, 1994) instructs Federal agencies, to the greatest extent practicable and permitted by law, to make achieving environmental justice part of its mission by addressing, as appropriate, disproportionately high and adverse human health or environmental effects on minority populations and low income populations. "Environmental justice" means the fair treatment of people of all races, income, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. "Fair treatment" implies that no person or group of people should shoulder a disproportionate share of negative environmental impacts resulting from the execution of environmental programs. As described in Section 4.22, Reclamation does not expect the project to cause impacts to environmental justice populations.

5.4.7 Executive Order 11988: Floodplain Management

Executive Order 11988 (May 24, 1977) instructs Federal agencies to determine to the greatest extent practicable whether the Proposed Action will occur in a floodplain prior to taking an action, and if so, to consider alternatives to avoid adverse effects. If the only feasible alternatives occur within a floodplain, the agency shall take action to design or modify its action to minimize potential harm to or within the floodplain consistent with regulations accompanying this Executive order.

The shoreline of Cle Elum Reservoir and the Cle Elum River both upstream and downstream from the reservoir are within the mapped 100-year floodplain. Reclamation proposes to construct shoreline protection in some of the mapped floodplain areas on the reservoir shoreline. The intent of shoreline protection is to address potential erosion and inundation problems caused by the higher reservoir pool level. Reclamation also will design the shoreline protection to minimize potential harm to the floodplain. The proposed project will not cause additional flooding downstream because Reclamation will continue its flood control operations and release the additional flows from the reservoir during low flow periods in the river.

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GLOSSARY

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acre-foot	The volume of water that could cover 1 acre to a depth of 1 foot. Equivalent to 43,560 cubic feet or 325,851 gallons.
active capacity	The portion of the reservoir that can be released to augment instream flows and to be delivered to irrigators,
alluvial	Composed of clay, silt, sand, gravel, or similar material deposited by running water.
anadromous	Fish that hatch and develop to adolescence in rivers and migrate to saltwater to feed, then migrate from saltwater to freshwater to spawn.
benthic	Relating to the bottom of a sea or lake or to the organisms that live there.
cfs	Flow rate in cubic feet per second.
Cle Elum datum	Elevations at Cle Elum Reservoir are based on Reclamation's local datum established when the dam was constructed. Elevations do not correspond to standard datum. The Cle Elum datum is approximately 5.4 feet below the NAVD88 datum.
cobbles	Rounded rock with a particle size between 2.5 and 1 inches.
cumulative effect	For NEPA purposes, these are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such action.
Endangered species	Under the Endangered Species Act, a species that is in danger of extinction throughout all or a significant portion of its range. To term a run of salmon "endangered" is to say that particular run is in danger of extinction.
Environmental Justice	The fair treatment of people of all races and incomes with respect to actions affecting the environment. Fair treatment implies that there is equity of the distribution of benefits and risks associated with a proposed project and that one group does not suffer disproportionate adverse effects.

Eutrophication	The process by which a body of water becomes enriched in dissolved nutrients that stimulate the growth of aquatic plant life, usually resulting in the depletion of dissolved oxygen.
Fascines	A rough bundle of brushwood or other material used for strengthening an earthen structure.
Flip-flop	An operational action in the upper Yakima River basin in late summer to encourage anadromous salmon to spawn at lower river state levels so that the flows required to keep the redds watered and protected during the subsequent incubation period are minimized.
Flow	The volume of water passing a given point per unit of time.
Freeboard	Freeboard is a factor of safety usually expressed in feet above a flood level. In this case, it is a 3-foot zone of additional protection from wave erosion.
Grub	Remove stumps and roots to provide a firm surface for embankments.
Habitat	The combination of resources and the environmental conditions that promotes occupancy by individuals of a given species and allows those individuals to survive and reproduce.
Historic property	Any building, site, district, structure, or object (that has archeological or cultural significance) included in, or eligible for inclusion in, the National Register.
Hydrogeomorphic processes	The science relating to the geographical, geological, and hydrological aspects of water bodies and changes to these in response to flow variations and to natural and human caused events.
Hydrograph	A graph showing the rate of flow or discharge versus time past a specific point in a river.
Hypolimnion	The layer of water below the thermocline.
Indian sacred site	A specific, discrete, narrowly delineated location on Federal land that is identified by an Indian Tribe or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion.

Indian Trust Assets	Legal interests in property held in trust by the United States for Indian Tribes or individuals. They are rights that were reserved by or granted to American Indian Tribes or Indian individuals by treaties, statutes, and Executive orders. These rights are sometimes further interpreted through court decisions and regulations.
Instream flows	Waterflows for designated uses within a defined stream channel, such as minimum flows for fish, wildlife, recreation, or aesthetics.
Junior water rights	Proratable water rights that, in water-short years, receive less than their full right on a prorated basis.
littoral	In the area along a freshwater shoreline.
metamorphic rock	Refers to rocks that have changed in form from their original rock type (sedimentary or igneous) in response to extreme changes in temperature, pressure, or chemical environment (i.e. limestone into marble).
nonproratable water rights	Pre-Yakima Project senior water rights related to natural flows that are served first and cannot be reduced until all the proratable rights are regulated to zero.
oligotrophic	Lacking plant nutrients and usually containing plentiful amounts of dissolved oxygen without stratification.
Orthophosphate	A salt or ester of orthophosphoric acid, or any compound containing the trivalent group −PO 4.
palustrine wetland	A freshwater wetland dominated by rooted or nonrooted vascular and nonvascular plants, or in some instances with no vegetation.
proratable water rights	Newer junior water rights related to storage water that, in water-short years, receive less than their full right on a prorated basis.
prorationing	The process of equally reducing the amount of water delivered to junior (i.e., “proratable”) water right holders in water-deficient years.
redd	The nest that a spawning female salmon digs in gravel to deposit her eggs.
riparian	Relating to, living in, or located on a water course.
riprap	Rock material used to armor shorelines, streambeds and other shoreline structures to protect against erosion.

salmonid	A family of soft-finned fishes of cold and temperate waters that includes salmon, trout, chars, freshwater whitefishes and graylings.
sediment	Any very finely divided organic or mineral matter deposited by water in nonturbulent areas.
senior water rights	Nonproratable water rights that are served first and cannot be reduced until all the proratable rights are regulated to zero.
skid steer	Vehicular construction equipment used to load materials.
smolt	Adolescent salmon or steelhead, usually 3 to 7 inches long, that are undergoing changes preparatory for living in saltwater (see also fry and fingerling).
spawner	Adult salmon that has left the ocean and entered a river to spawn.
target flows	Flows quantified in Title XII of the Act of October 31, 1994, for two points in the Yakima River basin (Sunnyside and Prosser Diversion Dams).
terrestrial	Of or relating to land as distinct from air or water.
thermocline	A layer of water where the temperature gradient is greater than that of the warmer layer above and the colder layer below.
threatened species	Under the Endangered Species Act, a species that is likely to become endangered within the foreseeable future.
Title XII target flows	Specific instream target flows established for Yakima Project operations at Sunnyside and Prosser Diversion Dams by Title XII of the Act of October 31, 1994 (Public Law 103–464).
total water supply available (TWSA)	The total water supply available for the Yakima River basin above the Parker gage for the period April through September.
ungulate	A four-legged, hoofed animal.
unregulated flows	The flow regime of a stream as it would occur under completely natural conditions; that is, not subjected to modification by reservoirs, diversions, or other human works.
waterway	A channel for conveying or discharging excess water.

water year	The 12-month period from October through September. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. For example, the year ending September 30, 1992, is called the “1992 water year.”
watershed	The total land area draining to any point in a stream.
wetland	Generally, an area characterized by periodic inundation or saturation, hydric soils, and vegetation adapted for life in saturated soil conditions.

Appendix A

TITLE XII – YAKIMA RIVER BASIN WATER ENHANCEMENT PROJECT ENABLING LEGISLATION

P.L.103-434, Oct.31., 1994
YAKIMA RIVER BASIN WATER ENHANCEMENT PROJECT (YRBWEP)
as amended by P.L.105-62, Oct.13, 1997, and P.L.106-372, Oct.27, 2000.

Sections of the legislation relevant to the Cle Elum Pool Raise Project are Section 1205 (pages 11-14) and Section 1206 (pages 14-15)

One Hundred Third Congress
of the
United States of America
AT THE SECOND SESSION

Begun and held at the City of Washington on Tuesday, the twenty-fifth day of January, one thousand nine hundred and ninety-four

An Act

To provide for the settlement of the water rights claims of the Yavapai-Prescott Indian Tribe in Yavapai County, Arizona, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

...

TITLE XII--YAKIMA RIVER BASIN WATER ENHANCEMENT PROJECT

SEC. 1201. PURPOSES.

