RECLAMATION
Managing Water in the West

Lake Roosevelt Incremental Storage Releases Project

Finding of No Significant Impact and Final Environmental Assessment

Yakima, Washington

U.S. Department of the Interior
Bureau of Reclamation
Pacific Northwest Region

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FINDING OF NO SIGNIFICANT IMPACT
Lake Roosevelt Incremental Storage Releases
Environmental Assessment
PN-FONSI-09-03

Introduction

The Bureau of Reclamation has prepared an Environmental Assessment (EA) for an incremental storage release on Lake Roosevelt. The proposed action is described in the Washington State Department of Ecology's Supplemental Environmental Impact Statement (SEIS) for the Lake Roosevelt Incremental Storage Release. It is a combination of Alternative 1C (Maximize Fish Flows), which addresses annual releases, and Alternative 1E (Maximize Fish Benefits Drought Years) which addresses operations in drought years. The information describing the alternatives can be found in Chapter 2 of Ecology's SEIS, Alternative 1C described on pages 2-20 – 2-13, and Alternative 1E on pages 2-15 – 2-17. Reclamation incorporates the description of the proposed action from that document by reference, which the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) specifically authorize and encourage agencies to do. 40 C.F.R. 1502.21.

The purpose and need of the Lake Roosevelt Incremental Storage Release Project is to improve water management in the Columbia River Basin by releasing additional water from Lake Roosevelt. The project will release an additional one foot of water from Lake Roosevelt to meet the following objectives:

- Improve municipal and industrial water supply in the Columbia River Basin by providing water to fulfill pending municipal and industrial water rights applications;

- Improve water management in the Odessa Subarea by providing water to replace some groundwater withdrawals;

- Enhance stream flows in the Columbia River downstream of Grand Coulee Dam to benefit fish; and

- To provide water to the State of Washington to issue to holders of interruptible water rights during drought years would result in an additional 0.8 foot drawdown in drought years.

Alternatives Considered

Two alternatives were developed and evaluated in the EA, the No Action alternative and the Lake Roosevelt Incremental Storage Release alternative. As noted above, the Bureau of Reclamation developed the proposed action alternative with reference to a wider range of alternatives considered in the Department of Ecology's SEIS. Further, the Lake Roosevelt Incremental Storage Release Alternative was developed in consultation with the Columbia River Water Management Policy Advisory Group (PAG), which is comprised of a large cross section of interested parties including city, county, state, federal, and tribal governments; public utility districts; irrigation districts; public interest groups; and environmental groups.

The Recommended Alternative

Reclamation has selected the Lake Roosevelt Incremental Storage Release alternative as the recommended alternative for implementation. Reasons for selecting the proposed action alternative include the positive contributions that the release alternative would make to implementing the project purposes, along with the determination evidenced throughout the final EA that the incremental impacts of the additional releases of water from Lake Roosevelt would have only minimal and insignificant impacts on the resources of concern, including fisheries, possible contaminants, and climate change, among others.

Consultation, Coordination, and Public Involvement

Consultations under Section 7 of the Endangered Species Act (ESA) have been conducted with the National Oceanic and Atmospheric Administration (NOAA Fisheries) to address impacts from this project on listed species and designated critical habitat as a part of the Federal Columbia River Power Systems Biological Assessment.

Summary of Review Comments and Reclamations Responses

The draft EA was sent out for public comment and posted on the Pacific Northwest Region Internet site on March 19, 2009. The public comment period closed on April 17, 2009. Nine letters of comments were received.

The major issues addressed in the comments dealt with the timing of NEPA compliance, the range of alternatives, contaminants in Lake Roosevelt, climate change, and the cumulative impacts associated with the proposal. Other issues raised, including groundwater and endangered species impacts, are addressed throughout the final EA.

Timing

Commenters believed that Reclamation should have prepared its NEPA analysis prior to its signing a Memorandum of Agreement (MOU) in December 2004. The MOU—between Reclamation, the State of Washington, and three irrigation districts—outlines the elements of the state's Columbia River Initiative (CRI). The MOU's stated intent is "to coordinate and facilitate cooperation between the parties to advance" certain actions related to the CRI. MOU § 1. It explicitly "does not create a legally binding contract or any right or benefit, substantive or procedural, enforceable at law or in equity." Id. (emphasis added). Further, the MOU recognizes that any Reclamation actions will be subject to NEPA review and compliance and indeed acknowledges that all actions are subject to "federal regulatory approvals." Id. §§ 32, 36. Because the MOU is merely an aspirational document and does not, by its terms, commit Reclamation to implementing any of the actions described, it would have been premature for Reclamation to conduct NEPA compliance prior to signing the MOU; signing the MOU did not cause any effects on the human environment. See 43 CFR 46.100(a) ("A bureau proposed action is subject to the procedural requirements of NEPA if it would cause effects on the human environment ….").

Commenters also noted that Reclamation should have prepared its NEPA analysis prior to applying to the state for two water rights permits needed to implement some of the actions involved in the Lake

Roosevelt Incremental Storage Release Project. Again, Reclamation believes that such analysis would have been premature because applying for the permits had no effect on the human environment. 43 CFR 46.100(a). Water made available to Reclamation under the permits may not be used for any purpose until Reclamation takes a federal action such as contracting with an entity for delivery of the water. Reclamation has always intended that, prior to any such federal action, its NEPA compliance would be complete. Should its NEPA analysis have necessitated or resulted in a change to the proposed action, Reclamation would have simply sought to amend the permits or let the permits lapse altogether.

Range of alternatives

Some commenters stated that a wider range of alternatives should have been included in the EA. As explained above, Reclamation developed the proposed action alternative with reference to a wider range of alternatives considered in the Department of Ecology's SEIS. Further, the Lake Roosevelt Incremental Storage Release Alternative was developed in consultation with the Columbia River Water Management Policy Advisory Group (PAG). Through the PAG, Reclamation received the views of cities, counties, the state, Indian tribes, public utility districts, irrigation districts, and environmental groups. Because the proposed action was formulated through a consensus process with the participation of a wide variety of interested parties, inclusion of only the proposed action and the no-action alternative in the EA is appropriate. See 43 CFR 46.310(b) (EA need only consider proposed action when "there are no unresolved conflicts about the proposed action with respect to alternative uses of available resources"); 73 Fed. Reg. 61,308 (quoting CEQ guidance stating, "When there is consensus about the proposed action based on input from interested parties, you can consider the proposed action and proceed without consideration of additional alternatives.").

Contaminants

Issues were raised relative to the potential for the drawdown associated with the proposed action to increase airborne contaminates by exposing more contaminated sediments to wind erosion. Additional information was added to the EA to address this issue. In a normal year, the number of additional acres exposed along the entire 151 mile reservoir would be approximately 400 acres, or a little over an acre for each mile of shoreline. The exposure would last for a few days to a few weeks in the late summer until Lake Roosevelt begins to refill. These areas are all exposed on an annual basis under normal operations but usually not during the recreation season which would occur with the proposed action. Studies of airborne contaminants have been conducted during periods when the exposure of sediments far exceeds the exposure that would occur with the proposed action. These studies have not found that the levels of airborne contaminants exceed the air quality standards even during the periods of deepest drawdown when sediments are exposed to a much greater extent than would occur with the proposed action. This information supported the EA's finding that the limited potential for increased contaminants would result in, at most, minor impacts.

Questions were also raised about the use of a draft EPA study (EPA 2006) that examined contaminants at beaches along Lake Roosevelt. The study provides estimates of contaminants in sediments at elevations that could be exposed by the drawdown associated with the proposed action. While the EPA study is a draft, it has been cited by EPA in the Work Plan for the Remedial Investigation and Feasibility Study for the upper Columbia River (EPA 2008). Given that the data is very pertinent to the evaluation of the proposed action and EPA has cited their draft report in recent documents, we have continued to use the draft report. Other suggested sources such as Cox et al. (2004) were not used as they involved

sediment sampling at elevations that would not be exposed by the proposed action.

Climate Change

Information from Columbia River discharge model runs, using climate change data from the University of Washington Climate Impacts Group (CIG), has been added to the EA. The modeling used the monthly changes, or "deltas," in predicting runoff with two greenhouse gas emission scenarios – medium emissions scenario (A1B) and low emissions scenario (B1). The predicted changes in temperature and precipitation used in the modeling came from a composite of predicted changes using 20 different global climate models. They indicate modest increases in fall winter and spring flows with decreases in summer flows. Annual discharge increases in the modeling. With these changes Lake Roosevelt would continue to fill, and water from storage in the reservoir would be available for the proposed action. Since spring flows may increase with changes in climate, use of the flow augmentation water provided as part of the proposed action may shift more toward the summer period when flow augmentation may be more valuable.

Global climate models generally agree that conditions in the future in the Pacific Northwest will be warmer. The individual models though predict various amounts of increase with Mantua et al. (2009) reporting that "the range of projected changes from individual models can be as extreme as 15% to 200% of the multi-model average." There is consensus among the climate models that some amount of future warming is likely to occur in the Pacific Northwest region; however, the models are not as consistent regarding increases in mean annual precipitation, with about 75% of the models predicting increases in precipitation in the northwest (Reclamation 2008:4-23). Recent studies have continued to identify the relatively wide range of future projections of precipitation. Mote and Salathe (2009: pg 11-14) report that models used in their study gave equivocal results relative to the projected future changes in precipitation. They report that individual models produce annual changes of a much as -10% or +20% by the 2080s. On a seasonal basis they indicate that some models produce modest reductions in fall or winter precipitation while others predict very large increases (up to 42%).

Cumulative Impacts

Several commenters suggested that the impacts associated with the Odessa Subarea Special Study should be considered as part of the cumulative effects analysis. An appraisal level study of the Odessa Subarea Special Study has been completed and a feasibility study, carried out by both Reclamation and the Department of Ecology, is underway. That study includes a range of action alternatives as well as the No Action alternative. To date, none of the action alternatives has been determined to be feasible and no actions have been taken to implement any of the alternatives. Consequently none of the actions being contemplated as part of the Odessa Subarea Special Study is reasonably certain to occur at this time.

Some commenters also suggested that the proposed action should be considered as part of the Odessa Subarea Special Study. While both actions would, if implemented, involve the additional diversion of water from the Columbia River for the irrigation of lands in the Odessa Subarea the Lake Roosevelt Incremental Storage Release project is a stand-alone project and can operate without any of the alternatives being contemplated as part of the Odessa Subarea Special Study. Likewise, the alternatives under consideration in the Special Study are not dependent on the Incremental Storage Release project. For these reasons, the Lake Roosevelt Incremental Storage Release project and the Odessa Subarea

Special Study do not qualify as "connected actions" under 40 CFR 1508.25(a)(1) and need not be addressed in the same NEPA document.

Congress authorized the continued irrigation development of the CBP using a phased development approach. House Document No. 172 anticipated about a 70-year period of incremental development to complete the CBP. The Lake Roosevelt Incremental Storage Release Project is one phase of contemplated phased development that to large extent makes use of existing facilities to provide incremental development of the CBP. Alternatives in the Odessa Subarea Special Study contemplate the construction of large new facilities, a portion of the East High Canal and/or expansion and extension of the East Low Canal. Neither project is dependent upon the other for its justification, success or failure. Each could go forward independent of the other and as such the Lake Roosevelt Incremental Storage Release Project is not a part of the Odessa Subarea Special Study. The distinct nature of the two projects further confirms that they are not considered as "connected action" under the CEQ regulations and need not be considered in the same NEPA analysis.

Other comments included Reclamation's decision not to include cumulative impacts from the Quincy Basin water right, the 508-14 water right, Department of Ecology's Columbia River Mainstem Off-Channel Storage Options Assessment, and the Potholes Supplemental Feed Route. The Quincy Basin water right is an artificially stored, underground water source. The water is stored in O'Sullivan Reservoir and under terms of the program, cannot be used for irrigation in the Odessa Subarea; therefore no cumulative impact will occur. The 508-14 water right is similar to the Quincy Basin water right, but currently is not in effect and is not reasonably certain to occur. In regards to Ecology's off-channel storage, Reclamation has no congressional authority to pursue a feasibility study for that project at this time, and so it is also not reasonably certain to occur. The Potholes Supplemental Feed Route has no effect to Columbia River flows; this project simply re-routes water already being diverted from the Columbia River.

Economics

Comments were also received regarding the economics of the proposed action and financing for it. Most of these comments assumed that the Lake Roosevelt Incremental Storage Release project was actually part of the Odessa Subarea Special Study. The largest set of comments on the issue focused largely on the Odessa study rather than the Lake Roosevelt Incremental Storage Release project. It concluded that if the Lake Roosevelt project is actually part of the Odessa Subarea Special Study then the comments on the Odessa project are applicable to the Lake Roosevelt Incremental Storage Release project as well. As outlined above the two projects are separate and distinct actions not relying on one another for their justification. As such comments on the Odessa Subarea Special Study are not relevant to the Lake Roosevelt Incremental Storage Release Project.

Most of the comments received regarding economics and financing dealt with the cost and benefits of the Odessa Subarea Special Study and the subsidies provided by law for the Columbia Basin Project. An EA is a NEPA compliance document the purpose of which is to assess potential impacts to the human environment from the proposed action. The comments on economics and project financing did not identify any additional environmental impacts, beyond those already addressed in the EA, which the commenters felt would occur as a result of the economic and financing issues raised. Consequently the analysis of effects has not been modified to account for the comments provided on those issues.

Mitigation

Although the Bureau of Reclamation has determined that no significant impacts to the environment will result from this proposed action, the Bureau, in coordination with the State of Washington, has developed a series of prospective mitigation measures in the Environmental Assessment, incorporating those in the State's SEIS by reference. Under the National Environmental Policy Act's implementing regulations, agencies are authorized and encouraged to work cooperatively to address any potential impacts on the environment.

Commenters have expressed concern mainly over the possible ramifications of two issues: the potential impacts of the proposed action on wildlife and fish and the effects of new water rights. With respect to effects on wildlife and plants, no mitigation is proposed as no impacts are anticipated. In terms of fish, releases of fish flows, designed to benefit off-site fisheries, are expected to offset any minor effects that may occur to Lake Roosevelt fisheries. Additionally, the potential slight reduction in zooplankton with reduced reservoir residence time and increase in fish entrainment may be mitigated, on the advice of WDFW, with changes to the existing artificial production supplementation program. With regard to the effect of new water rights, Ecology has already issued two secondary use permits for two parts of the proposed action, irrigation in the Odessa area and M&I use. The Reports of Examination prepared by Ecology for those permits did not find that they would impair or adversely affect existing water rights so no mitigation was necessary. A secondary use permit for the drought year portion of this proposal would be subject to similar review. Ecology has indicated in the SEIS at 4-22 that that permit would not be issued if the authorized releases would impair or adversely affect existing water rights from the reservoir and those impacts could not be mitigated.

Further proposed mitigation actions can be found in Chapter 3 of the Environmental Assessment and Chapter 4 of the SEIS. However, no significant impacts are expected to result from the proposed action.

Findings

This Finding of No Significant Impact (FONSI) is based upon the following:

- Impacts to listed fish would be beneficial downstream of Grand Coulee Dam from the additional one-foot release.
- While contaminants are present in and around Lake Roosevelt the additional drawdown does not expose much additional sediments to wind erosion Studies to date have not found that airborne contaminants are a human health threat even during periods of maximum drawdown when far more sediments are exposed to wind erosion than that contemplated in the Lake Roosevelt Incremental Storage Release Project.
- No negative impacts to terrestrial and aquatic species, groundwater, surface water, or soils were identified in the EA.
- The potential impacts from global climate change are difficult to predict with any precision. Based on estimates using composite values from 20 different global climate models it appears that annual discharge in the Columbia River will increase with modestly higher flows occurring in the fall, winter and spring and lower flows in the summer. Lake Roosevelt will continue to fill and the water supplies for the proposed action, which come from storage in Lake Roosevelt, will continue to be available.

Based on the environmental analysis as presented in the final EA, Reclamation concludes that implementation of preferred action and associated environmental commitments would have no significant impact on the quality of the human environment or the natural resources in the affected area.

This Finding of No Significant Impact has therefore been prepared and submitted to document environmental review and evaluation in compliance with the National Environmental Policy Act of 1969, as amended.

RECOMMENDED:

Columbia-Cascades Area Environmental Manager

6-12-09
Date

APPROVED:

Columbia-Cascades Office Area Manager

6-12-09
Date

LAKE ROOSEVELT INCREMENTAL STORAGE RELEASES ENVIRONMENTAL ASSESSMENT

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Acronyms

AIP	Agreement in Principle
amsl	above mean sea level
APE	Area of Potential Effect
ARPA	Archaeological Resources Protection Act of 1979
ASIL	Acceptable Source Impact Level
BiOp	Biological Opinion
BMP	Best Management Practices
BPA	Bonneville Power Administration
CBP	Columbia Basin Project
CBFWP	Columbia Basin Fish and Wildlife Program
CBRW	Columbia Basin Railroad
CCT	Confederated Tribes of the Colville Reservation
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
Corps	U.S. Army Corps of Engineers
CRI	Columbia River Initiative
CSRIA	Columbia-Snake River Irrigators Association
CSTAG	Contaminated Sediments Technical Advisory Group
cy	Cubic Yard
Districts	East Columbia Irrigation District, South Columbia Irrigation District, and Quincy-Columbia Irrigation District
DNR	Washington State Department of Natural Resources
DOH	Washington State Department of Health
EA	Environmental Assessment
Ecology	Washington State Department of Ecology
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESSB	Engrossed Substitute Senate Bill
FCRPS	Federal Columbia River Power System
IPPC	Intergovernmental Panel on Climate Change
ITA	Indian Trust Assets
LRNRA	Lake Roosevelt National Recreation Area
MOU	Memorandum of Understanding
Management Program	Columbia River Basin Water Management Program
MSA	Magnusen-Stevens Act of 1996
maf	Million acre-feet
NAGPRA	Native American Graves Protection and Repatriation Acts of 1990
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NPPC	Northwest Power Planning Council
NPS	National Park Service
NRA	National Recreation Area
PAG	Columbia River Water Management Policy Advisory Group
PEIS	Programmatic Environmental Impact Statement
PHS	Priority Habitats and Species

PM 10	Particulate Matter Less Than 10 Microns
PNCA	Pacific Northwest Coordination Agreement
RCW	Revised Code of Washington
Reclamation	Bureau of Reclamation
RI/FS	Remedial Investigation and Feasibility Study
RIOG	Regional Implementation and Oversight Group
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office
STI	Spokane Tribe if Indians
TCP	Traditional Cultural Properties
TDG	Total Dissolved Gas
TEL	Threshold Effects Level
TMT	Technical Management Team
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRA	Voluntary Regional Agreement
WAC	Washington Administrative Code
WDFW	Washington State Department of Fish and Wildlife

Chapter 1 Purpose of and Need for Action

1.1 Introduction

In December, 2004 a Memorandum of Understanding (MOU) for the Columbia River Initiative (CRI) was signed between Washington State, Bureau of Reclamation (Reclamation), East Columbia Basin Irrigation District, South Columbia Basin Irrigation District, and Quincy-Columbia Basin Irrigation District (Districts). The objectives outlined in the MOU include investigating the withdrawal of additional water from Lake Roosevelt to provide drought relief, improve municipal and industrial supply, provide a replacement for some of the groundwater for use in the Odessa Subarea, and for instream purposes in Lake Roosevelt and below Grand Coulee Dam along the mainstem of the Columbia River to the Pacific Ocean.

With the passage of the Columbia River Water Management Act by the Washington State Legislature in 2006, the CRI was modified and became part of the Columbia River Basin Water Management Program (Management Program). The objectives of the Management Program are to meet the water needs of growing communities and their rural and agricultural economies along the mainstem of the Columbia River, and to do so in a manner that reduces the risk to fish resulting from out-of-stream use of water. Washington State Department of Ecology (Ecology) has been directed to aggressively pursue development of water supplies to benefit both instream and out-of-stream water uses through implementation of the Columbia River Basin Water Management Program. As part of the Management Program, Ecology set up the Columbia River Water Management Policy Advisory Group (PAG); to create a forum for Ecology to talk with stakeholders about key Columbia River water resource management issues and for stakeholders to build understanding of one another's perspectives and identify areas of common interest. The stakeholders represent a large cross section of interested parties to include city, county, State, Federal and Tribal governments, Public Utility Districts, Irrigation Districts, Public Interest Groups, and Environmental Groups. The PAG is to help Ecology identify policy issues associated with implementing a new water resource management program for the Columbia River; to provide Ecology with a full range of perspectives on policy choices and priorities, represented by stakeholder interests; and, assist Ecology in setting criteria for funding of storage and conservation projects and provide a full range of perspectives on potential projects sent forward from the Conservation and Storage Advisory Group.

Ecology prepared a Programmatic Environmental Impact Statement (PEIS) in 2007 entitled Final Programmatic Environmental Impact Statement for the Columbia River Water Management Program. In this document Ecology committed to doing further impact analysis on each of the projects included in the PEIS.

In August 2008, Ecology completed a Supplemental Environmental Impact Statement for the Lake Roosevelt Incremental Storage Releases Program (SEIS). The SEIS analyzes impacts of releasing an additional one foot of water from Lake Roosevelt during the irrigation season and doing improvements to the Weber siphons, features of the Columbia Basin Project (CBP).

1.2 Purpose and Need

The purpose and need of the Lake Roosevelt Incremental Storage Releases Project is to improve water management in the Columbia River Basin by releasing additional water from Lake Roosevelt to meet the following objectives:

- Improve municipal and industrial water supply in the Columbia River Basin by providing water to fulfill pending municipal and industrial water rights applications;

- Improve water management in the Odessa Subarea by providing water to replace some groundwater withdrawals;

- Enhance stream flows in the Columbia River downstream of Grand Coulee Dam to benefit fish; and

- Provide water to the State of Washington to issue to holders of interruptible water rights during drought years.

These objectives address the purposes described in the MOU between Ecology, Reclamation, and the Columbia Basin Project Irrigation Districts (Section 1.3.1). These objectives also address the priority needs identified in RCW 90.90.020(3) (Section 1.3.2).

1.3 Project Location and General Description of the Area

Franklin D. Roosevelt Lake, also known as Lake Roosevelt, is located within Grant, Lincoln, Ferry, Okanogan, and Stevens Counties, Washington. It is formed by Grand Coulee Dam on the Columbia River at about river mile 596 near Coulee Dam, WA. Lake Roosevelt extends 151 miles northeast to the Canadian border and up the Spokane River, a tributary of the Columbia, to within 37 miles of Spokane. The total storage capacity of the reservoir is about 9.4 million acre-feet, and the active capacity is about 5.2 million acre-feet.

Water from Lake Roosevelt is pumped up to Banks Lake at Grand Coulee Dam. It is delivered to farm lands stretching from around Soap Lake to Pasco and east from the Columbia River to around the Connell and Warden areas. The water is delivered through a series of reservoirs, canals, laterals and pumping stations. The CBP is authorized to irrigate 1,029,000 acres; about 671,000, or approximately 65 percent of the acreage authorized by Congress is currently irrigated. Most of the lands authorized for irrigation but not yet receiving CBP water lie to the east of the land currently irrigated. A portion of these lands are over the Odessa Aquifer and could receive CBP water as part of this proposal.

The water to be provided for municipal and industrial use, drought relief and instream flows would be released from Grand Coulee Dam and stay instream until it is diverted for use. With the exception of the 51 mile long Hanford Reach north of Kennewick, the Columbia River below Grand Coulee Dam is impounded down to Bonneville Dam at river mile 146. Diversions of the municipal and industrial water and the drought relief water would likely occur from the impoundments along this reach of the river. Water used to augment instream flows would remain in the river all the way to the mouth.

The Weber Branch and the Weber Coulee siphons, which are a part of the East Low Canal on the CBP, are located near the canal crossing of Interstate Highway 90 (I-90) approximately 10 miles east of Moses Lake. The first, or upstream, siphon is the Weber Branch. It is 3,215 feet long and crosses a valley that is approximately 80 feet deep (below the invert of the East Low Canal). The siphon is comprised of reinforced concrete and is 14 feet 8 inches in diameter.

The second siphon is 6,166 feet long and crosses Weber Coulee, a valley that is approximately 110 feet deep (below the invert of the East Low Canal). The existing Weber Coulee Siphon is also reinforced concrete and 14 feet 8 inches in diameter. When I-90 was built, the pipe for a second siphon was constructed for part of the route to avoid having to dig under or tunnel through I-90 when a second siphon was needed.

Figure 1-1. Project Location Map

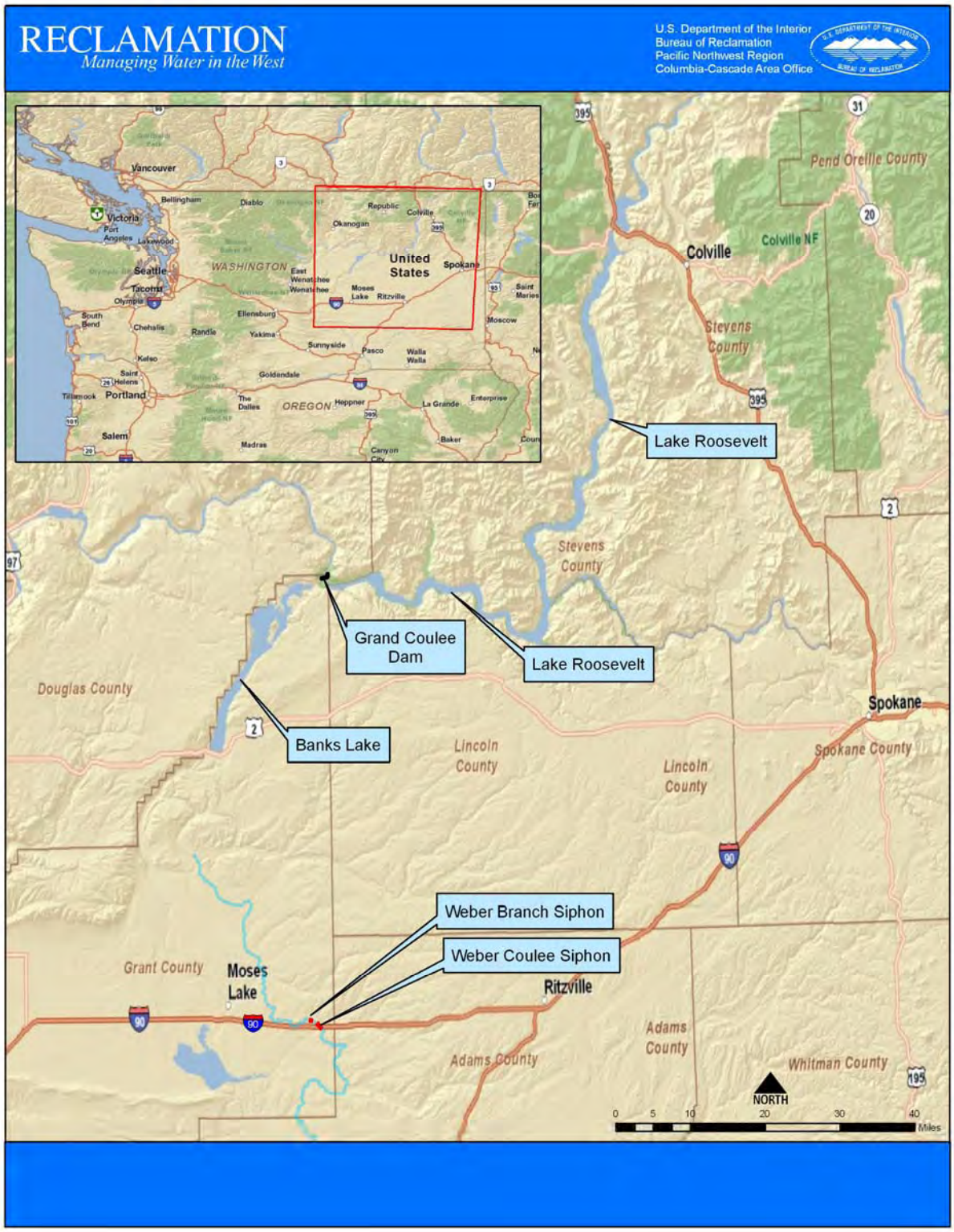
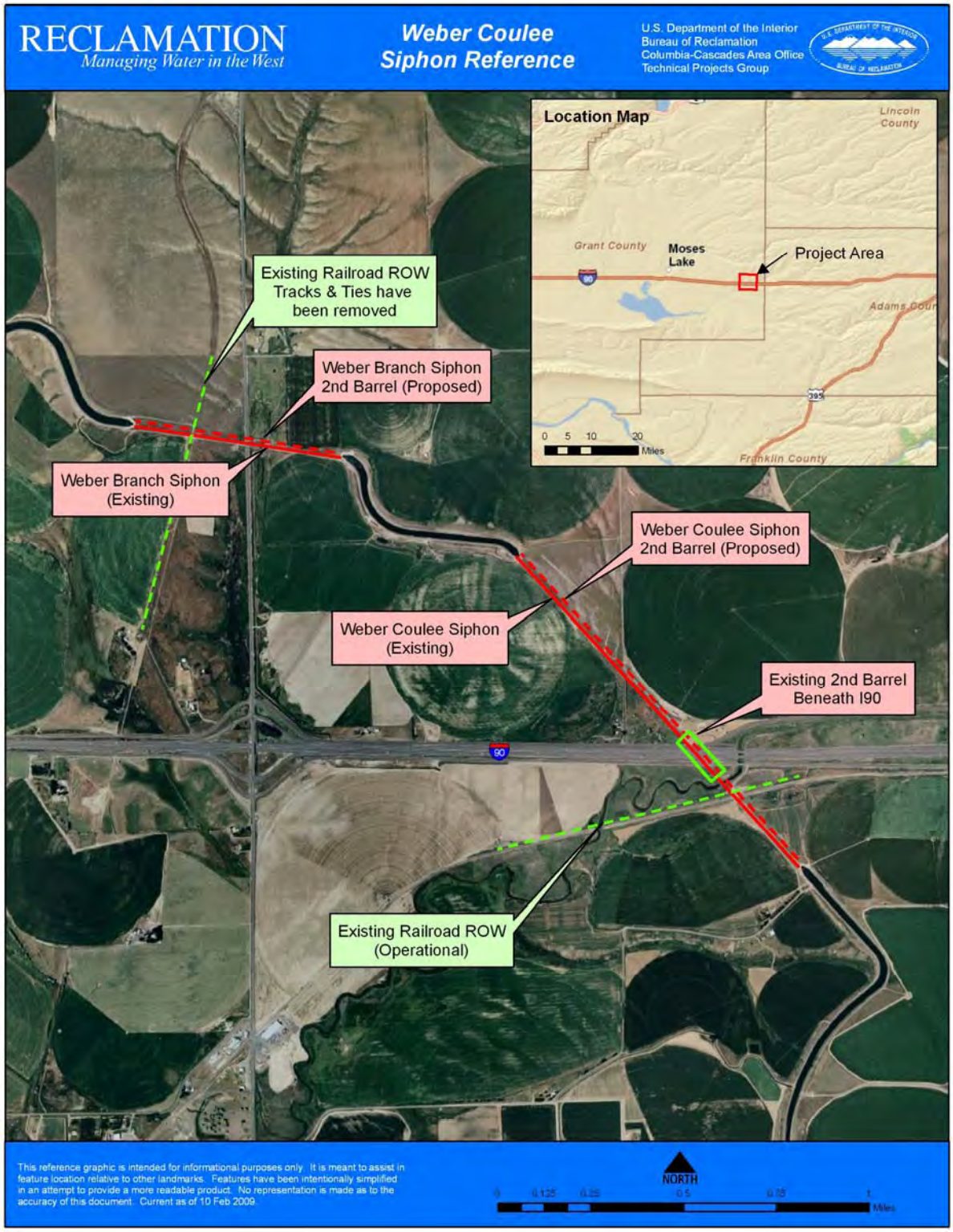