The purposes of this title are--

(1) to protect, mitigate, and enhance fish and wildlife through improved water management; improved instream flows; improved water quality; protection, creation and enhancement of wetlands; and by other appropriate means of habitat improvement;

(2) to improve the reliability of water supply for irrigation;

(3) to authorize a Yakima River basin water conservation program that will improve the efficiency of water delivery and use; enhance basin water supplies; improve water quality; protect, create and enhance wetlands; and determine the amount of basin water needs that can be met by water conservation measures;

(4) to realize sufficient water savings from the Yakima River Basin Water Conservation Program so that not less than 40,000 acre-feet of water savings per year are achieved by the end of the fourth year of the Basin Conservation Program, and not less than 110,000 acre-feet of water savings per year are achieved by the end of the eighth year of the program, to protect and enhance fish and wildlife resources; and not less than 55,000 acre feet of water savings per year are achieved by the end of the eighth year of the program for availability for irrigation;

(5) to encourage voluntary transactions among public and private entities which result in the implementation of water conservation measures, practices, and facilities; and

(6) to provide for the implementation by the Yakama Indian Nation at its sole discretion of (A) an irrigation demonstration project on the Yakama Indian Reservation using water savings from system improvements to the Wapato Irrigation Project, and (B) a Toppenish Creek corridor enhancement project integrating agricultural, fish, wildlife, and cultural resources.

SEC. 1202. DEFINITIONS.

As used in this title:

(1) The term `Basin Conservation Plan' means a plan for implementing water conservation measures found in the various water conservation plans developed under the Basin Conservation Program.

(2) The term `Basin Conservation Program' means the Yakima River Basin Water Conservation Program established under section 1203(a).

(3) The term `comprehensive basin operating plan' means a plan that will provide guidance to the Yakima Project Superintendent for operation of the existing Yakima Project as modified by actions taken pursuant to this title.

(4) The term `Conservation Advisory Group' means the Yakima River Basin Conservation Advisory Group established under section 1203(c).

(5) The term `conserved water' means water saved and attributable to the program established under the Basin Conservation Program.

(6) The term `Irrigation Demonstration Project' means the Yakama Indian Reservation Irrigation Demonstration Project authorized in section 1204(b).

(7) The term `nonproratable water' means that portion of the total water supply available under provisions of sections 18 and 19 of Civil Action No. 21 (Federal District Court Judgment of January 31, 1945) that is not subject to proration in times of water shortage.

(8) The term `on-district storage' means small water storage facilities located within the boundaries of an irrigation entity, including reregulating reservoirs, holding ponds, or other new storage methods which allow for efficient water use.

(9) The term `proratable water' means that portion of the total water supply available under provisions of sections 18 and 19 of Civil Action No. 21 (Federal District Court Judgment of January 31, 1945) that is subject to proration in times of water shortage.

(10) The term `Secretary' means the Secretary of the Interior.

(11) The term `System Operations Advisory Committee' means a group of fishery biologists--

(A) created by the Yakima Project Superintendent in response to the supplemental instructions entitled `Supplementary Instructions to the Water Master', and dated November 28, 1980, in the case of Kittitass Reclamation District, et al. vs. the Sunnyside Valley Irrigation District, et al. (E.D. Wash., Civil No. 21.);

(B) who advise the Yakima Project Superintendent on operations of the Yakima Project for fish and wildlife purposes; and

(C) who, together with others, were identified for consultation on November 29, 1990, in the amended partial summary judgment entered in the basin adjudication (Yakima County Superior Court No. 77-2-01484-5).

(12) The term `Toppenish Enhancement Project' means the Toppenish Creek corridor enhancement project authorized by section 1204(c).

(13) The term `Yakama Indian Nation' means the Confederated Tribes and Bands of the Yakama Indian Nation as redesignated under section 1204(g).

(14) The term `Yakima Project Superintendent' means the individual designated by the Regional Director, Pacific Northwest Region, Bureau of Reclamation, to be responsible for the operation and management of the Yakima Federal Reclamation Project, Washington.

SEC. 1203. YAKIMA RIVER BASIN WATER CONSERVATION PROGRAM.

(a) ESTABLISHMENT- (1) The Secretary, in consultation with the State of Washington, the Yakama Indian Nation, Yakima River basin irrigators, and other interested parties, shall establish and administer a Yakima River Basin Water Conservation Program for the purpose of evaluating and implementing measures to improve the availability of water supplies for irrigation and the protection and enhancement of fish and wildlife resources, including wetlands, while improving the quality of water in the Yakima Basin. The

Secretary may make grants to eligible entities for the purposes of carrying out this title under such terms and conditions as the Secretary may require. Such terms and conditions shall include a requirement that all water districts, irrigation districts, individuals, or other entities eligible to participate in the Basin Conservation Program must equip all surface water delivery systems within their boundaries with volumetric water meters or equally effective water measuring methods within 5 years of the date of enactment of this Act.

(2) Conserved water resulting in whole or in part from the expenditure of Federal funds shall not be used to expand irrigation in the Yakima Basin, except as specifically provided in section 1204(a)(3) on the Yakama Indian Reservation.

(3) The provisions of this section shall not apply to the Yakama Indian Nation except as to any funds specifically applied for from the Basin Conservation Program.

(b) FOUR PHASES OF PROGRAM- The Basin Conservation Program shall encourage and provide funding assistance for four phases of water conservation, which shall consist of the following:

> (1) The development of water conservation plans, consistent with applicable water conservation guidelines of the Secretary, by irrigation districts, conservation districts, water purveyors, other areawide entities, and individuals not included within an areawide entity.
>
> (2) The investigation of the feasibility of specific potential water conservation measures identified in conservation plans.
>
> (3) The implementation of measures that have been identified in conservation plans and have been determined to be feasible.
>
> (4) Post implementation monitoring and evaluation of implemented measures.

(c) CONSERVATION ADVISORY GROUP- (1) Not later than 12 months after the date of enactment of this Act, the Secretary, in consultation with the State of Washington, the Yakama Indian Nation, Yakima River basin irrigators, and other interested and related parties, shall establish the Yakima River Basin Conservation Advisory Group.

(2) Members of the Conservation Advisory Group shall be appointed by the Secretary and shall be comprised of--

> (A) one representative of the Yakima River basin nonproratable irrigators,
>
> (B) one representative of the Yakima River basin proratable irrigators,
>
> (C) one representative of the Yakama Indian Nation,

(D) one representative of environmental interests,

(E) one representative of the Washington State University Agricultural Extension Service,

(F) one representative of the Department of Wildlife of the State of Washington, and

(G) one individual who shall serve as the facilitator.

(3) The Conservation Advisory Group shall--

(A) provide recommendations to the Secretary and to the State of Washington regarding the structure and implementation of the Basin Conservation Program,

(B) provide recommendations to the Secretary and to the State of Washington regarding the establishment of a permanent program for the measurement and reporting of all natural flow and contract diversions within the basin,

(C) structure a process to prepare a basin conservation plan as specified in subsection (f),

(D) provide annual review of the implementation of the applicable water conservation guidelines of the Secretary, and

(E) provide recommendations consistent with statutes of the State of Washington on rules, regulations, and administration of a process to facilitate the voluntary sale or lease of water.

(4) The facilitator shall arrange for meetings of the Conservation Advisory Group, provide logistical support, and serve as moderator for the meetings.

(5) The Conservation Advisory Group shall consult an irrigation district when considering actions specifically affecting that district. For the purposes of this paragraph, an irrigation district includes the Yakima Reservation Irrigation District.

(6) The Conservation Advisory Group shall be nonvoting, seeking consensus whenever possible. If disagreement occurs, any member may submit independent comments to the Secretary. The Conservation Advisory Group shall terminate 5 years after the date of its establishment unless extended by the Secretary.

(d) COST SHARING- (1) Except as otherwise provided by this title, costs incurred in the four phases of the Basin Conservation Program shall be shared as follows:

Program Phase	Non-Federal		Federal Grant
	State Grant	Local	
1. Development of water conservation plans	50% but not more than $200,000 per recipient	(Residual amount if any)	50%
2. Investigation of specific water conservation measures	50% but sum of 1 and 2 not greater than $200,000 per recipient	20% after deducting State funds for Item 2	Residual amount after deducting State and local funds for Item 2
3 and 4. Implementation and post implementation monitoring and evaluation	17.5%	17.5%	65.0%

(2) The Yakima River Basin Water Enhancement Project is a Federal action to improve streamflow and fish passage conditions and shall be considered part of a comprehensive program to restore the Yakima River basin anadromous fishery resource. Related fishery resource improvement facilities which utilize funding sources under the Pacific Northwest Electric Power Planning and Conservation Act of 1989 (94 Stat. 2697) and independent water-related improvements of the State of Washington and other public and private entities to improve irrigation water use, water supply, and water quality, shall be treated as non-Federal cost share expenditures and shall be consolidated in any final calculation of required cost sharing. Within one year of the date of enactment of this Act, the Secretary shall enter into a binding cost sharing agreement with the State of Washington. The agreement shall describe the terms and conditions of specific contributions and other activities that may, subject to approval by the Secretary, qualify as non-Federal cost share expenditures.