Figure 1-2. Aerial View of Weber Siphons



1.4 Project History and Background

Lake Roosevelt is the reservoir formed by Grand Coulee Dam. Construction on the dam began in 1933 and was completed in 1941. Congress originally authorized the Grand Coulee project for irrigation, navigation, flood control, hydropower, and other beneficial uses. Storage and delivery of water for municipal and industrial purposes is a beneficial use and a project purpose. Since the original authorization, recreation and fish management have been added to the authorized purposes of the dam and reservoir. However, recreation and fish management continue to be secondary considerations for the overall operation of the reservoir (NPS, 2000).

Grand Coulee and Lake Roosevelt are part of the complex and highly regulated system of Columbia River dams and reservoirs. The general management and operation of the Columbia River system is presented in Section 3.1 of the Ecology's PEIS (Ecology, 2007). The following sections present additional information specifically relevant to management of Lake Roosevelt.

Reclamation operates the dam and reservoir for flood control, hydropower generation, irrigation, recreation, and fish and wildlife. The reservoir is operated in coordination with the U.S. Army Corps of Engineers (Corps) for flood control and the Bonneville Power Administration (BPA) for power production. Reclamation also coordinates with state and federal fish and wildlife agencies to release flows for fish in the Columbia River or to store water in the reservoir for resident fish.

At full pool, the surface elevation of Lake Roosevelt is 1,290 feet above mean sea level (amsl) and has an active capacity of 5.2 million acre-feet. Lake Roosevelt receives large amounts of runoff from its tributaries with enough runoff to fill the reservoir approximately seven times in an average year. The minimum operating pool level of Lake Roosevelt is 1,208 feet amsl. To meet the purposes of its operation, Lake Roosevelt is drawn down and filled twice during the year – a deeper draw down in winter and early spring for flood control and a smaller draw down in summer for flow augmentation.

The reservoir is operated under a series of "rule curves" that regulate the amount of fill and drawdown for flood control. In late winter or early spring, flows are released from the reservoir to allow room to store upstream runoff to prevent flooding downstream. In an average year, with normal precipitation, the reservoir can be drawn down 50 feet or more. The level of drawdown is set by the Corps based on the volume water supply forecast and other factors. The reservoir typically refills by July 4.

Approximately 2.65 million acre-feet is pumped annually to Banks Lake to support irrigation in the CBP. The irrigation season is generally from mid-March through October.

Lake Roosevelt is also operated to provide stream flows downstream to benefit fish. In the Columbia River system, there are 13 anadromous fish stocks listed as threatened or endangered under the Endangered Species Act (ESA). Under the ESA, National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) have developed Biological Opinions that include objectives for Columbia River operations to benefit the listed species. The two agencies review annual water management plans developed by the Corps, Reclamation, and BPA to assist in meeting the Biological Opinion (BiOp) fish objectives. The water management plans are intended to manage flows to avoid stranding fish, speed downstream migration of juvenile

fish, facilitate upstream passage of adults, meet water temperature needs, and avoid high creating dissolved gas conditions.

In addition to seasonal fluctuations, Lake Roosevelt fluctuates daily because of load following and other operations for power. Grand Coulee Dam is one of 11 hydropower generating facilities on the Columbia River mainstem. Grand Coulee Dam has three power plants with 32 turbines and a maximum generating capacity of 6,809 megawatts. The amount and timing of power generation is coordinated through the Pacific Northwest Coordination Agreement (PNCA) and the Canadian Treaty. Additional information on hydropower production is provided in the SEIS, Section 3.13.

Reclamation also operates Lake Roosevelt for recreation purposes within the limitations of the rule curves for other reservoir purposes. Lake Roosevelt is drafted to elevation 1280 or 1278 amsl by the end of August to help meet flow objectives for anadromous juvenile fish migration.

1.4.1 River and Reservoir Management

The operation of Columbia River dams and reservoirs, including Lake Roosevelt, are governed by a complex system of international treaty, federal and state laws, and management agreements. The river and dams are managed as the Federal Columbia River Power System (FCRPS) and regulated by BPA, Reclamation, and the Corps. These agencies coordinate the operations of the reservoirs to meet their various authorized purposes. In addition, a number of other organizations have management responsibilities related to specific purposes. The FCRPS Regional Forum was established to provide regional discussion and decisions on the operation and configuration of the FCRPS (FCRPS, 2001). The Regional Forum consisted of an Implementation Team, the Executive Committee, and various technical teams and work groups, including the Technical Management Team (TMT). The TMT consists of representatives from NMFS, USFWS, Reclamation, Corps, BPA, state agencies, and Indian Tribes. The TMT is responsible for recommendations on day-to-day operations to optimize passage conditions for fish under the Biological Opinions. Regional coordination for the 2008 BiOp is conducted through the Regional Implementation and Oversight Group (RIOG). The RIOG consists of three levels: policy makers from the regional sovereigns; senior technical teams; and technical teams. The technical team level of RIOG will continue nearly the same as the equivalent level of the Regional Forum.

Several native tribes have reservations and historic use areas in the Columbia River Basin. The native tribes have historic and treaty rights to take fish from the Columbia River and its tributaries and have treaty rights to fish in usual and accustomed places. The federal government has a trust responsibility to provide services that protect and enhance the treaty rights of native people. The tribes implement fish and wildlife management programs in the Columbia River Basin and participate in river governance decisions. Tribes with a primary interest in the operation of Lake Roosevelt are the Confederated Tribes of the Colville Reservation and Spokane Tribe of Indians, as well as the Yakama Nation and the Nez Perce, Umatilla, and Warm Springs Tribes.

1.4.2 Lake Roosevelt National Recreation Area

Lake Roosevelt is 151 miles long and extends nearly to the Canadian border. The lake has approximately 600 miles of shoreline. The majority of the shoreline is managed as the Lake

Roosevelt National Recreation Area (NRA). From 1946 until 1990, the NRA was managed solely by the National Park Service (NPS). In 1990, cooperative management was established between NPS, the Confederated Tribes of the Colville Reservation (CCT), and the Spokane Tribe of Indians (STI). The NRA consists of a narrow band of land that extends upland from the maximum high water mark of the reservoir (1,290 feet amsl). The NRA encompasses all the lands that were acquired or withdrawn by Reclamation for construction of the reservoir. The CCT and the STI manage the lands on their tribal reservations and the NPS manages the lands in the NRA. Reclamation retains management of the dam, its immediate area, and some other locations deemed necessary for operating the reservoir.

1.5 Water Source and Rights

Reclamation currently operates under a 1938 storage water right issued by the state for irrigation and hydroelectric production.

1.6 Related National Environmental Policy Act and Endangered Species Act Documents

- Department of Ecology Programmatic Environmental Impact Statement issued in February, 2007.

- Department of Ecology Supplemental Environmental Impact Statement for the Lake Roosevelt Incremental Storage Releases Program issued in August, 2008

- Final Biological Opinion issued by National Marine Fisheries in May, 2008, on the operation of the Federal Columbia River Power System for salmon and steelhead listed under the Endangered Species Act.

1.7 Permits Required for Implementation of This Project

On December 1, 2008, Ecology issued Reclamation two secondary water use permits to use the water for the purposes designated in the MOU:

- Permit 1 is for 37,500 acre-feet for enhanced stream flows with 25,000 acre-feet of that amount to be placed in the state trust program for mitigation of future municipal and industrial use. The instantaneous flow limit on Permit 1 is 305 cubic feet per second (cfs) with 204.66 cfs for mitigation for municipal and industrial use and 101.33 cfs for instream purposes.
- Permit 2 is for 45,000 acre-feet with 30,000 acre-feet for irrigation of lands within the Odessa Subarea as an alternative water supply to existing groundwater use and 15,000 acre-feet for stream flow enhancement. The instantaneous flow limit on Permit 2 is 303 cfs with 181 cfs for the Odessa Subarea and 122 cfs for instream purposes.
- To implement the drought provisions of this action Reclamation will apply to the State for an additional secondary use permit.

Permits may be required for construction of improvements at the Weber siphons. This may include a Hydraulic Permit Approval and a National Pollutant Discharge Elimination System Permit.

1.8 Tribal Agreements

The state has developed cooperative agreements with the CCT and with the STI regarding management of Lake Roosevelt. The state entered into an Agreement in Principle (AIP) with the CCT in 2005 and extended that agreement in 2006. Provisions of the AIP included:

- Investigation of potential impacts of the drawdown of Lake Roosevelt and compensation for impacts to the CCT;
- Creation of an economic development capital fund for the CCT;
- Creation of a fisheries enhancement capital fund and provisions for joint work on fisheries management; and
- Tribal participation in investigation of the potential for new off-channel storage in the Columbia River system.

In December 2007, the state announced the signing of Water Resources Management Agreements with the CCT and the STI in support of the incremental storage releases from Lake Roosevelt covered in this EA. The state agreed to provide annual payments to the tribes to mitigate for potential damage to fish and wildlife, recreation and cultural activities resulting from the release of water from Lake Roosevelt, and for economic development investments to benefit the local economy.

Following signing of the Water Resource Management Agreements legislation (ESSB 6874) was enacted that directs Ecology to allocate funds annually from the Columbia River Basin Water Supply Development Account to the CCT and the STI. Funds are allocated to the CCT to provide mitigation for potential effects of the proposed action on resident fish, cultural resources, recreation resources, additional exposure of contaminated sediments, and hydropower revenue. Funds allocated to the STI are to provide mitigation for potential effects of the project on power revenue, recreation resources, and cultural resources. Neither agreement affects the tribal water rights or any other tribal rights.

The legislation also authorizes a study of potential impacts to counties affected by the proposed action. Ecology will assist affected counties to explore options to ensure water resources are available for their current and future needs. A Memorandum of Understanding could be developed between the state and the affected counties.

Chapter 2 Alternatives Including the Proposed Action

This chapter addresses the proposed action alternative as well as the No Action alternative. The proposed action is described in the Ecology's SEIS for the Lake Roosevelt Incremental Storage Release (Ecology, 2008). It is a combination of Alternative 1C (Maximize Fish Flows) , which addresses annual releases, and Alternative 1E (Maximize Fish Benefits Drought Years) which addresses operations in drought years. The information describing the alternatives can be found in Chapter 2 of the Ecology's SEIS, Alternative 1C described on pages 2-20 – 2-13, and Alternative 1E on pages 2-15 – 2-17. Information regarding the modifications to the Weber Branch and Weber Coulee siphons which would need to be modified as part of Alternative 1C can be found on pages 2-17 – 2-19. We incorporate the description of the proposed action from that document by reference. The PEIS is available online at http://www.ecy.wa.gov/programs/wr/cwp/eis.html and the SEIS is available at http://www.ecy.wa.gov/programs/wr/cwp/cr_lkroos.html. Hard copies of both documents are also available for examination at Reclamation's Columbia-Cascades Area Office at 1917 Marsh Road, Yakima, WA. What follows is a brief summary of the proposed action and No Action alternatives.

2.1 No Action Alternative

Under the No Action Alternative, no incremental storage releases would be made from Lake Roosevelt. The reservoir would continue to be operated under existing conditions. Lake levels would continue to fluctuate as they do under the existing operating schedule. No additional releases would be made from Lake Roosevelt to improve municipal and industrial water supply or provide water for Columbia River mainstem interruptible water right holders. The water users with pending water right applications for municipal and industrial uses would need to seek other sources of water or water rights or reduce their expected water use. The water users with interruptible water rights would continue to have their water diversions interrupted during drought years as conditioned on their existing water rights. There would be no additional water released from Lake Roosevelt to supplement stream flows for fish in the Columbia River during non-drought or drought years. Lake Roosevelt water would not be available to help replace groundwater in the Odessa Subarea during non-drought years. Irrigators in the Odessa Subarea would continue to deplete the Odessa Aquifer, find new sources or water, alter their agricultural practices to use less water, or convert to dry land farming.

Other entities may propose releases of water from Lake Roosevelt as separate projects. Those projects would be evaluated under separate environmental review.

2.2 Lake Roosevelt Incremental Storage Release Alternative

Lake Roosevelt

Under the proposed action, water would be released from Lake Roosevelt on an annual basis to provide for irrigation in the Odessa Subarea and for municipal/industrial use from the Canadian border to the mouth of the river. The proposed action also includes withdrawals that would

occur only during drought years (April – September water supply forecast at The Dalles less than 60 million acre-feet (WAC 173.563.056) and provide water to existing water right holders along the Columbia River whose water rights are interruptible during drought years. Under the proposed action 25,000 acre-feet would be available annually for additional municipal and industrial use, 30,000 acre-feet would be annually available for irrigation in the Odessa Subarea and 27,500 acre-feet would be available annually to augment instream flows. In total 82,500 acre-feet would be released in a non-drought year with 27,500 acre-feet of that water remaining in the river for fish flows. In drought years an additional 33,000 acre-feet would be released and available for diversion by existing water right holders whose water rights are interruptible in drought years and another 17,000 acre-feet would be available for instream flow augmentation. In a drought year releases would total 132,500 acre-feet.