(3) Costs of the Basin Conservation Program related to projects on the Yakama Indian Reservation are a Federal responsibility and shall be nonreimbursable and not subject to the cost-sharing provisions of this subsection.

(e) ENTITY WATER CONSERVATION PLANS- To participate in the Conservation Basin Program an entity must submit a proposed water conservation plan to the Secretary. The Secretary shall approve a water conservation plan submitted under this subsection if the Secretary determines that the plan meets the applicable water conservation guidelines of the Secretary.

(f) BASIN CONSERVATION PLAN- The Conservation Advisory Group shall, within 2 1/2 years after the date of enactment of this Act, submit a draft basin conservation plan to the Secretary.

(g) PUBLIC COMMENT- The Secretary shall distribute the draft basin conservation plan and the entity water conservation plans submitted under subsections (e) and (f), respectively, for public comment for a 60-day period.

(h) PUBLICATION OF BASIN CONSERVATION PLAN- Within 60 days after the close of the comment period under subsection (g), the Secretary shall publish the Basin Conservation Plan which plan will provide the basis--

(1) for prioritizing and allocating funds to implement conservation measures under this title; and

(2) for preparing an interim comprehensive basin operating plan under section 1210 of this title as provided for in Public Law 96-162 (93 Stat. 1241).

(i) CONSERVATION MEASURES- (1) Measures considered for implementation in the Basin Conservation Program may include, among others, conveyance and distribution system monitoring, automation of water conveyance systems, water measuring or metering devices and equipment, lining and piping of water conveyance and distribution systems, on-district storage, electrification of hydraulic turbines, tail-water recycling, consolidation of irrigation systems, irrigation scheduling, and improvement of on-farm water application systems. Basin Conservation Program funds may also be used throughout all four phases of the Basin Conservation Program to mitigate for adverse impacts of program measures.

(2) In addition to implementing existing technologies, the Secretary shall encourage the testing of innovative water conservation measures. The Secretary shall, to the maximum extent possible under applicable Federal, State, and tribal law, cooperate with the State of Washington to facilitate water and water right transfers, water banking, dry year options, the sale and leasing of water, and other innovative allocation tools used to maximize the utility of existing Yakima River basin water supplies.

(3) The Secretary may, consistent with applicable law, use funds appropriated to carry out this section for the purchase or lease of land, water, or water rights from any entity or individual willing to limit or forego water use on a temporary or permanent basis. Funds used for purchase or lease under this paragraph are not subject to the cost sharing provisions of subsection (d). Efforts to acquire water should be made immediately upon availability of funds to meet the three-year goal specified in section 1205(a)(4) to provide water to be used by the Yakima Project Superintendent under the advisement of the System Operations Advisory Committee for instream flow purposes. The use of Basin Conservation Program funds under this paragraph are in addition to those specifically authorized to be appropriated by subsection (j)(4).

(4) On-farm water management improvements shall be coordinated with programs administered by the Secretary of Agriculture and State conservation districts.

(j) AUTHORIZATION OF APPROPRIATIONS- There is hereby authorized to be appropriated to the Secretary, at September 1990 prices, plus or minus such amounts as may be justified by reason of ordinary fluctuations of applicable cost indexes, the following amounts for the Basin Conservation Program:

(1) $1,000,000 for the development of water conservation plans.

(2) $4,000,000 for investigation of specific potential water conservation measures identified in conservation plans for consideration for implementing through the Basin Conservation Program.

(3) Up to $67,500,000 for design, implementation, post-implementation monitoring and evaluation of measures, and addressing environmental impacts.

(4) Up to $10,000,000 for the initial acquisition of water from willing sellers or lessors specifically to provide instream flows for interim periods to facilitate the outward migration of anadromous fish flushing flows. Such funds shall not be subject to the cost sharing provisions of subsection (d).

(5) $100,000 annually for the establishment and support of the Conservation Advisory Group during its duration. Such funds shall be available for travel and per diem, rental of meeting rooms, typing, printing and mailing, and associated administrative needs. The Secretary and the State of Washington shall provide appropriate staff support to the Conservation Advisory Group.

SEC. 1204. YAKAMA INDIAN NATION.

(a) WAPATO IRRIGATION PROJECT IMPROVEMENTS AND APPROPRIATIONS- (1) The Yakama Indian Nation's proposed system improvements to the Wapato Irrigation Project, as well as the design, construction, operation, and maintenance of the Irrigation Demonstration Project and the Toppenish Creek corridor enhancement project, pursuant to this title shall be coordinated with the Bureau of Indian Affairs.

(2) There is authorized to be appropriated to the Secretary not more than $23,000,000 for the preparation of plans, investigation of measures, and following the Secretary's certification that such measures are consistent with the water conservation objectives of this title, the implementation of system improvements to the Wapato Irrigation Project. Funding for further improvements within the Wapato Irrigation Project may be acquired under the Basin Conservation Program or other sources identified by the Yakama Indian Nation.

(3) Water savings resulting from irrigation system improvements shall be available for the use of the Yakama Indian Nation for irrigation and other purposes on the reservation

and for protection and enhancement of fish and wildlife within the Yakima River basin. The conveyance of such water through irrigation facilities other than the Wapato Irrigation Project shall be on a voluntary basis and shall not further diminish the amount of water that otherwise would have been delivered by an entity to its water users in years of water proration.

(b) IRRIGATION DEMONSTRATION PROJECT APPROPRIATIONS- (1)(A) There is hereby authorized to be appropriated to the Secretary--

> (i) at September 1990 prices, plus or minus such amounts as may be justified by reason of ordinary fluctuations of applicable cost indexes, $8,500,000 for the design and construction of the Yakama Indian Reservation Irrigation Demonstration Project; and
>
> (ii) such sums as may be necessary for the operation and maintenance of the Irrigation Demonstration Project, including funds for administration, training, equipment, materials, and supplies for the period specified by the Secretary, which sums are in addition to operation and maintenance funds for wildlife and cultural purposes appropriated to the Secretary under other authorization.

(B) Funds may not be made available under this subsection until the Yakama Indian Nation obtains the concurrence of the Secretary in the construction, management, and administrative aspects of the Irrigation Demonstration Project.

(C) After the end of the period specified under subparagraph (A)(ii), costs for the operation and maintenance of the Irrigation Demonstration Project, including funds for administration, training, equipment, materials, and supplies referred to in that subparagraph, shall be borne exclusively by the lands directly benefitting from the Irrigation Demonstration Project.

(2) The Irrigation Demonstration Project shall provide for the construction of distribution and on-farm irrigation facilities to use all or a portion of the water savings, as determined by the Yakama Indian Nation, resulting from the Wapato Irrigation Project system improvements for--

> (A) demonstrating cost-effective state of the art irrigation water management and conservation,
>
> (B) the training of tribal members in irrigation methods, operation, and management, and
>
> (C) upgrading existing hydroelectric facilities and construction of additional hydroelectric facilities on the reservation to meet irrigation pumping power needs.

(c) TOPPENISH CREEK CORRIDOR ENHANCEMENT PROJECT APPROPRIATIONS- There is hereby authorized to be appropriated to the Secretary $1,500,000 for the further investigation by the Yakama Indian Nation of measures to develop a Toppenish Creek corridor enhancement project to demonstrate integration of management of agricultural, fish, wildlife, and cultural resources to meet tribal objectives and such amount as the Secretary subsequently determines is necessary for implementation. There is also authorized to be appropriated to the Secretary such sums as may be necessary for the operation and maintenance of the Toppenish Enhancement Project.

(d) REPORT- Within 5 years of the implementation of the Irrigation Demonstration Project and the Toppenish Enhancement Project, the Secretary, in consultation with the Yakama Indian Nation, shall report to the Committee on Energy and Natural Resources of the Senate, the Committee on Natural Resources of the House of Representatives, and the Governor of the State of Washington on the effectiveness of the conservation, training, mitigation, and other measures implemented.

(e) STATUS OF IMPROVEMENTS AND FACILITIES- The Wapato Irrigation Project system improvements and any specific irrigation facility of the Irrigation Demonstration Project (excluding on-farm irrigation facilities) and the Toppenish Enhancement Project shall become features of the Wapato Irrigation Project.

(f) TREATMENT OF CERTAIN COSTS- Costs related to Wapato Irrigation Project improvements, the Irrigation Demonstration Project, and the Toppenish Enhancement Project shall be a Federal responsibility and are nonreimbursable and nonreturnable.

(g) REDESIGNATION OF YAKIMA INDIAN NATION TO YAKAMA INDIAN NATION-

(1) REDESIGNATION- The Confederated Tribes and Bands of the Yakima Indian Nation shall be known and designated as the `Confederated Tribes and Bands of the Yakama Indian Nation'.

(2) REFERENCES- Any reference in a law, map, regulation, document, paper, or other record of the United States to the Confederated Tribes and Bands of the Yakima Indian Nation referred to in subsection (a) shall be deemed to be a reference to the `Confederated Tribes and Bands of the Yakama Indian Nation'.

SEC. 1205. OPERATION OF YAKIMA BASIN PROJECTS.

(a) WATER SAVINGS FROM BASIN CONSERVATION PROGRAM- (1) The Basin Conservation Program is intended to result in reductions in water diversions allowing for changes in the present operation of the Yakima Project to improve stream flow conditions in the Yakima River basin. Except as provided by paragraph (5) of this subsection and section 1209, commencing with the enactment of this title, and notwithstanding that anticipated water savings are yet to be realized, the Secretary, upon the enactment of this title and acting through the Yakima Project Superintendent, shall (A) continue to estimate the water supply which is anticipated to be available to meet water entitlements; and (B) provide instream flows in accordance with the following criteria:

Water Supply Estimate for Period (million acre feet):				Target Flow from Date of Estimate thru October Downstream of (cubic feet per second):	
April thru September	May thru September	June thru September	July thru September	Sunnyside Diversion Dam	Prosser Diversion Dam
(1) 3.2	2.9	2.4	1.9	600	600
(2) 2.9	2.65	2.2	1.7	500	500
(3) 2.65	2.4	2.0	1.5	400	400
Less than line 3 water supply				300	300

(2) The initial target flows represent target flows at the respective points. Reasonable fluctuations from these target flows are anticipated in the operation of the Yakima Project, except that for any period exceeding 24 hours--

(A) actual flows at the Sunnyside Diversion Dam may not decrease to less than 65 percent of the target flow at the Sunnyside Diversion Dam; and

(B) actual flows at the Prosser Diversion Dam may not decrease by more than 50 cubic feet per second from the target flow.

(3) The instream flows shall be increased for interim periods during any month of April through October to facilitate when necessary the outward migration of anadromous fish. Increased instream flows for such interim periods shall be obtained through voluntary sale and leasing of water or water rights or from conservation measures taken under this title.

(4)(A)(i) Within the three-year period beginning when appropriations are first provided to carry out the Basin Conservation Program, the instream flow goal in the Yakima River is as follows: to secure water which is to be used for instream flows to facilitate meeting recommendations of the System Operations Advisory Committee for flushing flows or other instream uses.

(ii) In addition to any other authority of the Secretary to provide water for flushing flows, the water required to meet the goal specified in clause (i) shall be acquired through the voluntary purchase or lease of land, water, or water rights and from the development of additional storage capability at Lake Cle Elum provided for in section 1206(a).

(iii) In addition to water required to meet the instream flow goal specified in clause (i), the System Operations Advisory Committee may recommend additional water to meet instream flow goals pursuant to judicial actions.

(B) After the period referred to in subparagraph (A), such instream flow goal is modified as follows:

> (i) The goal increases so that the instream target flows specified in the table in paragraph (1) increase by 50 cubic feet per second for each 27,000 acre-feet of reduced annual water diversions achieved through implementation of measures under the Basin Conservation Program. Such increases do not apply to actions taken pursuant to section 1204. Such increases shall not further diminish the amount of water that otherwise would have been delivered by an entity to its water users in years of water proration.
>
> (ii) The goal changes directly with the availability of water resulting from Federal expenditures under this title for purchase or lease of water under this title.

(C) The Yakima Project Superintendent shall maintain an account of funded and completed conservation measures taken under the Basin Conservation Program.

(D) No later than March 31 of each calendar year, the Yakima Project Superintendent shall meet with the State of Washington, Yakama Indian Nation, and Yakima River basin irrigators to mutually determine total diversion reductions and respective adjustments to the target flows referred to in this subsection. The Yakima Project Superintendent shall announce such adjustments with the announcements of Total Water Supply Available. For the purposes of this subparagraph, conserved water will be considered available for adjusting target flows in the first year following completion of a measure or following a result from the post implementation monitoring and evaluation program, as the case may be.

(5) Operational procedures and processes in the Yakima River basin which have or may be implemented through judicial actions shall not be impacted by this title.

(6)(A) Within three years after the date of enactment of this Act, the Secretary shall conduct a study and submit a report with recommendations to the appropriate committees of the Congress on whether the water supply available for irrigation is adequate to sustain the agricultural economy of the Yakima River basin.

(B) The target flows provided for under this subsection shall be evaluated within three years after the date of enactment of this Act by the Systems Operations Advisory Committee for the purpose of making a report with recommendations to the Secretary and the Congress evaluating what is necessary to have biologically-based target flows.

(C) The recommendations and reports under subparagraphs (A) and (B) shall provide a basis for the third phase of the Yakima River Basin Water Enhancement Project.

(b) WATER FROM LAKE CLE ELUM- Water accruing from the development of additional storage capacity at Lake Cle Elum, made available pursuant to the modifications authorized in section 1206(a), shall not be part of the Yakima River basin's water supply as provided in subsection (a)(1). Water obtained from such development is exclusively dedicated to instream flows for use by the Yakima Project Superintendent as flushing flows or as otherwise advised by the System Operations Advisory Committee. Water may be carried over from year-to-year in the additional capacity to the extent that there is space available. Releases may be made from other Yakima Project storage facilities to most effectively utilize this additional water, except that water deliveries to holders of existing water rights shall not be impaired.

(c) STATUS OF BASIN CONSERVATION PROGRAM FACILITIES- Measures of the Basin Conservation Program which are implemented on facilities currently under the administrative jurisdiction of the Secretary, except as provided in section 1204, shall be considered features of the Yakima River Basin Water Enhancement Project, and their operation and maintenance shall be integrated and coordinated with other features of the existing Yakima Project. The responsibility for operation and maintenance and the related costs shall remain with the current operating entity. As appropriate, the Secretary shall incorporate the operation and maintenance of such facilities into existing agreements. The Secretary shall assure that such facilities are operated in a manner consistent with Federal and State law and in accordance with water rights recognized pursuant to State and Federal law.

(d) WATER ACQUIRED BY PURCHASE AND LEASE- Water acquired from voluntary sellers and lessors shall be administered as a block of water separate from the Total Water Supply Available, in accordance with applicable Federal and State law.

(e) YAKIMA PROJECT PURPOSE- (1) An additional purpose of the Yakima Project shall be for fish, wildlife, and recreation.

(2) The existing storage rights of the Yakima Project shall include storage for the purposes of fish, wildlife, and recreation.

(3) The purposes specified in paragraphs (1) and (2) shall not impair the operation of the Yakima Project to provide water for irrigation purposes nor impact existing contracts.

SEC. 1206. LAKE CLE ELUM AUTHORIZATION OF APPROPRIATIONS.

(a) MODIFICATIONS AND IMPROVEMENTS- There is hereby authorized to be appropriated to the Secretary--

(1) at September 1990 prices, plus or minus such amounts as may be justified by reason of ordinary fluctuation of applicable indexes, $2,934,000 to--

(A) modify the radial gates at Cle Elum Dam to provide an additional 14,600 acre-feet of storage capacity in Lake Cle Elum,

(B) provide for shoreline protection of Lake Cle Elum, and

(C) construct juvenile fish passage facilities at Cle Elum Dam, plus

(2) such additional amounts as may be necessary which may be required for environmental mitigation.

(b) OPERATION AND MAINTENANCE APPROPRIATIONS- There is hereby authorized to be appropriated to the Secretary such sums as may be necessary for that portion of the operation and maintenance of Cle Elum Dam determined by the Secretary to be a Federal responsibility.

SEC. 1207. ENHANCEMENT OF WATER SUPPLIES FOR YAKIMA BASIN TRIBUTARIES.

(a) GENERAL PROVISIONS- The following shall be applicable to the investigation and implementation of measures to enhance water supplies for fish and wildlife and irrigation purposes on tributaries of the Yakima River basin:

(1) An enhancement program authorized by this section undertaken in any tributary shall be contingent upon the agreement of appropriate water right owners to participate.

(2) The enhancement program authorized by this section shall not be construed to affect (A) the water rights of any water right owners in the tributary or other water delivering entities; (B) the capability of tributary water users to divert, convey, and apply water; and (C) existing water and land uses within the tributary area.

(3) The water supply for tributary enhancement shall be administered in accordance with applicable State and Federal laws.

(4) Any enhancement program authorized by this section shall be predicated upon the availability of a dependable water supply.

(b) STUDY- (1) The Secretary, following consultation with the State of Washington, the tributary water right owners, and the Yakama Indian Nation, and agreement of appropriate water right owners to participate, shall conduct a study concerning the measures that can be implemented to enhance water supplies for fish and wildlife and irrigation purposes on Taneum Creek, including (but not limited to)--

(A) water use efficiency improvements;

(B) the conveyance of water from the Yakima Project through the facilities of any irrigation entity willing to contract with the Secretary without adverse impact to water users;

(C) the construction, operation, and maintenance of ground water withdrawal facilities;

(D) contracting with any entity that is willing to voluntarily limit or forego present water use through lease or sale of water or water rights on a temporary or permanent basis;

(E) purchase of water rights from willing sellers; and

(F) other measures compatible with the purposes of this title, including restoration of stream habitats.