The water to be made available in the Odessa Subarea would only be available to individuals within the CBP project boundary who are currently irrigating with a valid groundwater right from the State. To receive water under this proposal the water right holders would have to agree to "exchange" the surface water being provided by this proposal for the groundwater that they are currently pumping.

The annual release of 82,500 acre-feet would result in approximately a 1-foot additional drawdown of the Lake Roosevelt at the end of August. In drought years, with the release of 132,500 acre-feet, an estimated additional drawdown of approximately 0.8 feet for a total of 1.8 feet at the end of August would occur.

The water that will be released from Lake Roosevelt is water that is currently stored in the lake as part of Reclamation's 1938 storage water right. Under the proposed action, Reclamation would provide the water under secondary use permits, two of which have been issued by Ecology (see Section 1.7) and a third, which has not been issued, which would cover the drought portion of the proposal.

Flow releases for fish and municipal and industrial users would be timed to maximize the benefits for fish in the Columbia River. A panel of fisheries and water managers would determine the release schedule each year that best achieves the fisheries benefits within the constraints of the water budget. This alternative represents the differences that could be expected in response to varying water supply and fishery objectives. The amount of water that can be released for municipal and industrial uses or for fish would be constrained by the instantaneous flow limits of Reclamation's secondary water use permit, For example, if the advisory panel determined that all of the water should be released in June to benefit fish, the release schedule could not be met because of the instantaneous flow limits.

This alternative would attempt to provide flexibility to spread water available for fish (fish flows plus municipal and industrial flows) throughout the April to August period and in September when water is available. Water would be released to the Columbia River under a schedule that would be developed by the advisory panel. Table 2- 1 illustrates the general flow release strategy. The shading on the table illustrates the months when water could be released for fish and municipal and industrial uses.

Water would be distributed to the Odessa Subarea from Banks Lake in mid-March through October. This water would not be available for downstream uses in the Columbia River. Water to supply Odessa would be released from Lake Roosevelt to Banks Lake in all months except in

September of some years when it would be drawn directly from Banks Lake. The demand for the Odessa Subarea in Table 2-2 shows average monthly releases. The actual demand would be dependent on the delivery schedule and lands served. Peak water use could exceed the monthly average.

Table 2-1. Maximize Fish Flows – Average Year

Purpose of Releases	Total Release (acre-feet)	Schedule of Incremental Releases from Lake Roosevelt (average cfs)						
		April	May	June	July	August	September	October
Odessa	30,000	34	65	101	130	97	51[1]	17
Fish	27,500						[1]	
Municipal/ Industrial	25,000						[1]	
Total	82,500							17

Months in which flow releases can occur
[1]Water may not be available in all Septembers

During dry years, all flows for fish would be released to the Columbia River between April and June to meet the requirements of the Water Resources Management Agreement with the CCT, (Table 2-2). Releases for municipal and industrial uses would be on the same schedule to coincide with the fish releases and obtain the maximum benefit for fish. This option would provide the highest release for spring migrating salmonids. Only the flows for Odessa, which go to Banks Lake, would be released in July, August, and October. Some water could also be released for municipal and industrial uses in July and August to meet mitigation requirements of Voluntary Regional Agreements. To meet lake level targets for kokanee, no water for Odessa would be diverted from Lake Roosevelt in September of dry years. The 51 cfs for Odessa would be released directly from water stored in Banks Lake during September. Table 2-2 shows the average demand for the Odessa Subarea. Actual demand could vary.

Table 2-2. Maximize Fish Flows –Dry Year

Purpose of Releases	Total Release (acre-feet)	Schedule of Incremental Releases from Lake Roosevelt (average cfs)						
		April	May	June	July	August	September	October
Odessa	30,000	155	149	154	130	97	0	66
Fish	27,500							
Municipal/ Industrial	25,000				0[1]	0[1]		
Total	82,500				130	97		66

Months in which flow releases can occur
[1] Mitigation for projects participating in a Voluntary Regional Agreement (VRA) is required by statute in July and August on the Columbia River and April through August on the Snake River. If Ecology agrees to a municipal/industrial VRA, releases would be scheduled to meet or exceed the consumptive impact of projects associated with the VRA.

Weber Siphons

To deliver water from the Lake Roosevelt to the Odessa Subarea as part of this project minor improvements to existing facilities are necessary to improve delivery efficiency. Specifically, improvements to the East Low Canal are needed to deliver water to users located south of I-90. The area south of I-90 has experienced the greatest declines in groundwater levels and there is a high demand for replacement water supplies. The improvements include upgrading the two siphons that are currently in place.

The original designs for the Weber Branch and Weber Coulee siphons were double-barrel siphons, two pipes next to each other; however, only one pipe was installed as part of the construction in the early 1950s. In order to deliver a portion of the 30,000 acre-feet south of I-90, the second barrel, or pipe, needs to be installed.

The Weber Branch and the Weber Coulee siphons are located at Stations 2091+45 and 2153+65, respectively, on the East Low Canal where the canal crosses I-90 approximately 10 miles east of Moses Lake. The first, or upstream, siphon is the Weber Branch. It is 3,215 feet long and crosses a valley that is approximately 80 feet deep (below the invert of the East Low Canal). The siphon is comprised of reinforced concrete pipe and is 14 feet, 8 inches interior diameter; the exterior of the pipe varies.

The second siphon, Weber Coulee siphon, is 6,166 feet long and crosses Weber Coulee, a valley that is approximately 110 feet deep (below the invert of the East Low Canal). The existing Weber Coulee Siphon is also reinforced concrete pipe and 14 feet, 8 inches interior diameter. When I-90 was built, 600 feet of the second barrel was constructed to avoid having to dig under or tunnel through I-90 later when a second barrel needed to be installed.

Chapter 3 Affected Environment and Environmental Consequences

The affected environment for the Lake Roosevelt Incremental Storage Release Project includes Lake Roosevelt and its shoreline, the Columbia River downstream of Grand Coulee Dam, and the Odessa Subarea. Water routed to the Odessa Subarea would flow through the existing conveyance system consisting of Banks Lake, the Main Canal, Billy Clapp Lake, and the East Low Canal. These areas were described in Ecology's PEIS prepared for the Columbia River Water Management Program (Ecology, 2007: 2-40) with additional detail being provided in the SEIS for the Lake Roosevelt Incremental Storage Release (Ecology, 2008). Information from both documents, specifically Chapter 3 in each, is incorporated here by reference and summarized below. A discussed earlier, the PEIS is available online at http://www.ecy.wa.gov/programs/wr/cwp/eis.html and the SEIS is available at http://www.ecy.wa.gov/programs/wr/cwp/cr_lkroos.html. Hard copies of both documents are also available for examination at Reclamation's Columbia-Cascades Area Office at 1917 Marsh Road, Yakima, WA.

Environmental consequences from the proposed action were addressed in Chapter 4 of the SEIS and Section 5.1 of Chapter 5 of the PEIS. Those analyses are incorporated by reference and summarized. The information included by reference from Ecology's PEIS and SEIS is summarized in Section 3.1 of this chapter. Additional information addressing federal issues of concern not addressed in either of Ecology's EISs is also in this chapter under Section 3.2.

3.1 Issues Addressed in Ecology's EISs

3.1.1 Earth

3.1.1.1 Affected Environment

The Affected Environment for this issue is addressed in the SEIS Section 3.2, pages 3-2 -3.9.

Lake Roosevelt

The Upper Columbia River has an extensive history of landslides, both prior to and after completion of Grand Coulee Dam. During the initial filling of Lake Roosevelt (full pool elevation attained in 1942), 245 known landslides occurred along the shoreline of Lake Roosevelt (Hansen, 1987). Between 1943 and 1952, an additional 255 known landslides occurred along the shoreline of Lake Roosevelt (Hansen, 1987).

In 1961, Reclamation commissioned a study to examine landslide issues which concluded that there were several factors which contributed to the landslides during early filling and operation of the reservoir including reservoir fluctuations. The study concluded that there was a strong correlation between the number of landslides and Lake Roosevelt's water level, with the majority of landslides occurring during the initial filling of Lake Roosevelt, and during major drawdowns (Jones et al., 1961). The Jones study noted that out of approximately 500 known landslides that occurred between 1941 and 1953, 245 (49 percent) occurred during the initial filling, 30 (6 percent) occurred during a 30-foot drawdown in 1944, and 120 (24 percent) occurred during 65-

foot drawdowns in 1952 and 1953 (Jones et al., 1961). Landslides have continued to occur since the completion of the Jones et al. (1961) study, but generally less frequently. Notable periods of landslide activity include the period from 1969 to 1975 (Schuster, 1979) and 1978 (Hansen, 1987). These high landslide activity periods generally corresponded to major drawdowns.

The concern for landslides is identified as minor for lake levels above 1,260 feet, moderate for lake levels between 1,240 and 1,260 feet, and major for lake levels below 1,240 feet (Reidel, 1997). To reduce the frequency and number of landslides, Reclamation has adopted operating procedures to attempt to keep lake drawdown rates at less than 1.5 feet per day or less than 3 feet over 2 days (Reidel, 1997).

There are numerous shallow embayment areas along the shoreline of the lake. Many of these occur where tributary streams enter the lake. At these locations water velocities in the streams are reduced, resulting in deposition of sediment. The specific location of these alluvial deposits is dependent on the level of Lake Roosevelt. During periods with high lake levels, alluvium is deposited further up the valleys than during drawdown periods. As a result shallow embayments, resulting from sediment deposition, are found in these areas.

Columbia River Downstream of Grand Coulee

The Columbia River downstream of Grand Coulee Dam is an area of ancient and historical landslide activity. Landslides downstream of Grand Coulee Dam generally occur as reactivations of ancient landslides, resulting both from natural conditions and operation of the Grand Coulee Dam. These landslides generally correspond to unusually high or low water levels (Hansen, 1987).

In 1978, landslides occurred along the 6-mile river reach downstream from the dam, reportedly as a result of a 13-foot drop in the mean tailrace elevation (Hansen, 1987). To stabilize the river bank downstream of the Grand Coulee Dam, Reclamation reshaped and rearmored a previously placed embankment; constructed drainage features; and installed automated instruments and real-time alarms to monitor the downstream areas identified as unstable.

Odessa Subarea and Banks Lake

The Odessa Subarea lies within the Columbia Basin physiographic province which is characterized by incised rivers, extensive plateaus, and anticlinal ridges (ridges created by tilting and uplift) rising to 4,000 feet above sea level (DNR 2001). The geology of the plateau region is dominated by basalt flows that make up the Miocene-aged (about 5 million to 24 million years ago) Columbia River Basalt Group (Ecology and WDFW 2004). The soil pattern in the Columbia Plateau physiographic province generally varies with precipitation, ranging from silty loams in wetter regions to dry, desert-type soils in dry regions. There are four soil regions in this physiographic province (Franklin and Dyrness 1988).

At Banks Lake shoreline erosion due to wind, large boats and land use activities is a problem. Areas identified in the *Banks Lake Drawdown Final Environmental Impact Statement* (Reclamation 2004) where erosion is occurring include the west shore of the Steamboat Rock peninsula; north and south of the Million Dollar Mile North Boat Launch; south of the Million Dollar Mile South Boat Launch; Barker Flat; and Electric City Community Park (Coulee Playland).

3.1.1.2 Environmental Consequences

Lake Roosevelt

Landslide potential would not change as a result of the proposed action. The additional drawdown during the period with highest landslide potential (April and May when the lake level is less than 1,240 feet amsl) would be minimal (less than 1 inch), and no impact is predicted during this period.

Alluvial deposition patterns, including at the mouth of small tributaries, would not change as a result of the proposed action. This is because the additional drawdown period would primarily occur during the summer when there is little deposition occurring, and negligible (less than 1 inch) change in lake level would occur during periods of higher deposition.

Little additional lakebed area would be exposed as a result of the additional drawdown. The maximum additional drawdown (1.8 feet or less) would occur during the summer when lake level is greater than 1,254 feet amsl. These lakebed areas would become exposed without the incremental storage releases as a result of normal reservoir operations. With additional drawdown, lakebed sediments may be exposed for a longer duration, with the maximum additional period of exposure lasting for a few days to a few weeks.

Ecology (2008) looked at the bathymetry of 14 selected embayments of Lake Roosevelt to estimate how much exposed sediment would occur with a 1 foot of drawdown. In general, they found that between 35 and 45 acres of lakebed is exposed for every 1 foot of drawdown when the lake elevation is between 1,290 and 1,255 feet amsl. The impacts associated with this action would occur within that range of elevations.

Columbia River Downstream of Grand Coulee

The additional drawdown would increase flow releases up to about 950 cfs during the summer. The increase in flow would be less than 2 percent of the current release and is therefore unlikely to cause an increase in landslide potential.

Odessa Subarea and Banks Lake

The Weber Branch Siphon would require approximately 32,000 cubic yards (cy) of excavation and 27,000 cy of fill around and over the siphon pipe. Approximately 3,000 cy of gravel fill may be imported from offsite to provide a suitable foundation for the siphon pipe. The Weber Coulee Siphon will require approximately 61,000 cy of excavation and 52,000 cy of fill around and over the pipeline. An additional 5,000 cy of gravel fill may be required to provide a suitable foundation. All fill materials would come from an approved source of material, either a Reclamation pit or another similarly permitted site. Both siphons will generate excess excavated materials—8,000 cy at the Weber Branch Siphon and 14,000 cy at the Weber Coulee Siphon. All excess material would be hauled off site and disposed of at an approved fill site. Excavation would clear the ground and expose soils and increase the potential for soil erosion. The area is flat and receives little precipitation; therefore, the erosion potential would be limited. Best

management practices such as silt fencing, would be implemented and the project would comply with applicable state and local stormwater regulations. Excavation and hauling of materials would also increase fugitive dust in the area.

Mitigation

The implementation of Best Management Practices (BMP) to control runoff and dust and compliance with stormwater regulations are expected to mitigate increased erosion potential at the two siphons.

3.1.2 Climate

3.1.2.1 Affected Environment

The Affected Environment of this issue is addressed in the SEIS Section 3.3

The Programmatic EIS (Ecology, 2007: 3-14) described the climate of the Columbia River Basin and briefly summarized findings of climate change modeling for the region.

Background on Global Climate Change

Climate change science has been studied and documented by the Intergovernmental Panel on Climate Change (IPCC) since the late 1980s.

The global mean surface temperature has increased more during the last few decades of the 20th century than the prior four centuries (National Academy Science, 2006). Global temperature projections forecast continued increases during the 21st century (IPCC, 2001).

Climate and Snowpack in the Pacific Northwest

Climate data indicate that temperatures in the Pacific Northwest generally increased between 1916 and 1997 (Mote et al., 2003). The warming that occurred in the region increased faster than the global average (CCTS, 2006).

Analysis of Pacific Northwest snowpack data from 1950 to the present shows a reduction in spring snowpack. A recent study indicates that spring snow melt could occur as much as two months earlier in the Pacific Northwest (Rauscher et al., in press; Purdue University, 2008).