(2) In conducting the Taneum Creek study, the Secretary shall consider--

(A) the hydrologic and environmental characteristics;

(B) the engineering and economic factors relating to each measure; and

(C) the potential impacts upon the operations of present water users in the tributary and measures to alleviate such impacts.

(3) The Secretary shall make available to the public for a 45-day comment period a draft report describing in detail the findings, conclusions, and recommendations of the study. The Secretary shall consider and include any comment made in developing a final report. The Secretary's final report shall be submitted to the Committee on Energy and Natural Resources of the Senate, the Committee on Natural Resources of the House of Representatives, and the Governor of the State of Washington, and made available to the public.

(c) IMPLEMENTATION OF NONSTORAGE MEASURES- After securing the necessary permits the Secretary may, in cooperation with the Department of Ecology of the State of Washington and in accordance with the laws of the State of Washington, implement nonstorage measures identified in the final report under subsection (b) upon fulfillment of the following conditions:

(1) The Secretary shall enter into an agreement with the appropriate water right owners who are willing to participate, the State of Washington, and the Yakama Indian Nation, for the use and management of the water supply to be provided by proposed tributary measures pursuant to this section.

(2) The Secretary and the State of Washington find that the implementation of the proposed tributary measures will not impair the water rights of any person or entity in the affected tributary.

(d) OTHER YAKIMA RIVER BASIN TRIBUTARIES- Enhancement programs similar to the enhancement program authorized by this section may be investigated and implemented by the Secretary in other tributaries contingent upon the agreement of the appropriate tributary water right owners to participate. The provisions set forth in this section shall be applicable to such programs.

(e) AUTHORIZATION OF APPROPRIATIONS- (1) There is hereby authorized to be appropriated to the Secretary $500,000 for the study of the Taneum Creek Project and such amount as the Secretary subsequently determines is necessary for implementation of tributary measures pursuant to this section.

(2) There is also authorized to be appropriated to the Secretary such funds as are necessary for the investigation of enhancement programs similar to the enhancement program authorized by this section in other Yakima River basin tributaries contingent upon the agreement of the appropriate water right owners to participate. Funds for the implementation of any such similar enhancement program may not be appropriated until after the Secretary submits an investigation report to the appropriate congressional committees.

SEC. 1208. CHANDLER PUMPING PLANT AND POWERPLANT-OPERATIONS AT PROSSER DIVERSION DAM.

(a) AUTHORIZATION OF APPROPRIATIONS FOR ELECTRIFICATION- In order to provide for electrification to enhance instream flows by eliminating the need to divert water to operate the hydraulic turbines which pump water to the Kennewick Irrigation District, there is authorized to be appropriated--

(1) $50,000 to conduct an assessment of opportunities for alternative pumping plant locations;

(2) $4,000,000 for construction; and

(3) such sums as may be necessary for the prorata share of the operation and maintenance allocated to fish and wildlife as determined by the Secretary.

(b) POWER FOR PROJECT PUMPING- (1) The Administrator of the Bonneville Power Administration shall provide for project power needed to effect the electrification as provided in subsection (a).

(2)(A) There is authorized to be appropriated for the Bureau of Reclamation for each fiscal year in which the Administrator provides power under this subsection an amount equal to the cost to the Bonneville Power Administration of providing power under this subsection during such fiscal year. The rate to be utilized by the Administrator in determining the cost of power under this paragraph in a fiscal year shall be the rate for priority firm power charged by the Bonneville Power Administration in that fiscal year under section 7(b) of the Pacific Northwest Electric Power Planning and Conservation Act (16 U.S.C. 839e(b)).

(B) The Bureau of Reclamation shall, using funds appropriated pursuant to the authorization of appropriations in subparagraph (A), reimburse the Bonneville Power Administration for the costs of the project power provided under this subsection. Such funds shall be available for such purpose without fiscal year limitation.

(c) SUBORDINATION- Any diversions for hydropower generation at the Chandler Powerplant shall be subordinated to meet the flow targets determined under subsection (f).

(d) WATER SUPPLY FOR KENNEWICK IRRIGATION DISTRICT- The Secretary shall ensure that the irrigation water supply for the Kennewick Irrigation District shall not be affected by conservation, electrification, or subordination pursuant to this title and any reduction in its irrigation water supply resulting from conservation measures adopted or implemented by other entities pursuant to this title shall be replaced by water developed through subordination, electrification, or a combination of the two.

(e) TREATMENT OF CERTAIN FUNDS- Funds appropriated and project power provided pursuant to this section shall be nonreimbursable since such funds are used for fish and wildlife purposes and such funds are not subject to cost share under section 1203(d).

(f) TARGET FLOWS- Target flows measured at appropriate biological and hydrological location or locations shall be determined by the Yakima Project Superintendent in consultation with the System Operations Advisory Committee.

SEC. 1209. AUGMENTATION OF KACHESS RESERVOIR STORED WATER.

(a) AUTHORIZATION OF APPROPRIATIONS- In order to augment Kachess Reservoir stored water supplies from flows of Cabin Creek and Silver Creek which are excess to system demands, there is authorized to be appropriated--

(1) such sums as may be necessary to carry out a feasibility study, including the benefits, costs, and environmental aspects, of the facility described in paragraph (2);

(2) for the construction of facilities to convey such flows to Kachess Reservoir, $20,000,000; and

(3) such sums as may be necessary for the pro rata share of the operation and maintenance allocated to fish and wildlife determined by the Secretary.

(b) LIMITATION- Construction of the facilities described in subsection (a)(1) is contingent on the completion of the feasibility study referred to in subsection (a)(2).

(c) USE OF ADDITIONAL WATER- The stored water supply resulting from the construction of facilities under this section shall be used by the Secretary to--

(1) enhance the water supply available to the Kittitas Reclamation District and the Roza Irrigation District in years of proration; and

(2) facilitate reservoir operations in the Easton Dam to Keechelus Dam reach of the Yakima River for the propagation of anadromous fish.

(d) TREATMENT OF COSTS- The construction and operation and maintenance costs of the facilities under this section shall be allocated to irrigation and fishery enhancement, as follows:

(1) The portion of such costs allocated to irrigation is reimbursable, with the construction costs to be paid prior to initiation of construction by the Kittitas Reclamation District and the Roza Irrigation District.

(2) The portion of such costs allocated to fishery enhancement is nonreimbursable.

(e) KACHESS DAM MODIFICATIONS- There is authorized to be appropriated $2,000,000 for the modification of the discharge facilities of Kachess Dam to improve reservoir operations for anadromous fish enhancement. Amounts appropriated under this subsection are nonreimbursable.

SEC. 1210. INTERIM COMPREHENSIVE BASIN OPERATING PLAN.

(a) DEVELOPMENT- The Secretary shall, in consultation with the State of Washington, Yakama Indian Nation, Yakima River Basin irrigation districts, Bonneville Power Administration, and other entities as determined by the Secretary, develop an interim comprehensive operating plan for providing a general framework within which the Yakima Project Superintendent operates the Yakima Project, including measures implemented under the Yakima River Basin Water Enhancement Project, including (but not limited to)--

(1) operating capability and constraints of the system;

(2) information on water supply calculations and water needs;

(3) system operations and stream flow objectives; and

(4) the System Operations Advisory Committee activities.

(b) PROCESS REQUIREMENTS- A draft of the interim comprehensive basin operating plan shall be completed within 18 months after the completion of the Basin Conservation Plan under section 1203(f) and, upon completion, published for a 90-day public review period. The Secretary shall complete and publish the final interim comprehensive operating plan within 90 days after the close of the public review period. The Secretary shall update the plan as needed to respond to decisions from water adjudications relating to the Yakima River basin.

(c) AUTHORIZATION OF APPROPRIATIONS- There is authorized to be appropriated $100,000 to carry out this section.

SEC. 1211. ENVIRONMENTAL COMPLIANCE.

There are hereby authorized to be appropriated to the Secretary $2,000,000 for environmental compliance activities including the conduct, in cooperation with the State of Washington, of an inventory of wildlife and wetland resources in the Yakima River basin and an investigation of measures, including `wetland banking', which could be implemented to address potential impacts which could result from the activities taken under this title.

SEC. 1212. SAVINGS AND CONTINGENCIES.

(a) IN GENERAL- Nothing in this title shall be construed to--

(1) affect or modify any treaty or other right of the Yakama Indian Nation;

(2) authorize the appropriation or use of water by any Federal, State, or local agency, the Yakama Indian Nation, or any other entity or individual;

(3) impair the rights or jurisdictions of the United States, the States, the Yakama Indian Nation, or other entities over waters of any river or stream or over any ground water resource;

(4) alter, amend, repeal, interpret, modify, or be in conflict with any interstate compact made by the States;

(5) alter, establish, or impair the respective rights of States, the United States, the Yakama Indian Nation, or any other entity or individual with respect to any water or water-related right;

(6) alter, diminish, or abridge the rights and obligations of any Federal, State, or local agency, the Yakama Indian Nation, or other entity, public or private;

(7) affect or modify the rights of the Yakama Indian Nation or its successors in interest to, and management and regulation of, those water resources arising or used, within the external boundaries of the Yakama Indian Reservation;

(8) affect or modify the settlement agreement between the United States and the State of Washington filed in Yakima County Superior Court with regard to Federal reserved water rights other than those rights reserved by the United States for the benefit of the Yakama Indian Nation and its members;

(9) affect or modify the rights of any Federal, State, or local agency, the Yakama Indian Nation, or any other entity, public or private with respect to any unresolved and unsettled claims in any water right adjudications, or court decisions, including State against Acquavella, or constitute evidence in any such proceeding in which any water or water related right is adjudicated; or

(10) preclude other planning studies and projects to accomplish the purposes of this title by other means: funded publicly, privately, or by a combination of public and private funding.

(b) CONTINGENCY BASED ON APPROPRIATIONS- The performance of any activity under this title which requires accomplishment within a specified period that may require appropriation of money by Congress or the allotment of funds shall be contingent upon such appropriation or allotment being made.

Appendix B

NOTICE OF ADOPTION

NOTICE OF ADOPTION OF EXISTING ENVIRONMENTAL DOCUMENT

Description of current proposal: Cle Elum Pool Raise Environmental Impact Statement (EIS)

Proponent: Washington State Department of Ecology

Location of current proposal: Kittitas County, State of Washington

Title of documents being adopted:

Cle Elum Dam Fish Passage Facilities and Fish Reintroduction Project Final EIS (Reclamation and Ecology, 2011b)

Yakima River Basin Integrated Water Resource Management Plan Final Programmatic Environmental Impact Statement (Reclamation and Ecology, 2012)

Date adopted documents were prepared: April 2011; March 2012

Description of documents being adopted:

The Cle Elum Dam Fish Passage Facilities and Fish Reintroduction Project EIS is a joint NEPA/SEPA document prepared by Reclamation and Ecology. It evaluates potential impacts of constructing fish passage facilities at the dam and reintroducing fish above the dam. The EIS is adopted to help document the existing conditions at Cle Elum Reservoir.

The Yakima River Basin Integrated Water Resource Management Plan Programmatic EIS is a joint NEPA/SEPA document prepared by Reclamation and Ecology. The EIS evaluates the potential impacts of implementing the Integrated Plan, a comprehensive approach to water resources and ecosystem restoration improvements in the Yakima River basin. The Integrated Plan includes seven elements: reservoir fish passage, structural and operational changes to existing facilities, surface water storage, groundwater storage, habitat/watershed protection and enhancement, enhanced water conservation, and market reallocation. It is adopted to help document the potential impacts of the Cle Elum Pool Raise Project, which is included as projects in the Integrated Plan and was evaluated at a programmatic level in the Integrated Plan EIS.

If the document being adopted has been challenged (WAC 197-11-630), please describe:

N/A

The documents are available to be read at (place/time): The adopted documents were distributed to agencies with jurisdiction, Tribes, and other interested parties when they were released. The documents may be viewed at Washington State Department of Ecology offices during normal business hours (8:00 a.m. to 5 p.m., Monday to Friday) at the following locations:

Department of Ecology Headquarters
300 Desmond Drive
Lacey, WA 98503

Department of Ecology Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902-3452

The adopted documents can be viewed on-line at the following locations.

Yakima River Basin Integrated Water Resource Management Plan Final Programmatic EIS:

http://www.usbr.gov/pn/programs/yrbwep/reports/FPEIS/fpeis.pdf

Cle Elum Dam Fish Passage Facilities and Fish Reintroduction Project Final EIS:

http://www.usbr.gov/pn/programs/eis/cle-elum/index.html

EIS REQUIRED: The lead agency has determined the Cle Elum Pool Raise Project is likely to have significant adverse impact on the environment. To meet the requirements of RCW 43.21C.030(2)(c), the lead agency is adopting portions of the NEPA and SEPA documents described above, in addition to preparing a stand-alone NEPA/SEPA EIS for the proposal, to fulfill its requirements under SEPA.

The lead agency has determined that this document is appropriate for the proposal and will accompany the proposal to decision makers.

Name of agency adoption document: Washington State Department of Ecology

Responsible Official: Derek I. Sandison

Position/title: Director, Office of Columbia River

Address: 303 S. Mission Street, Suite 200
Wenatchee, WA 98801

Phone: 509-662-0516

Date: September 16, 2014 **Signature:** ____________________

Appendix C

CORRESPONDENCE WITH THE SYSTEM OPERATIONS ADVISORY COMMITTEE

IN REPLY REFER TO:

United States Department of the Interior
BUREAU OF RECLAMATION
Columbia-Cascades Area Office
1917 Marsh Road
Yakima, Washington 98901-2058

TAKE PRIDE IN AMERICA

CCA-1610
PRJ-3.00

JUN 19 2014

Mr. Jeff Thomas
Member
System Operations Advisory Committee
1917 Marsh Road
Yakima, WA 98901

Subject: System Operations Advisory Committee Communication on the Cle Elum Pool Raise Environmental Impact Statement – RiverWare Modeling Operational Scenarios

Dear Mr. Thomas:

This letter is part of our ongoing coordination with the System Operations Advisory Committee (SOAC) regarding Bureau of Reclamation's compliance with the direction outlined in Title XII of the Yakima River Basin Water Enhancement Project (YRBWEP) legislation (Public Law 103-434, Yavapai-Prescott Indian Tribe Water Rights Settlement Act of 1994, Title XII, Yakima River Basin Water Enhancement Project, [108 Stat. 4526 U.S. Code]). Reclamation and Washington State Department of Ecology are preparing an Environmental Impact Statement (EIS) for the Cle Elum Pool Raise (CEPR) Project. The CEPR Project is authorized in Sections 1205 and 1206 of Title XII.

Section 1205 states:

> "(b) WATER FROM LAKE CLE ELUM- Water accruing from the development of additional storage capacity at Lake Cle Elum, made available pursuant to the modifications authorized in section 1206(a), shall not be part of the Yakima River basin's water supply as provided in subsection (a)(1). Water obtained from such development is exclusively dedicated to instream flows for use by the Yakima Project Superintendent as flushing flows or as otherwise advised by the System Operations Advisory Committee. Water may be carried over from year-to-year in the additional capacity to the extent that there is space available. Releases may be made from other Yakima Project storage facilities to most effectively utilize this additional water, except that water deliveries to holders of existing water rights shall not be impaired."

Section 1206 states:

"(a) MODIFICATIONS AND IMPROVEMENTS- There is hereby authorized to be appropriated to the Secretary--

(1) at September 1990 prices, plus or minus such amounts as may be justified by reason of ordinary fluctuation of applicable indexes, $2,934,000 to--

(A) modify the radial gates at Cle Elum Dam to provide an additional 14,600 acre-feet of storage capacity in Lake Cle Elum,

(B) provide for shoreline protection of Lake Cle Elum, and

(C) construct juvenile fish passage facilities at Cle Elum Dam, plus

(2) such additional amounts as may be necessary which may be required for environmental mitigation.

(b) OPERATION AND MAINTENANCE APPROPRIATIONS- There is hereby authorized to be appropriated to the Secretary such sums as may be necessary for that portion of the operation and maintenance of Cle Elum Dam determined by the Secretary to be a Federal responsibility."

For the purposes of the EIS, Reclamation and Ecology are evaluating a range of operational alternatives described below. The additional storage would occur during spring and early summer in those years when high flows from snowmelt fill the reservoir. Flows from the reservoir would be slightly reduced while the reservoir is filling as compared to the baseline condition during the spring. The additional stored water could be used during summer, fall, or winter. Use of the increased storage may change annually and over time due to improved knowledge of instream flow needs and specific flow needs identified in any one year. For that reason, the additional stored water would be managed adaptively by Reclamation for instream flows with advice from SOAC. Potential uses of the additional flows are described below:

1. **Use of Additional Water for Carryover Storage.** For this scenario, the additional storage would not be released in the year the reservoir elevation exceeds 2,240 feet. The additional storage would be conserved or carried over.

2. **Use of Additional Stored Water for Instream Flows.** For this scenario, the additional stored water would be released during winter (October to March) to increase instream flow in the Cle Elum River and increase overwintering habitat. The additional stored water would provide instream flows of approximately 40 cfs for 6 months. Reclamation acknowledges that releases equal to the increased volume stored at Cle Elum may also be made at other times of the year at varying rates and also may be made from other Yakima Project reservoirs in lieu of releases from Cle Elum, as stated in Section 1205. However, Reclamation does not anticipate this will be outside existing operational ranges.