In the Pacific Northwest, snow provides a significant proportion of inflow to lower elevation reservoirs during spring and summer. A warmer regional climate would result in increased temperatures that reduce winter snowpack (with precipitation being equal). This would increase the volume of runoff during the winter, and result in earlier spring peak flows and reduced warm season runoff (Hamlet et al., 2007).

Columbia River Basin

Data indicate increased winter runoff volumes associated with increased Columbia River Basin

temperatures (Hamlet and Lettenmaier, 1999). Warmer winter temperatures would result in more precipitation falling as rain rather than snow. A reduced winter snowpack would result in less snowmelt during the summer and lower dry season runoff volumes in the region, if precipitation declines or is unchanged.

Change in seasonal water regimes may have significant implications for water resource management. This change in water management may cause increased competition for water during non-winter months. As noted earlier, the current average runoff at Grand Coulee is approximately 7 times the storage capacity of the reservoir.

Climate Projections

The global climate models generally agree that conditions in the future in the Pacific Northwest will be warmer. The individual models though predict various amounts of increase with Mantua et al. (2009) reporting that "the range of projected changes from individual models can be as extreme as 15 to 200 per cent of the multi-model average." There is consensus among the climate models that some amount of future warming is likely to occur in the Pacific Northwest region; however, the models are not as consistent regarding increases in mean annual precipitation, with about 75% of the models predicting increases in precipitation in the northwest (Reclamation 2008:4-23). Recent studies have continued to identify the relative wide range of future projections of precipitation. Mote and Salathe (2009: pg 11-14) report that models used in their study gave equivocal results relative to the projected future changes in precipitation. They report that individual models produce changes of a much as -10% or +20% by the 2080s. On a seasonal basis they indicate that some models produce modest reductions in fall or winter precipitation while others predict very large increases (up to 42%).

The uncertainty of the precipitation projections complicates projecting runoff for the Columbia River Basin since runoff is dependent on both temperature and precipitation. Studies have shown that with increased precipitation, runoff could increase during all seasons (Hamlet and Lettenmaier, 1999). McGuire Elsner et al. (2009: pg 51-52) using composite values for precipitation and temperature change from 20 different global climate models predict that runoff across the state will increase on an annual basis by 4-6% by the 2080s with an increase in cool season runoff and a decrease in warm season runoff. Results for individual global climate models vary substantially making reliable predictions of future expected conditions difficult.

Therefore, the discussion of potential climate change impacts on Columbia River Basin water resources is qualitative rather than quantitative.

Potential Climate Change Impacts on Runoff and Surface Water Supplies

Climate change has the potential to significantly alter the timing of runoff contributing to the Columbia River and its reservoir system. Warming, whether precipitation increases or not, would result in higher flows during winter. Depending upon what happens with precipitation, flows may decrease or show little change during the summer.

Reductions in summer flows could have a significant impact on summer flow objectives, hydropower production, and water available for irrigation that is not provided from storage.

3.1.2.2 Environmental Consequences

All areas

A program such as the Lake Roosevelt Incremental Storage Releases Project could both affect, and be affected by, climate change. Projects can affect climate change by increasing carbon emissions that contribute to global warming. As noted in Section 3.3, climate change could affect precipitation, snowmelt and runoff to Lake Roosevelt, which could affect the water available for the incremental storage releases. The effect of the proposed action on climate change is discussed as a short-term impact, and the effect of climate change on the proposed action is discussed as a long-term impact.

In the short-term, the proposed action is not expected to increase emissions that would affect climate change since there would be little construction involved and there would be no increase in transportation emissions. The storage releases are expected to slightly reduce hydropower production, which could increase the need to shift to another form of power generation, possibly with increased carbon emissions.

The potential general impacts of climate change on water resource management are described in Section 3.3 of the SEIS. The impacts of climate change could affect water management at Lake Roosevelt by altering the amount and timing of water available in the reservoir. There remains uncertainty about the magnitude of temperature changes in the Pacific Northwest as well as uncertainty about the direction and magnitude of future changes in precipitation. Consequently it is not possible to discuss those impacts in precise terms quantitatively. Impacts related to reduced water availability include more interruptible water rights, reduced water available to meet flow objectives, and additional unusable recreational facilities.

Mitigation

Changes in water availability in the Columbia River Basin will require the managing agencies to adaptively manage the river to respond to changing conditions. If conditions change, Reclamation will coordinate with Ecology and other Columbia River managing agencies to adapt to climate changes. Possible mitigation actions include changes to Reclamation service contracts and an adaptive management plan for recreation impacts.

3.1.3 Surface Water

3.1.3.1 Affected Environment

The Affected Environment of this issue is addressed in the SEIS and PEIS Section 3.4.

Lake Roosevelt

Information concerning operations of Lake Roosevelt is also discussed in Chapter 2 of this EA. To summarize, the reservoir is operated for flood control, hydropower generation, irrigation, recreation, and fish and wildlife purposes. At full pool, the surface elevation of Lake Roosevelt is 1,290 feet amsl and has an active capacity of 5.2 million acre-feet. Minimum pool is 1,208 feet amsl. To meet the purposes of its operation, Lake Roosevelt is drawn down and filled twice

during the year - once for flood control and once for flow augmentation. The drawdown for flood control is substantially larger than the flow augmentation drawdown. In late winter or early spring the reservoir is drawn down for flood control purposes. In an average year, with normal precipitation, this drawdown is in the range of 50 feet. In wet years the drawdown may be as much as 80 feet while in years with little snowpack the drawdown may be less than 25-30 feet (Figure 3-1). The level of drawdown is set by the Corps based on volume water supply forecasts and other factors. The reservoir typically refills by July 1. The drawdown for flow augmentation would range from 10 to 12 feet, to elevation 1280 or 1278 amsl.

Approximately 2.65 million acre-feet is pumped annually to Banks Lake to support irrigation in the CBP. An average of approximately 78 million acre-feet of water passes Grand Coulee Dam each year. The irrigation season is generally from March through October. During the summer recreation season efforts are made to maintain a lake level of at or above 1,280' amsl is to assure that boat launches and marinas are accessible and beaches and campgrounds can be optimally used. In addition to seasonal fluctuations, Lake Roosevelt fluctuates daily because of releases for hydropower production.

Water quality issues of concern at Lake Roosevelt include temperatures and total dissolved gas (TDG).
Based on the data presented in the Lake Roosevelt Fisheries Evaluation Program (LRFEP) done for STI, Lake Roosevelt exhibits thermal stratification during the summer as follows:

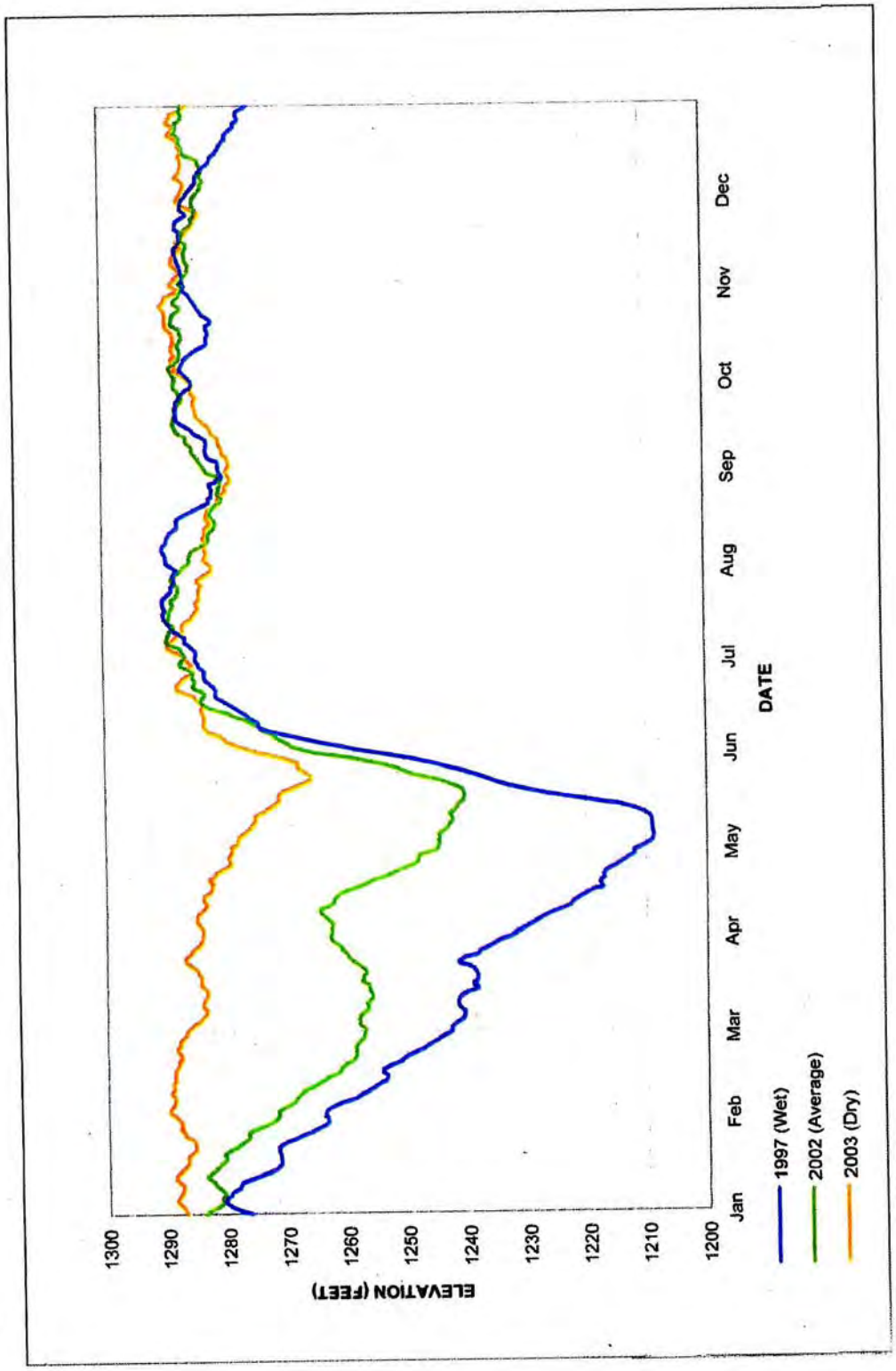
- Keller Ferry: Maximum sample depth of 100 meters. August stratification only: 73.4º to 57.2º F (23º to 14º C). Isothermal: 62.6º to 68º F (17º to 20º C) in September and October.
- Spring Canyon: Maximum sample depth of 100 meters. August stratification only: 75.2º to 57.2º F (24º to 14º C). Isothermal: 62.6º to 66.2º F (17º to 19º C) in September and October.
- Porcupine Bay: Maximum sample depth of 35 meters. Stratified in June, July and August: 73.4º to 53.6º F (23º to 12º C). Isothermal: 60.8º to 68º F (16º to 20º C) in September and October.

Mean monthly temperatures across all sampling locations for 2002 to 2005 (as reported by the STI) ranged as follows:

- June: 54.7º to 57.9º F (12.6º to 14.4º C)
- July: 61.5º to 63.1º F (17.3º to 16.4º C)
- August: 65.3º to 67.64º F (18.5º to 19.8º C)
- September: 64.6º to 65.8º F (18.1º to 18.8º C)
- October: 59.5º to 61.7º F (15.3º to 16.5º C)

Annual mean TDG saturation within Lake Roosevelt was highest at Keller Ferry at 109.4 percent in 2005 and lowest at Spring Canyon at 104.2 percent in 2004 (SEIS). Between 2002 and 2005, peak TDG reached as high as 132.6 percent (These high levels of TDG are coming into the reservoir from upstream). TDG tended to be highest in the summer months with peaks in June, and lowest in the winter months.

Figure 3-1 Lake Roosevelt Water Surface Elevations



Columbia River Downstream of Grand Coulee

The Columbia River originates in two lakes that lie between the Continental Divide and Selkirk Mountains in British Columbia. The river flows over 1,000 miles before reaching the Pacific Ocean. It flows north for its first 200 or more miles, and then turns south toward the Canada-U.S. border. Within the U.S., the river flows southwest, skirting one of the Columbia Plateau's massive basalt flows, before turning southeast and cutting through a dramatic gorge in the volcanic shield near its junction with the Snake River. From its confluence with the Snake River, the Columbia River runs nearly due west to the Pacific Ocean (MWH 2005).

According to the Columbia Basin Water Management Division of the U.S. Army Corps of Engineers, there are 14 dams (federal and non-federal) on the Columbia River mainstem, three are in Canada and the remaining reservoirs are in the United States. Hydropower projects on the Columbia River mainstem and other storage developments on its tributaries created reservoir storage projects with an active storage capacity in excess of 46 million acre-feet (maf) (Ecology and WDFW 2004). This volume is equivalent to one-third of the mean annual flow of the Columbia River at The Dalles, Oregon. Average annual discharge at The Dalles is 138 maf (U.S. Army Corps 2006) and fluctuates between 85.7 maf in a low water year to 188.2 maf in a high water year (Ecology 2007).

Temperature and TDG are also of concern in the reaches below Grand Coulee. Water temperature downstream of Lake Roosevelt generally ranges from 37.4º F (3º C) in winter to about 68º F (20º C) in summer. In general, the maximum TDG was recorded in July and August and minimum TDG was recorded in the winter months. For the average year (2002) TDG concentrations ranged from 94.5 percent to 119 percent saturation. The 1997 wet year shows a higher and earlier peak TDG concentration than any other year. The 2001 drought year has the smallest range of TDG concentrations ranging from 93.6 to 108.6 percent saturation.

Odessa Subarea and Banks Lake

There are approximately 1.5 million acres of irrigated land in Washington within the Columbia River Basin. Along the middle Columbia River, the largest diversion is for the CBP at Grand Coulee Dam. The CBP begins at the head of the Grand Coulee and extends south 125 miles to the confluence of the Snake and Columbia Rivers. The Columbia River forms the western boundary of the CBP near Quincy, and the project extends east 60 miles near Odessa and Lind. The CBP irrigates about 671,000 acres. The average annual diversion for the CBP is 2.65 million acre-feet as measured at the Main Canal during the 2000 to 2004 period. Banks Lake and Potholes Reservoir are large reservoirs used to regulate irrigation water after it is pumped from the Columbia River. Banks Lake is a 27-mile long reservoir enclosed by North Dam and Dry Falls Dam and has an active storage capacity of 715,000 acre-feet. Potholes Reservoir, created by O'Sullivan Dam, covers 27,000 acres and has an active storage capacity of 407,000 acre-feet (MWG 2003; MWG 1995).

Surface water bodies in the Odessa Subarea include Crab Creek, Rocky Coulee, Weber Coulee, Lind Coulee, Esquatzel Coulee and several smaller coulees and streams. Most streams in the Odessa Subarea are intermittent, except for the portion of Crab Creek that flows through the Odessa Subarea. The streams convey runoff from precipitation and in some cases intercept seepage flow from irrigation which flows into Moses Lake, Potholes Reservoir or other irrigation facilities.