3. **Use of Additional Stored Water for Total Water Supply Available (TWSA).** For this reservoir operation alternative, the additional stored water would be managed as part of TWSA. TWSA provides an estimated total water volume available for use in determining the instream flow targets for each year in accordance with the operating criteria of the YRBWEP legislation. As part of TWSA, the additional water supply could be used to provide water supply for proratable irrigation districts in a drought or other

out-of-stream water users in a drought and for instream flows, as described in the YRBWEP legislation. Although a TWSA operational scenario would require additional authorization, it is evaluated in the EIS to provide for the full range of environmental impacts from operation of the CEPR Project.

Reclamation requests written concurrence that you agree that the range of scenarios described above provides for the likely scenarios upon which SOAC would advise Reclamation once the CEPR Project is fully operational.

Reclamation and Ecology appreciate your attention to this matter and look forward to working with you on this project.

Sincerely,

Sidney P. Ottem
Yakima Field Office Manager

Identical Letters Sent To:

Mr. David Child, Member
System Operations Advisory Committee
2807 W. Washington Avenue
Yakima, WA 98902

Mr. John Easterbrooks, Member
System Operations Advisory Committee
1701 South 24th Avenue
Yakima, WA 98902

Mr. Mark Johnston, Member
System Operations Advisory Committee
760 Pence Road
Yakima, WA 98902

cc: Mr. Derek Sandison
Washington State Department of Ecology
Office of Columbia River
15 W. Yakima Avenue, Suite 200
Yakima, WA 98902

Mr. Sidney Ottem
Yakima Field Office Manager
Bureau of Reclamation
Columbia-Cascades Area Office
1917 Marsh Road
Yakima, WA 98901-2058

Subject: System Operations Advisory Committee Communication on the Cle Elum Pool Raise Environmental Impact Statement – RiverWare Modeling Operational Scenarios

Dear Mr. Ottem:

In response to your letter dated June 19, 2014 regarding the Operational Scenarios for Cle Elum Pool Raise Project (CEPR), the System Operations Advisory Committee (SOAC) understands that an Environmental Impact Statement (EIS) for the proposed CEPR is being prepared by Reclamation and Ecology. We further understand that a range of operational scenarios must be presented in the EIS to adequately describe the range of possible environmental impacts. We understand that the RiverWare model will be used to analyze three operational scenarios:

1. **Use of Additional Water for Carryover Storage.**
2. **Use of Additional Stored Water for Instream Flows.**
3. **Use of Additional Stored Water for Total Water Supply Available (TWSA).**

The SOAC hereby concurs that the range of scenarios listed above provides for the likely scenarios upon which SOAC would advise Reclamation once the CEPR Project is fully operational.

7-15-14			7-23-14
Jeff Thomas U.S. Fish and Wildlife Service	Date	Mark Johnston Yakama Nation	Date
John A. Easterbrooks	7/15/14		7/15/14
John Easterbrooks Washington Department of Fish and Wildlife	Date	David Child Yakima Basin Joint Board	Date

cc: Mr. Derek Sandison
Washington State Department of Ecology
Office of Columbia River
15 W. Yakima Avenue, Suite 200
Yakima, WA 98902

Appendix D

SPECIES LISTS

Table D-1. Survey and Manage Species in the Cle Elum Ranger District (USFS, 2001 and 2009; BLM, 2011; Lau, 2012)

Species Name	Survey and Manage Category[1]	Habitat[2]
Vascular Plants		
Mingan moonwort	A	Riparian zones and old-growth western red cedar in dense shade, sparse understory, alluvium substrate, and often a duff layer of cedar branchlets.
Mountain grape-fern	A	Dark coniferous forests, usually near western red cedar swamps and streams from 3300-9800 feet in elevation.
Cold-water corydalis	A	In western hemlock and pacific silver fir zone and near cold flowing water and seeps and small streams.
Hemlock dwarf mistletoe	F	Principal host trees are mountain hemlock and true firs. Secondary host trees include pines and spruces.
Clustered lady's slipper	C	Habitat varies from dry to damp, rocky to loamy. Found in areas with 60 to 100 percent shade provided by various plant communities including mixed evergreen, mixed conifer, Douglas fir, and pine forest.
Mountain lady's slipper	C	Grows on a wide variety of substrates in wooded communities with 60-80 percent canopy closure in mixed conifer forests commonly consisting of Douglas fir with pine or grand fir.
Lichens[3]		
Cladonia norvegica	C	Decaying bark or wood at the base of conifer trees and on decaying logs in humid Douglas fir, Sitka spruce, and Western hemlock forests
Hypogymnia duplicata	C	Epiphyte on mountain hemlock, western hemlock, Pacific silver fir, Douglas fir and subalpine fir in old-growth forests between 1100-5450 feet
Lobaria linita	A	Moss-covered rocks in cool, moist areas in forests bordering Pacific silver fir and mountain hemlock zones. May also grow on trunks of fir trees.
Usnea longissima	F	Old-growth and late-successional conifer stands, hardwood stands, and riparian areas
Fungi[3]		
Acanthophysium farlowii	B	Recently dead twigs of live true firs, Douglas fir, and hemlock.
Albatrellus ellisii	B	Found on ground in forests
Bondarzewia mesenterica (B. montana)	B	Late successional conifer forests in Washington, often associated with stumps or snags
Cantharellus subalbidus	D	Conifer forests
Chalciporus piperatus	D	Scattered in humus in mixed woods

Clavariadelphus occidentalis	B	On soil or duff under mixed deciduous-coniferous forests
Clavariadelphus sachalinensis	B	
Clavariadelphus truncatus (borealis)	B	
Craterellus tubaeformis	D	On wet soil, often along streams or near springs or in bogs under conifers; also juxtaposed to rotten logs.
Cudonia monticola	B	On spruce needles and coniferous debris.
Gastroboletus turbinatus	B	Montane and subalpine forests of true firs, spruce, and pine
Gomphus clavatus	F	Partially hidden in deep humus in coniferous forests.
Gomphus kauffmanii	E	
Gyromitra californica	B	Well-rotted stumps or logs of coniferous trees
Helvella crassitunicata	B	Found on soil, especially along trails, in montane regions with true pines
Hypomyces luteovirens	B	Obligate parasite of species in the *Russulaceae*; found in association with roots of various tree species in the pine family.
Mycena overholtsii	D	Decayed wood in true fir forests
Otidea leporina	D	Spruce, Douglas fir, and western hemlock forests.
Polyzellus multiplex	B	Occurs in association with roots of true firs in late successional, mid-elevation, montane, conifer forests.
Ramaria araiospora	B	Spruce, Douglas fir, and western hemlock forests.
Rhizopogon evadens var. subalpinus	B	Roots of mountain hemlock or true firs.
Sarcodon fuscoindicus	B	Found in soil throughout forests
Sparassis crispa	D	Within 6 feet of the base of a living Douglas fir or pine tree
Spathularia flavida	B	Litter or woody debris of conifer and hardwood forests
Tremiscus helvelloides	D	Duff, soil, and rotten wood under conifers.

[1] Categories A through F are ranked highest to lowest based on level of relative rarity, ability to reasonably and consistently locate occupied sites during surveys prior to habitat disturbing activities, and the level of information known about the species or group of species (USFS, 2001).

[2] Potash, 1998a and 1998b; Lau, 2012; Hawksworth et al., 1996; Seevers and Lang, 1998a and 1998b; BLM, 2014a, 2014b, and 2014c; Glavich, 2013; Castellano et al., 1999 and 2003.

[3] Lichens and Fungi are listed by scientific name only.