Banks Lake is a man-made reservoir used to regulate irrigation water prior to entering the CBP canal system. Water is pumped into Banks Lake from Lake Roosevelt via the 1.6-mile-long Feeder Canal and then delivered for irrigation down the Main Canal The lake is 27 miles long, has a surface area of 28,000 acres (42 square miles), and has a total storage capacity of 1,275,000 acre-feet and an active storage capacity of 715,000 acre-feet. The reservoir's full pool elevation is 1,570 feet. Under current operating conditions, the reservoir is drawn down to a minimum elevation of 1,565 feet in August and refilled by September 22 to elevation 1,570 feet. Periodically Banks Lake is drawn down by over 20 feet during the winter to allow maintenance of the pumping plant, Feeder Canal, and Main Canal headworks, and to control Eurasian watermilfoil, a noxious aquatic weed.

Banks Lake stratifies slightly in the summer; however, mixing of cooler water pumped from Lake Roosevelt limits stratification in the northern part of the lake (Reclamation, 2004). As reported in Reclamation (2004), phosphorus levels range from 10 to 20 mg/L, and surface temperature of the lake ranges from 75.2º to 82.4º F (24º to 28º C). Banks Lake was on the 2004 303(d) list for 2,3,7,8-TCDD and Total PCBs in tissue (Ecology, 2004).

3.1.3.2 Environmental Consequences

Lake Roosevelt

The long-term impacts of modifying the release schedule for Lake Roosevelt will be a slight change in the water levels in Lake Roosevelt during the April-October time period.

The maximum change in Lake Roosevelt elevations in all but drought years is approximately 1-foot from existing operations. The maximum change occurs at the end of August, and decreases to zero at the end of September as the reservoir refills. This would result in a water surface elevation at the end of August of around 1279 feet to 1277 feet amsl rather than 1280 feet to 1278 feet amsl. In years with releases to the Columbia River in September, reservoir refill will occur in October as long as an elevation of 1,283 feet amsl is reached by October 1 for kokanee spawning access. The actual flow releases and resulting lake drawdown will be determined by a panel of fisheries and water managers.

In a drought year – statistically, 1 out of 26 years - Lake Roosevelt would have a drawdown of 1.8 feet at the end of August. This conservatively assumes the maximum flow releases from this proposed action (44,500 acre-feet for fish, 25,000 acre-feet for municipal and industrial, and 33,000 acre-feet for interruptible water rights) will occur prior to the end of August. The actual flow releases and resulting drawdown will depend on the flow release schedule developed by the panel of fisheries and water managers. In drought years, this would result in a reservoir elevation of about 1276 rather than 1278 without the proposed action.

Lower Lake Roosevelt water levels are not expected to change the lake's overall thermal characteristics, including stratification.

Columbia River Downstream of Grand Coulee

The long-term impacts from changing the release schedule from Lake Roosevelt will be a change

in flow in the Columbia River (Table 3-1). The timing of the increase in flow will vary based on real time decisions made by the fisheries and water managers, however the maximum additional flow release would be approximately 950 cfs in July and August of a drought year. The decrease in flow during September when Lake Roosevelt is filling to compensate for summer drawdowns would be approximately 1,370 cfs during dry and average years and up to approximately 2,200 cfs during a drought year.

Table 3-1. Estimated Difference in Columbia River Flow Downstream of Lake Roosevelt

Year type	Differences in flow by month (cfs)						
	April	May	June	July	August	Sept.	October
Non-drought year	0 to 884 (173)[1]	0 to 855 (173)[1]	0 to 884 (173)[1]	0 to 855 (173)[1]	0 to 855 (173)[1]	-1,371[2]	-17
Drought Year	0 to 749 (247)[1]	0 to 725 (247)[1]	0 to 749 (247)[1]	0 to 945 (472)[1]	0 to 945 (472)[1]	-2,162[2]	-17

[1]Actual difference in flow is dependant on real time in-season decisions. This table presents a range of possible values and a value in parenthesis that assumes the releases are distributed in full equally throughout the allowable period.

[2]Actual difference in flow is dependant on real-time in-season decisions. This value assumes the full allotments allowable are released.

For the proposed action, the increase in flow immediately downstream of Lake Roosevelt depends on releases determined by the panel of fisheries and water managers described in SEIS (Ecology 2008). The range would be 0 to 1.9 percent of river flow at Grand Coulee Dam (Table 3-2). The maximum decrease in September would be about 3.5 percent for the proposed action. This assumes the full allocation of releases for fish, municipal and industrial, and interruptible water rights occurs.

The differences in flow are a very small percentage of the flow in the Columbia River downstream of Lake Roosevelt. As tributaries enter the Columbia River, the percentages decrease further. For example, the average monthly flow in the Columbia River at The Dalles Dam during August in a dry year (2003) is 131,300 cfs, compared to 94,160 cfs below Lake Roosevelt. There are significant tributary inflows between Grand Coulee Dam and The Dalles Dam. Tributaries include Yakima, Snake, Deschutes, Umatilla, Okanogan, Methow, Chelan, Entiate, Wenatchee, and John Day. During September, these tributaries increase the average monthly flow at The Dalles Dam to 94,600 cfs compared to 73,200 cfs below Lake Roosevelt, an increase of 30 to 40 percent.

Table 3-2. Difference in Average Monthly Flow in the Columbia River Downstream of Lake Roosevelt with Additional Flow Releases

Year type	Differences in flow by month (cfs)						
	April	May	June	July	August	Sept.	October
Non-drought year	0 to 0.8% (0.2%)[1]	0 to 0.8% (0.2%)[1]	0 to 0.5% (0.1%)[1]	0 to 0.5% (0.1%)[1]	0 to 0.8% (0.2%)[1]	-1.9%[2]	0.0%
Drought Year	0 to 1.2% (0.4%)[1]	0 to 1.5% (0.5%)[1]	0 to 1.0% (0.3%)[1]	0 to 1.9% (0.9%)[1]	0 to 1.4% (0.7%)[1]	-3.5%[2]	0.0%

[1]Actual difference in flow is dependant on real time in-season decisions. This table presents a range of possible values and a value in parenthesis that assumes the releases are distributed in full equally throughout the allowable period.
[2]Actual difference in flow is dependant on real-time in-season decisions. This value assumes the full allotments allowable are released.

The incremental storage releases would continue to maintain typical summertime release temperatures. Currently these are warmer than the 64.4º F (18º C) criterion, but cooler than 68º

F (20º C). Modeling done of potential effects of climate change on water temperatures indicates that these temperatures will likely increase in the future (Mantua et al. 2009). The modeling assumed that water temperatures will likely rise as a function of increasing air temperatures. Since the proposed action will have no affect on future air temperatures it would not impact water temperatures under the global climate change scenarios. Total flow with the proposed action would increase by less than one percent in comparison to current releases and therefore is not expected to cause a measurable increase in TDG saturation levels below Grand Coulee Dam.

Odessa Subarea and Banks Lake

With the proposed action in most years Reclamation will be able to release Lake Roosevelt water into Banks Lake over Labor Day weekend because power demand is reduced. In dry and drought years not enough water is available for the Labor Day releases so water would be withdrawn directly from Banks Lake in September for delivery to the Odessa area with no flow releases from Lake Roosevelt. In those years Banks Lake would be drawn down during September. The drawdown would be approximately 1.5 inches at the end of September and is not expected to be noticeable. The lake would refill in October.

The proposed improvements to the Weber Branch and Weber Coulee siphons would have minor impacts to water resources. Construction could take place both during the irrigation season, but would not impact the delivery of water since the existing barrel of the siphon could be used for the delivery. Construction impacts associated with the Weber Coulee siphon could affect the irrigation induced waterway in the bottom of the coulee near the siphon. Eroded materials could runoff into the channel in Weber Coulee.

Mitigation

Construction best management practices would be implemented to minimize impacts to the waterway in Weber Coulee.

3.1.4 Groundwater

3.1.4.1 Affected Environment

Groundwater resources are discussed in the PEIS (Ecology, 2007: 3-37) and summarized here. Groundwater is under ground water found in pore spaces between grains of soil or rock or within fractured rock formations. Groundwater typically originates as precipitation that infiltrates through soil and underlying unsaturated geologic materials until reaching the water table. The saturated zone is referred to as an aquifer when it is capable of yielding sufficient water to supply wells. Saturated zones composed of coarse sands and gravels or those occupying large fractures in bedrock are generally the most productive aquifers. An aquifer is recharged by the process of infiltration and percolation of water to the zone of saturation (Ecology and WDFW 2004).

Lake Roosevelt

Groundwater level elevations for most wells located within 1 mile of Lake Roosevelt appear to be in hydraulic connection with Lake Roosevelt. Except for deep wells (greater than 600 feet below ground surface) and wells that are completed above the level of Lake Roosevelt.

Groundwater levels are generally higher or equal to the Lake Roosevelt water level elevation. Therefore, groundwater generally flows toward Lake Roosevelt.

Groundwater level elevations decrease in response to the lowering of the Lake Roosevelt surface water elevation. Groundwater continues to flow toward Lake Roosevelt during drawdown and recovers quickly during refilling of the reservoir.

Columbia River Downstream of Grand Coulee

Groundwater in the Columbia River Basin in Washington is predominantly associated with the flood basalts of the Columbia River Basalt Group, but also with sediments that overlie or are interbedded with the basalts. The entire aquifer system underlies approximately 50,600 square miles of the Columbia Plateau in Washington, Oregon, and parts of northwest Idaho (Bauer 2000).

In general, recharge to the deep, confined basalt aquifers is less than 1 inch per year, but in some irrigated areas, recharge can be as great as 10 inches per year (Bauer 2000). Large production wells are usually completed within the deep, confined basalt aquifer systems because of their high-yield capacity and good water quality. These aquifer systems are usually found in the Grande Ronde Formation of the Columbia River Basalt Group. More than 80 percent of drinking water in the mid-Columbia River Basin comes from groundwater. The largest groundwater users are irrigators in the Central Columbia Plateau area (Jones and Wagner 1995).

Groundwater is also found in shallow alluvial aquifers associated with surface water bodies to which they are often interconnected. Stream flow derived from groundwater discharge during low-flow periods is referred to as baseflow. Baseflow is important in maintaining year-round flow in streams fed by rain and snowmelt runoff (Hermanson 1991).

Groundwater levels in shallow portions of the alluvial aquifer system have risen in areas where surface water is brought in for agriculture. Leakage from irrigation canals and other water that is not used consumptively by crops reaches the shallow water table and increases shallow groundwater levels. Shallow water levels have increased in the Quincy and Pasco basins by 150 feet or more since development (Jones and Wagner 1995).

Odessa Subarea and Banks Lake

Approximately 102,600 acres of the Odessa Subarea underlies the easternmost portion of the authorized CBP. Irrigation wells primarily pump water from basalt aquifers at a depth of 500 to 1,000 feet below the ground surface (Luzier and Skrivan 1975). Ecology began permitting irrigation wells in the Odessa Subarea in the 1960s and 1970s while anticipating the completion of the CBP. Significant declines (e.g., 40 feet between March 1967 and March 1971) in the water level prompted Ecology to designate the Odessa Subarea as a groundwater management area (WAC 173-128A, 130A; Luzier and Skrivin 1975). The purpose of the management area designation was to control the rate of decline of groundwater.

In addition to water level declines, there are water quality concerns associated with the continued use of deep groundwater in the Odessa Subarea such as high water temperatures and mineral content. At this time, there do not appear to be any published water quality studies that report quality data for the Odessa Subarea. Both water quality and quantity concerns prompted

Reclamation's study on the use of water from Lake Roosevelt to replace groundwater in the Odessa Subarea (Reclamation 2006c,d).

3.1.4.2 Environmental Consequences

Lake Roosevelt

Aquifers for wells located within 1 mile of Lake Roosevelt are generally in hydraulic connection with Lake Roosevelt. Groundwater level elevations follow the same increases and decreases as observed in surface water level elevations of Lake Roosevelt.

The proposed action includes a maximum 1.0 to 1.8 foot decrease in the water level of Lake Roosevelt for a short period at the end of August. A smaller decrease will occur from April up to August as additional water is withdrawn from Lake Roosevelt. Wells that are hydraulically connected to Lake Roosevelt may see a smaller, but similar decrease in their static water level during the period of additional drawdown. The magnitude of these decreases is dependent on individual characteristics of the wells and nearby geology. The maximum additional drawdown will occur in late August, well after the period that Lake Roosevelt is lowest (prior to spring melt). The change in water levels in August is within the normal operating range of Lake Roosevelt. Existing wells that can operate over the current range of Lake Roosevelt water levels will not be affected by the additional drawdown. A slight increase in pumping head may result. The increase will be proportional to the decrease in static water level divided by the depth from the ground surface to the static water level. For example, a 1 foot decline in static water levels for a well with a 200 foot depth to static water level would cause a 0.5 percent increase in pumping head.

Columbia River Downstream of Grand Coulee

Except for the Hanford Reach of the Columbia River most of the area potentially affected is impounded. Groundwater along these impounded reaches is affected by the elevation of the reservoirs not the total discharge in the river. Since reservoir elevation would not change in response to the slight changes in flows groundwater along the river would not be affected. Along the Hanford Reach the slight changes in flows predicted with the proposed action, likely under 1% except in September, will not affect groundwater in these areas.

Odessa Subarea and Banks Lake

The proposed improvements to Weber Coulee and Weber Branch siphons would cause minor impacts to groundwater. A small irrigation-induced wetland is present at the bottom of the draw crossed by the Weber Branch siphon. Excavation in this area would likely encounter shallow groundwater. The excavation would be dewatered by pumping the groundwater either to an upland settling pond or into the East Low Canal. A similar situation would occur where the Weber Coulee siphon crosses Weber Coulee. While examining the existing unused siphon barrel under I-90 groundwater was encountered. During construction in this area groundwater would need to be pumped from the excavation into an upland settling pond or into the East Low Canal. In dewatering the construction sites the groundwater table would not be lowered except in the excavation and the immediately adjacent area. Once construction was completed and the siphons buried, no additional impacts to groundwater would occur.

In the Odessa subarea irrigation water delivered would simply replace groundwater currently being used for irrigation. This substitution would not affect the shallow alluvial aquifers in the area. Replacement of groundwater use with surface water sources in the Odessa Subarea could reduce the rate of groundwater level decline in the Odessa Subarea. The 30,000 acre-feet of irrigation water from Lake Roosevelt is not intended to recover groundwater levels to pre-development conditions. However, it will decrease the rate at which historical groundwater level declines have occurred over the past 50 years.

Mitigation

No mitigation measures are proposed for groundwater impacts. Decreases in groundwater use in the Odessa Subarea will occur, but will not increase groundwater levels in a measurable amount over the entire aquifer.

3.1.5 Legal Considerations

3.1.5.1 Affected Environment

The Affected Environment of this issue is addressed in the SEIS Section 3.6

Water Rights

Reclamation has water rights for 6.4 million acre-feet of live storage in the reservoir and water rights to release approximately 3,158,000 acre-feet for consumptive beneficial use at full build-out of the CBP. The water withdrawn from appropriation by Reclamation for development of the CBP is withdrawn until "the project is declared complete or abandoned by the United States" (RCW 90.40.100).

Prior to 1980, there were no instream flows set for the Columbia River. In 1980, Ecology adopted an administrative rule that provided that new water rights would be conditioned upon the flows set by the rule (Chapter 173-563 WAC). Water rights conditioned on instream flows are called "interruptible rights" because the use of the right is subject to being interrupted when forecasted river levels fall below established flows. To date, Ecology has issued approximately 340 interruptible water rights on the Columbia River mainstem.

Canadian Treaty

As discussed in Ecology's PEIS (Ecology, 2008: 3-32), the Columbia River Treaty was signed by the U.S. in 1961 and ratified by Canada in 1964. The Treaty provided for the construction of four Upper Columbia River storage dams—three in Canada and one in Montana. The dams provide flood control and increased hydropower generation. Under the Treaty, Canada has rights to divert up to 1.5 million acre-feet per year from the Kootenay River into the headwaters of the Columbia River. Either Canada or the United States can terminate the Treaty in 2024 with 10 years advance notice. If the Treaty is terminated, Canada has the right for 40 years thereafter to divert an unspecified quantity of water from the Kootenay River into the Columbia as long as the flow of the Kootenay at the border is 2,500 cfs or the natural flow. Canada pledged in the Treaty

not to divert water in such a way that the flow crossing the boundary is altered. The Treaty may also be renegotiated under the same terms.

3.1.5.2 Environmental Consequences

Water Rights

The proposed action would involve exercising an additional portion of Reclamation's existing water right but would not affect the terms of that right.

In drought years the drought provisions of the proposed action could provide additional water supplies to interruptible water right holders on the Columbia River. The would require additional permits be granted to those holders by Ecology. However, Ecology may not grant the permits if additional releases would impair or adversely affect existing water rights from the reservoir. Therefore, no impacts to existing water rights are anticipated.

Canadian Treaty

The additional releases will have no impacts on the Canadian Treaty because it is within the normal operation levels of the reservoir and involves an existing water right issue in 1938. The renegotiation of the Treaty may, however, have impacts on the water supply to Lake Roosevelt and the flexibility in how the reservoir is operated. Neither the U.S. nor Canada has provided the necessary notification to initiate the process of renegotiating the treaty. Nor have the parties indicated what terms they may request as part of any future treaty negotiation. As such it is not possible to determine what affects the action may have on future treaty terms or reservoir operations.

Mitigation

Mitigation would be required if the additional releases would adversely affect water right holders who divert from Lake Roosevelt. Any required mitigation would be determined by Ecology as the water right applications are processed.

3.1.6 Fish

3.1.6.1 Affected Environment

The Affected Environment of this issue is addressed in the SEIS Section 3.7.

Lake Roosevelt

Construction of the Grand Coulee Dam in 1941 eliminated migratory forms of anadromous fish species upstream of the dam. A fishery survey in 1963 found native fish such as peamouth, northern pikeminnow, suckers, shiners, kokanee, and rainbow trout dominated the fish community (Earnest et al., 1966; Scholz et al., 1986). A variety of non-native fish had also been introduced, including carp, yellow perch, smallmouth bass, pumpkinseed, lake whitefish, brook trout, walleye, and bullheads. By 1973, yellow perch and walleye comprised 32 percent of the

catch, suggesting a shift in dominance in the fish community to walleye (Harper et al., 1981; Scholz et al., 1986).

Historically, rainbow trout inhabited tributaries of the reservoir. However, the rainbow trout fishery was noted as "mediocre" by Earnest et al. (1966). Before the mid-1980s, little historical data were documented for rainbow trout in Lake Roosevelt. In the early 1980s, migrating adult rainbow trout averaging 16.2 inches were captured in the Sanpoil River (Beak Consultants, 1980; Scholz et al., 1985).

It was clear that reservoir operations negatively affected salmonid fish reproduction and limited juvenile rearing habitat. Nevertheless, a large food base of zooplankton existed that was capable of supporting a substantial number of adult rainbow trout and kokanee salmon. Continued research in the early 1980s determined artificial production was a viable alternative to restore and enhance kokanee salmon and rainbow trout in Lake Roosevelt (Scholz et al., 1986).

In the Northwest Power Planning Council's (NPPC) 1987 Columbia River Basin Fish and Wildlife Program (NPPC, 1987), the Council recommended that the Bonneville Power Administration (BPA) support construction of two kokanee salmon hatcheries to enhance the Lake Roosevelt fishery. Rainbow trout production objectives were added before completion of the hatcheries. To accomplish this goal, the Lake Roosevelt Fishery Enhancement Program (LRFEP) was formed. The LRFEP is a cooperative effort between the STI, CCT, Washington Department of Fish and Wildlife (WDFW), Eastern Washington University, the Lake Roosevelt Development Association (now known as the Lake Roosevelt Voluntary Net Pen Program), and the NPS. The purpose of the LRFEP is to develop a collaborative multi-agency artificial production program as a mitigation measure to restore and enhance kokanee salmon and rainbow trout populations in Lake Roosevelt. Since 1987, annual funding from BPA's Columbia Basin Fish and Wildlife Program (CBFWP) has been instrumental in developing a robust, harvestable fishery in Lake Roosevelt.

From 1988 to 1998, the principal sport fishery on Lake Roosevelt shifted from walleye to rainbow trout and kokanee salmon (Underwood et al., 1997; Tilson and Scholz, 1997). The angler use, harvest rates for rainbow and kokanee and the economic value of the fishery has increased substantially during the latest 10-year period. The investigations on the lake also suggest the hatchery and net pen programs have enhanced the Lake Roosevelt fishery while not negatively impacting native stocks within the lake (Lake Roosevelt Forum, 2008b). Fishermen praise the volunteer net pen program and the hatchery efforts since an extremely high percentage of the rainbows and kokanee caught during the lake fishing derbies are of hatchery origin (Lee, 2002).

Columbia River Downstream of Grand Coulee

The fisheries downstream of Lake Roosevelt are extensive and a more detailed account can be found in the PEIS and SEIS in sections 3.7.

The fish habitat conditions found in Lake Rufus Woods, the reservoir immediately below Grand Coulee Dam and formed by Chief Joe Dam, are largely controlled by the operation of Grand Coulee and Chief Joseph Dams. Similar to Lake Roosevelt, Lake Rufus Woods supports resident fisheries primarily for rainbow trout, and kokanee salmon. The popular rainbow trout fishery in Lake Rufus Woods consists mainly of fish originating from the Spokane Tribal

Hatchery and Trout Lodge. An adfluvial population of kokanee salmon maintains a sustainable wild population in the reservoir by successfully spawning in the Nespelem River. The primary kokanee hatchery stock in the area is released in Lake Roosevelt. Since 1995, adult kokanee returns have been monitored annually in the lower Nespelem River with adult returns ranging from 6 to 389 in 1997 and 1999, respectively.

Five Mid-Columbia PUD dams with linking reservoirs are located further downstream of Lake Rufus Woods. Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids Dams are located upstream of the only free-flowing stretch of the Columbia River remaining, the Hanford Reach. Anadromous fish species dominate the species composition in these areas.

Odessa Subarea and Banks Lake

There are 22 fish species in Banks Lake of which 11 are actively pursued by anglers. The reservoir supports a variety of non-game, warm water and cold water game fish species most notably walleye, bass, trout, and kokanee salmon.

Kokanee salmon are known to naturally spawn in the lake during October and November, with peak spawning around the first week of November. Generally, Banks Lake is operated favorably with respect to the kokanee life cycle and the lake supports a population of natural spawners. Populations of kokanee are supplemented with annual fish plants but the kokanee population may be more dependent on lake shore spawning than hatchery supplementation (Washington Department of Game, 1986).

Planting of hatchery rainbow trout fingerlings has resulted in a successful non-seasonal boat and bank fishery. This species is a prized gamefish in Banks Lake. Operation of the reservoir has far less influence on rainbow trout than it does kokanee. Lakeshore spawning of rainbow trout is not significant and annual hatchery fingerling plants must be made to sustain a viable fishery (Washington Department of Game, 1986).

Yellow perch, bass, and walleye are the warm water species popular with anglers on Banks Lake. Largemouth bass are a target fishery for Banks Lake anglers today. This species, though widespread throughout the lake, is somewhat confined to specific areas of preferred habitat.

According to WDFW records, hatchery trout and kokanee stocking in Banks Lake between 1999 through 2008 shows:

- Catchable trout (greater then 7 inches) averaged 55,100
- Trout fry averaged 144,952
- Kokanee fry averaged 850,622
- In 2008, 133,560 catchable kokanee (greater then 7 inches) were stocked (WDFW, 1999-2008)

Since 1990, stocking has concentrated on rainbow trout, kokanee, and walleye. Rainbow trout have been stocked every year since 1990 at an average of over 188,000 fish annually. A cooperative rainbow trout rearing project between WDFW, an Electric City sportsmen's group, and Coulee City Chamber of Commerce has been conducted to improve trout fishing. Average kokanee stocking between 1990 and 1999, was more than 915,000 fish annually. Current

management calls for stocking Banks Lake with one million kokanee annually as part of the Columbia River Fish and Wildlife Mitigation Program.

3.1.6.2 Environmental Consequences

Lake Roosevelt

The proposed action is not expected to have significant negative impacts to fish in Lake Roosevelt. In about 50 percent of water years, no additional shoreline would be exposed beyond what is routinely exposed during current operations. During the other 50 percent of years, more shoreline will be more exposed than currently occurs in the summer season, but the drawdown will not expose areas that are not exposed during current operations. The habitat of these shorelines areas will not be further degraded by the additional storage releases. The capacity of the lake to support growth or rearing of kokanee, rainbow trout, or white sturgeon should not be negatively impacted. The Water Resources Management Agreements between the State of Washington and the CCT and the STI provide mitigation for potential impacts to fish and aquatic resources in Lake Roosevelt.

Columbia River Downstream of Grand Coulee

The incremental storage releases would increase flows in the Columbia River by a minor amount in most months. Although the flow increases will be small, they are expected to help meet stream flow objectives in the Columbia River and provide benefits to fish. Columbia River flows will decrease in September when Lake Roosevelt refills with the biggest decreases in drought years in years when water for Odessa is diverted from Lake Roosevelt in September. The decreases are small relative to Columbia River flows and are not expected to negatively impact fish. Flow objectives under the 2008 FCRPS Biological Opinion will not be negatively impacted during the juvenile fish migration period from April to August.

Odessa Subarea and Banks Lake

Water flowing into Banks Lake destined for the Odessa Subarea would be simultaneously withdrawn from the south end at Dry Falls Dam. Unless a lag time between inflow and outflow occurs, lake elevations would not change materially with the incremental flow release alternatives. The flow regime would increase through-lake water velocities by less than 1 percent depending upon the month under consideration. During the month of September in dry and drought years, when Lake Roosevelt is being refilled, water destined for the Odessa Subarea will come from existing storage in Banks Lake and lake elevations are anticipated to decrease approximately 1.5 inches. This level of change is too small to quantify shifts in hydrological or biological conditions in the lake.

Lewis et al. (2002) report lake residence times of 146 days during the irrigation season. The worst-case reduction in lake residence time under the proposed action, would be approximately one day in July. This modification is too small to adversely influence either phytoplankton or zooplankton production, fish feeding or breeding opportunities in the lake, or increase the potential for fish entrainment past Dry Falls Dam.

No impacts are expected to the fish in Billy Clapp Lake located downstream from Banks Lake as the additional flow would have no affect on reservoir elevations and little effect on residence time.

Mitigation

Per the recommendation of WDFW, a slight reduction in zooplankton with reduced reservoir residence time and an increase in fish entrainment due to the additional drawdown associated with the incremental flow releases may be mitigated with changes to the current artificial production supplementation program (WDFW, 2007).

3.1.7 Wildlife and Plants

3.1.7.1 Affected Environment

The Affected Environment of this issue is addressed in the SEIS Section 3.8.

Lake Roosevelt

Lake Roosevelt is surrounded by multiple vegetation communities including mixed conifer forests, shrub-steppe, riparian wetlands, open water, and mixed agriculture and pasture grasslands. These communities provide abundant and diverse habitats for wildlife species. Vegetation along the 151-mile-long lakeshore gradually transitions from conifer forests in the north to semiarid grassland and sagebrush communities in the south. Conifer forests north of Kettle Falls are dominated by second-growth ponderosa pine, Douglas fir, and western larch. South of Kettle Falls, riparian areas characterized by alder, willow, hazelnut and black cottonwood are present next to ponderosa pine and Douglas-fir dominated forests. Riparian vegetation, including cottonwood trees and willow is present along the shoreline.

Due to the annual large and rapid fluctuations of water levels within the reservoir, there are limited aquatic bed and wetland communities in the littoral zone which extends from the shore to a depth where the light is barely sufficient for rooted aquatic plants to grow. Voeller (1993) observed little aquatic plant community growth and low benthic macroinvertebrate assemblages due to the lack of stable littoral habitats at Lake Roosevelt. For an approximately three-month period, the lake drawdown separates the riparian habitats from the reservoir by an expanse of barren land. Aquatic plants, such as bulrushes, sedges, reeds and cattail, which provide food and cover for waterfowl, mammals, and amphibians, are supported in the littoral zone. Both Eurasian watermilfoil and yellow flag iris are invasive aquatic species that have been also been noted in Lake Roosevelt. Submersed aquatic plants include water starwort, waterweed, common watermilfoil, common hornwort, pondweeds, and pygmy weed.

Vegetation communities in the Lake Roosevelt area support abundant wildlife, including an estimated 75 species of mammals, 200 species of birds, 10 species of amphibians and 15 species of reptiles (NPS, 2000). Systematic surveys of wildlife have not been conducted in the area, but Priority Habitats and Species (PHS) data (WDFW, 2008) note the presence of elk, deer, and bird species.

Some areas along the shoreline are identified by WDFW as providing roosting and breeding habitats, including several communal bald eagle roosts found in proximity to the lake. WDFW

has identified areas that support high concentrations of waterfowl in Lake Roosevelt including large numbers of migrating or wintering ducks and geese. In general however, the rapid annual fluctuation of water levels due to reservoir operations limits the establishment of shoreline vegetation and the amount of suitable habitat for nesting waterfowl.

Columbia River Downstream of Grand Coulee

Below Grand Coulee along Rufus Woods Lake the Columbia River flows through arid habitats, including disturbed shrub-steppe and irrigated agricultural fields. This is generally the situation all the way downstream to about The Dalles where coniferous forests become part of the adjacent vegetation again. Along Rufus Woods Lake priority species documented by WDFW include several bald eagle communal roosts, nesting records of prairie falcon, Swainson's hawk, loggerhead shrike, and longbilled curlew (WDFW, 2008). Waterfowl concentrations occupy the area, and woodhouse toad and sagebrush lizard have been documented in the area, both of which are priority species.