Table D-2. USFS Sensitive and Strategic Species in the Cle Elum Ranger District (WDNR, 2014a; Lau, 2012; USFS, 2011b)

Common Name	Habitat[1]	Documented in Cle Elum Ranger District[1]	Potential Habitat in the Study Area[1]	WNHP State Status[2]
Vascular Plants				
Tall agoseris	Meadows and open woods, from lowlands to timberline in the mountains	x		S
Northern bentgrass	Banks and gravel bars in river and lake valleys, and on open grasslands and rocky slopes of mountains and cliff		x	T
Sierra onion	Rocky, thin or sandy soils of open slopes, dry meadows and dry drainage channels		x	T
Least bladdery milk-vetch	Gravelly, sandy areas, often in open woods. Prairies and foothills to Ponderosa pine forests at moderate elevations		x	S
Triangular-lobed moonwort	Perennial streams in coniferous forests. Grows in surface gravel, moist decayed litter, and rocky soil.		x	S
Blackened sedge	Mid to high elevation forest and subalpine meadows		x	---
Hair-like sedge	Streambanks, wet meadows, wet ledges and marshy lake shores.		x	T
Cordroot sedge	Wetlands, peatlands, sphagnum bogs and lakeshores		x	S
Bristly sedge	Marshes, lake margins, drainage ditches, rivulets, and wet meadows in lowlands		x	S
Yellow bog sedge	Sphagnum bogs, forested wetlands and other wet marshy places		x	---
Large-awned sedge	Moist or wet, open places and near the coast. Seepages near *Alnus sinuata* thickets on basalt cliffs.		x	T
Beaked sedge	Quaking or floating peat in association with slender sedge along lake shoreline	x	x	S

Canadian single-spike sedge	Moist meadows, rocky outcrops with some soil development at high elevations, 5900-7400 feet	x		S
Dryspike sedge	Open, sandy oak, oak-pine, or pine forests and savannas, dry prairies, sand dunes, sandy fields, sunny rock outcrops, alpine or subalpine meadows; 0–3600 meters	x		
Long-styled sedge	Coastal regions in shallow marshes, gravelly loam, streambanks and moist meadows. Some over hardened lava flow.		x	S
Many-headed sedge	Moist or wet low ground, especially in marshes or along beaches and shores.		x	S
Sparse-flowered sedge	Bogs, fens, swamps, wet grassy areas, occasionally in seepage areas in forest.		x	T
Thompson's chaenactis	Habitat: Open, usually rocky areas, at moderate to mid-elevations in the mountains.	x		S
Lanceleaf springbeauty	Wet subalpine to alpine meadows, often flowering near the edge of melting snow		x	---
Fernleaf goldthread	Moist, cool, old forest with a well-developed litter layer		x	---
Cold-water corydalis	Near cold flowing water and seeps and small streams in western hemlock/pacific silver fir zone		x	S
Wenatchee larkspur	Boggy meadowlands.	x		E
Yellow mountain-avens	In crevices of rocky, dry cliffs, High mountains, often above timberline, but down to lower elevations along streams		x	S
Purple spike-rush	Wet places, lake shores		x	---
Water avens	Stream banks, lake shores, bogs and wet meadows		x	S
Oregon goldenaster	On sand and gravel bars along rivers and streams		x	T
Longsepal globemallow	Dry, open hillsides, gravelly stream sides, and open Ponderosa pine forests, low to mid elevations.	x		S
Western jewel-weed	Disturbed, moist often shaded		x	T
Water lobelia	Occurs in shallow water at		x	T

	margins of lakes and ponds.			
Suksdorf's monkeyflower	Wet to dry open places; lowlands to rather high in the mountains.		x	---
Branching montia	Moist woods at low elevation.	x	x	S
Coyote tobacco	Dry sandy bottom lands, and in other dry open places		x	S
Yellowflower locoweed	Forest openings, moderate to mid elevations in the mountains		x	---
Brewer's cliffbrake	Open, rocky alpine areas from 4700 to 6700 feet	x		S
Fuzzytongue penstemon	West facing slopes of small canyons and in dry and rocky habitats in the foothills of the Cascade Range	x		S
Chelan rockmat	Crevices on ledges of open cliffs and rock outcrops	x		---
Least phacelia	Seasonally wet openings on clay pan	x		E
American pillwort	In shallow water of ponds an temporary pools and on reservoir margins		x	T
Pine-foot	Second growth forest at low elevations		x	T
Choris' bog-orchid	In shallow water of ponds and temporary pools and on reservoirs margins		x	T
Small northern bog-orchid	Damp to wet forested areas		x	S
Brewer's cinquefoil	Moist meadows, lake margins, and stream banks to dry, open exposed slopes at 5,000-6,000 feet	x		T
Cutleaf anemone	Prairies, wet meadows and on alpine slopes and ridges in loose, sandy, well drained soil at 5000-6000 feet.	x	x	---
Sticky goldenweed	Meadows and open or sparsely wooded slopes in the foothills to moderate elevations in the mountains.	x	x	S
Idaho gooseberry	Along streams, and slopes of moist to dry canyons		x	T
Lowland toothcup	Lakeshores, wet; in muddy soil		x	t
Black snake-root	Moist, low ground, less often on moist, wooded slopes.		x	S
Seely's silene	Cliffs and talus slopes at moderate to mid-elevations in	x		S

	the mountains.			
Western ladies' tresses	Moist to wet meadows	x		S
Thompson's clover	Common on dry, grassy hillsides just below the ponderosa pine woodlands		x	t
Flat-leaved bladderwort	Shallow, standing or slowly moving water.	x		---
Velvet-leaved blueberry	Moist or dry soil and bogs		x	S
Bryophytes				
Schistostega pennata		x	x	---

[1] Lau, 2012

[2] WDNR, 2014

Table D-3. Invasive Plant Species in Kittitas County and the Cle Elum Ranger District (Lau, 2012)

Common Name	Cle Elum Ranger District Priority Weeds	Kittitas County Regulated Noxious Weed
Absinth wormwood	x	x
Musk thistle	x	x
Diffuse knapweed	x	x
Brown knapweed	x	x
Spotted knapweed	x	x
Meadow knapweed	x	x
Russian thistle	x	x
Chicory	x	x
Canada thistle	x	x
Bull thistle	x	x
Hounds tongue	x	x
Scotch broom	x	x
Foxglove		x
Herb robert		x
English Ivy		x
Orange hawkweed	x	x
Yellow hawkweed	x	x
Common Hawkweed	x	x
European hawkweed	x	x
Common velvet grass		
St. johnswort	x	x
Cat's ear	x	x
Yellow flag iris		x
Yellow archangel		x
Everlasting peavine		x
Oxeye daisy	x	x
Dalmatian toadflax		x
Butter and eggs		x
Reed canarygrass		
Narrowleaf plaintain		
Greater plaintain		
Bohemian knotweed		x
Sulfur cinquefoil	x	x

English laurel		
Creeping buttercup		
Himalayan blackberry	x	x
Evergreen blackberry	x	x
Red sorrel		
Curly dock		
Tansy ragwort	x	x
Woodland ragwort	x	
Common groundsel	x	
Bladder campion		x
Common tansy	x	x
Dandelion		
Salsify		
Red clover		
White clover		
False mayweed		
Common mullein		
Field veronica		
Common speedwell		

Appendix E

U.S. FOREST SERVICE AQUATIC CONSERVATION STRATEGY OBJECTIVES

U.S. Forest Service Aquatic Conservation Strategy Objectives

The nine Aquatic Conservation Strategy Objectives were established in the Northwest Forest Plan (USFS and BLM, 1994b). The nine objectives are:

A. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

B. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

C. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

D. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

E. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

F. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

G. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

H. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability

I. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species

Appendix F

FISH AND WILDLIFE COORDINATION ACT EMAIL FROM U.S. FISH AND WILDLIFE SERVICE

From: **Jessica Gonzales** <Jessica_Gonzales@fws.gov>
Date: Thu, Aug 1, 2013 at 12:30 PM
Subject: RE: Yakima Basin Integrated Water Resource Management Plan - Fish and Wildlife Coordination Act Activities for upcoming projects
To: Gwendolyn Christensen <gchristensen@usbr.gov>
Cc: Jeff Krupka <Jeff_Krupka@fws.gov>, Stephen Lewis <Stephen_Lewis@fws.gov>

Wendy,

I agree with your determination of needing no further Fish and Wildlife Coordination Act Reports for the Cle Elum Pool Raise, Keechelus-to-Kachess Conveyance, and Kachess Inactive Storage projects. Discussion regarding consultation under Section 7 of ESA has begun on these projects.

Thanks,

Jessica L. Gonzales

USFWS Central Washington Field Office
215 Melody Lane # 103
Wenatchee WA 98801-8122
Phone: 509-665-3508 ext 2000
Mobile: 509-760-6925

From: Christensen, Gwendolyn [mailto:gchristensen@usbr.gov]
Sent: Monday, July 29, 2013 5:46 PM
To: Jessica Gonzales
Cc: Candace McKinley; Walter Larrick; Corey Carmack; Gerald Kelso
Subject: Yakima Basin Integrated Water Resource Management Plan - Fish and Wildlife Coordination Act Activities for upcoming projects

As we have discussed, the Fish and Wildlife Coordination Act (FWCA) Report prepared by the U.S. Fish and Wildlife Service for the Yakima River Basin Integrated Water Resource Management Plan (Integrated Plan) Final Programmatic Environmental Impact Statement (Reclamation, March 2012) is sufficient for future projects undertaken for the Integrated Plan, including Cle Elum Pool Raise, Keechelus-to-Kachess Conveyance, and Kachess Inactive Storage. Separate FWCA reports for these projects are not required.

Pursuant to the FWCA report written for the Integrated Plan, Reclamation will consult under Section 7 of the Endangered Species Act with the U.S. Fish and Wildlife Service on these three projects, which will undergo site-specific NEPA evaluation in the next couple of years.

We appreciate your continued participation and involvement with the Integrated Plan.

Please respond to this e-mail with your concurrence.

Wendy Christensen, PE
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