The Hanford Reach of the Columbia River supports remnant habitat for aquatic organisms that were widespread before the remainder of the Columbia River system was converted to reservoirs (USFWS, 2006). In addition, dune, instream, riparian, and urban natural open space priority habitats are located along the shoreline (WDFW, 2008). Similar to riparian and emergent habitats in Lake Roosevelt, shoreline areas along the Hanford Reach are affected by fluctuating water levels due to operation schedules at Priest Rapids Dam. Current operations result in daily fluctuations in discharges from Priest Rapids Dam that are frequently in the range of 60,000 to 100,000 cfs or more. This causes the depth and width of the river to vary significantly over a short time, with elevation changes in a day of over 13 feet (Nugent et al. 2002). Changes in flow due to the proposed action are extremely small compared to the current fluctuations.

Odessa Subarea and Banks Lake

The Odessa Subarea mainly supports arid lands that have been converted to irrigated agricultural land. Some areas of intact and disturbed shrub-steppe are present. WDFW notes shrub-steppe, wetland, and riparian priority habitats throughout the northern portion of the Odessa Subarea. Priority species documented in this area include ferruginous hawk, and sharp-tailed grouse, which are state listed as "threatened". Mule deer, prairie falcon, loggerhead shrike, sage thrasher, sage sparrow, Washington Ground squirrel, white-tailed jackrabbit, and tiger salamander have been recorded in portions of the Subarea as well.

At Banks Lake the fluctuating reservoir impedes the development of extensive wetland and riparian vegetation but there are areas of aquatic plants between 1,569 feet and 1,566 feet amsl (Reclamation, 2004). There are over 20 islands in the lake, including Steamboat Rock, a granite outcrop in the northern portion of the lake, which contain undisturbed vegetation communities. Shrub-steppe priority habitats are present to the southeast and rural natural open space is relatively common.

The lake supports several concentrations of waterfowl (WDFW, 2008). Records of priority species include greater sage grouse, which have been documented west of the lake, and sandhill cranes that are also known to inhabit the land west of the lake. Mule deer occur in the lake vicinity, especially to the northwest and northeast. Chukar, a priority game species, has been documented southwest of the lake. Several bald eagle communal roosts exist around the lake.

Multiple occurrences of golden eagle, prairie falcon, peregrine falcon, Swainson's hawk, and loggerhead shrike have been recorded near Banks Lake. American white pelican, long-billed curlew, black-crowned night heron, common loon, and western grebe have also been reported. A gull colony is located within the lake boundaries, and Canada geese frequent the area (WDFW, 2008).

There are two wetland areas associated with the Weber Siphon enlargement. Both wetlands are artificial, made by leakage from the canal, or runoff from adjacent fields. The size of each wetland is less than an acre. Work will occur in both wetlands to enlarge the Weber Siphon, so the wetlands will be drained during construction. During construction, water from the wetlands will most likely be pumped into a holding pond for sediments to settle out, then pumped into East Low Canal.

3.1.7.2 Environmental Consequences

Lake Roosevelt

The proposed project would involve an additional drawdown of 1.0 to 1.8 feet. This would expose an area already exposed by normal operations of the reservoir but at a different time of year. The maximum exposure would be at the end of August and would last for a few days to a few weeks. The exposure of these areas for such a short duration near the end of the growing season would have no affect on vegetation at Lake Roosevelt. This is due to the fact that the vegetation communities at Lake Roosevelt have developed under existing fluctuating conditions and all areas that would be exposed by the proposed actions are exposed annually as a result of normal reservoir operations.

Nesting waterfowl and breeding amphibians that do find suitable habitat are currently impacted by the rapid drawdown in spring, resulting in losses each year. The additional summer drawdown of the lake is not anticipated to increase the current level of impact substantially, but will expose slightly more surface area in shallow waters. Between 35 and 45 acres of shallow embayment habitat within the 13 selected embayments would be exposed under the additional drawdown. However, the maximum draft under drought conditions would occur at the end of August, well after the height of the spring breeding season for many amphibians and waterfowl.

In summary, given the large volume of water held by the lake and the extreme fluctuation of water levels under normal operating conditions, the affects that would occur to wildlife as a result of the additional drawdown are generally within the range of fluctuations that currently exist.

Columbia River Downstream of Grand Coulee

The additional water released at Grand Coulee Dam as part of the proposed action will not result in impacts to wildlife or vegetation. The increase in flow would be less than 1 percent of the current release and will not result in the change in reservoir elevations in the impoundments downstream. The increase in flow will be within the range of current daily fluctuations and cannot be differentiated from existing conditions. In the Hanford Reach, the influence of the additional flow on vegetation communities becomes further minimized as it represents only a 0.4

percent increase from existing conditions in a reach that experiences far larger fluctuations on a daily basis under current conditions.

Odessa Subarea and Banks Lake

Few short-term impacts to wildlife or plants will occur as a result of the proposed diversion to the Odessa Subarea. The 30,000 acre-feet of irrigation water would be delivered with existing infrastructure to lands currently being irrigated. Conveyance systems would need to be built to move water from existing canals to individual farms. The conveyance systems would be located in existing disturbed and agricultural areas and few impacts to plants and wildlife are anticipated.

At Banks Lake the proposed action could result in a 1.5 inch decline in water surface elevations in September in dry or drought years. Banks Lake is managed with an average 1 – 3 foot fluctuation during any week. A 1.5 inch decline will not affect vegetation or wildlife.

Short-term effects of construction on wildlife species at the Weber Branch and Weber Coulee siphons are anticipated to be minimal because of the limited habitat in the project area. Construction would take place within the existing canal right-of-way in an area surrounded by agricultural land and, for the Weber Coulee siphon, adjacent to I-90. Native vegetation in the area is extremely limited and most has been degraded by human activities. Little would be removed or disturbed by the project. Construction could cause temporary disturbance to those wildlife species occurring in the area that are noise intolerant but there is current significant human activity in the area. Temporary noise disturbance is estimated to last approximately 6 months to one year. Wildlife species that are noise intolerant would be expected to return to the area once construction is complete.

Placement of the second barrel in the siphons will require work in the wetlands at both locations. The wetlands will be disturbed during construction, vegetation will be removed and the water will be pumped away from the work area. After construction, the sites will be restored and revegetated to prevent establishment of invasive plant species. The wetland vegetation may return to these sites if leakage and runoff continue at the sites. A permit may be issued by Ecology for the construction of the siphons. All conditions of the permit will be followed.

Mitigation

No mitigation is required for impacts to wildlife and plants because no impacts are anticipated.

3.1.8 Cultural Resources/Historic Properties

Historic properties are defined as buildings, sites, structures, or objects that may have historical, architectural, archaeological, cultural, or scientific importance (36 CFR PART 800.16(1)(1). A legislative and regulatory basis requires the identification, evaluation, protection, and management of historic resources in federal undertakings. The following discussion is in response to the data needs required principally by the National Historic Preservation Act of 1966 (NHPA), as amended.

NHPA requires that federal agencies complete inventories and site evaluation actions to identify cultural resources that may be eligible for listing on the National Register of Historic Places

(National Register) and then ensure those resources "are not inadvertently transferred, sold, demolished, substantially altered, or allowed to deteriorate significantly." Regulations entitled "Protection of Historic Properties" (36 CFR 800) defines the process for implementing requirements of the NHPA, including consultation with the appropriate State Historic Preservation Office (SHPO) and Advisory Council on Historic Preservation.

The Archaeological Resources Protection Act of 1979 (ARPA) prevents the study agency from disclosing specific site locations. ARPA and the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) define the notification and tribal consultation processes the study agency must implement if human remains of Native American ancestry are inadvertently discovered during the course of an action on federal land. NAGPRA also encourages agencies to have a discovery plan in place when actions will occur in an area that has the potential for human remains. Finally, NAGPRA defines a process for agencies to determine if recovered human remains are affiliated with federally recognized tribes and a process for disposition of affiliated remains.

3.1.8.1 Affected Environment

The Affected Environment of this issue is addressed in the PEIS Section 3.10 and in the SEIS Section 3.9.

Lake Roosevelt

Lake Roosevelt has been subject to numerous cultural resource studies since 1942 (Chance 1967, 1977, 1979, 1982; Collier et al. 1942; Masten and Galm 1986; McKie and Chance 1980; Galm 1994; Roulette et al. 2001). Most cultural resource surveys have focused on elevations between 1,220 and 1,290 feet amsl (Galm 1994:11.4). As of 2006, nearly 700 sites had been recorded on Lake Roosevelt project lands (Yu 2006). Prehistoric resources at Lake Roosevelt include small and large habitation sites, resource procurement and processing sites, and ritual sites, while historic resources include dumps, structural remains, town sites, mines, missions, forts, cemeteries, and schools (Galm 1994:11.3).

The majority of recorded prehistoric sites are between river mile (RM) 670 and RM 745; this is likely attributed to the large landforms that are exposed during drawdowns, which reveal a high density of sites (Galm 1994:11.6). South of RM 670, most of the sites there are permanently inundated. They are under more than 100 feet of water at normal pool.

The nature of this undertaking is to implement actions associated with the Lake Roosevelt Incremental Storage Draft and the MOU between Reclamation, Ecology, and the Districts. Direct impacts are associated with the change in operations at Lake Roosevelt.

Columbia River Downstream of Grand Coulee

Cultural resources have been previously identified within other reservoirs on the Columbia River. Table 3-3 summarizes the number of recorded cultural resources within 11 reservoir sites on the Columbia River. Cultural resources included in this table are predominantly archaeological and historic sites. The inclusion of Traditional Cultural Properties (TCPs) and the built environment would increase these numbers.

Table 3-3. Recorded Cultural Resources at Columbia River Reservoir Sites

Dam (year built)	Manager	Number of Historic Properties on Project Lands	Surface Area (acres)
Bonneville (1938)	Portland District USACE	57[1]	595
The Dalles (1957)	Portland District USACE	145[1]	
John Day (1968)	Portland District USACE	157[1]	
McNary (1953)	Walla Walla District USACE	181	37,000 (normal pool)
Priest Rapids (1959)	Grant County PUD	218	7,725 (normal maximum pool)
Wanapum (1963)	Grant County PUD	419	14,680 (normal maximum pool)
Rock Island (1933)	Chelan County PUD	51	3,120
Rocky Reach (1961)	Chelan County PUD	77	9,100
Wells (1967)	Douglas County PUD	29	9,740 (normal pool)
Chief Joseph (1955)	Seattle District USACE	500	8,400 (full pool)
Grand Coulee (1941)	U.S. Bureau of Reclamation	668	82,000

Sources: PUD No. 2 of Grant County 2003; U.S. Army Corps of Engineers 2006a, 2006b, 2006c; U.S. Bureau of Reclamation, personal communication 2006; Beckham and Baxter 1988; CJDCRMCG 1998; Dickson 2002; Griffin and Churchill 2001; Galm and Masten 1988; Roulette et al. 2001; Hamilton and Hicks 2003; Hartmann and Gill 2004; Nelson 2006; Miller 2001; Masten and Galm 1986; Scott 2003, Yu 2006.

[1]Washington state sites only

In areas potentially affected by the proposed action downstream of Grand Coulee, fishing camps were set up at narrow places on the Columbia River where dip nets or spears could reap the available bounty. While sedentary winter villages were established along the main river channel for winter resources and climate protection. Columbia River islands were often the locations of burials, as were areas adjacent to streams. The cultural significance of the Columbia River to Native American groups is evident in their art, oral traditions, and ceremonies. Petroglyphs and pictographs, images carved or painted on rock surfaces, are usually located near a permanent water source. The Columbia River also plays a role in the oral traditions and ceremonies of the Native American groups who lived and currently live along it.

With respect to Euro-American history of region the importance of transportation on the Columbia River is longstanding. It was used as a transportation corridor by fur traders and explorers during the early historic period. It continued to play an important transportation role after the discovery of gold in the northern interior of the state. Steamboats brought miners, supplies, and cattle to the area and returned with gold and silver. By 1888 steamboats reached the Upper Columbia River, developing settlements in the Wenatchee and Lake Chelan areas.

Odessa Subarea and Banks Lake

An evaluation of cultural resources within the Odessa Subarea was conducted by Reclamation as part of an evaluation of the water delivery alternatives possible in the Odessa Subarea. Research was conducted to identify previously recorded cultural resources and previous cultural investigations in the 2,000-square-mile study area; no fieldwork was undertaken.
Previous cultural resource investigations were found to have been conducted in less than 1 percent of the study area; only six prehistoric and nine historic sites have been previously

recorded (Ives, 2007). Additionally, a preliminary TCP (Traditional Cultural Property) study was conducted for the Odessa Subarea (Shannon, 2007).

Direct impacts are associated with the ground disturbing activities associated with construction at the Weber Siphons.

The area of potential effect (APE) includes the area surrounding the Weber Siphons. No direct or indirect effects outside of this area can be attributed to this project.

3.1.8.2 Environmental Consequences

Lake Roosevelt

No new long-term/operational impacts to cultural resources are anticipated as a result of incremental storage releases. Under the proposed action, additional drawdown will occur of up to 1.0 feet in most years and 1.8 feet in drought years by the end of August. These drawdowns are within the normal operating range of the reservoir and would last for a few days to a few weeks at most.

Columbia River Downstream of Grand Coulee

No new long-term/operational impacts to cultural resources are anticipated to the Columbia River downstream area as a result of increased flows as the increase represents less than a 1 percent change from current operational flows.

Odessa Subarea

Short term impacts to cultural resources under this alternative are anticipated to be limited to infrastructure improvements such as on-farm canals. If any canal construction projects receive state or federal funding, those projects would be subject to further cultural review. Construction at the Weber siphons is not expected to disturb cultural resources since construction would be limited to previously disturbed areas within the canal right-of-way.

Construction work at the Weber Siphons may require additional evaluation. To fulfill the requirements of Section 106 of NHPA, a survey to identify historic properties (including Traditional Cultural Properties) and subsequent reporting must be completed prior to construction activities. This report will likely include a literature review, results of a field survey, evaluation of identified resources, and mitigation. Additionally, Reclamation will consult with the SHPO, and all appropriate Indian Tribes in preparation of this report.

Mitigation

The State of Washington has entered into Water Resource Management Agreements with the CCT and the STI to mitigate effects of the storage releases including effects to cultural resources (Washington State and CCT, 2007; Washington State and STI, 2008). These agreements provide for full mitigation of potential effects to cultural resources within each tribe's Lake Roosevelt management area therefore no additional mitigation measures are proposed. Reclamation will coordinate with NPS to develop appropriate mitigation for potential impacts to cultural resources

on NPS managed lands. Should any significant cultural resource issues be discovered at the Weber siphon location, no ground disturbing activities will occur until all issues are mitigated.

3.1.9 Environmental Health

3.1.9.1 Affected Environment

The Affected Environment of this issue is addressed in the SEIS Section 3.10

Lake Roosevelt

Located 10 river miles upstream of the U.S.-Canadian border, Teck Cominco has been in operation as a smelting facility since 1896. As stated in the US Environmental Protection Agency 2007 Contaminated Sediments Technical Advisory Group (CSTAG) Recommendations for the Upper Columbia River Memo:

> This facility either produces or has historically produced lead, zinc, cadmium, silver, gold, bismuth, antimony, indium, germanium, arsenic, mercury, sulfuric acid, liquid sulfur dioxide, ammonia, ammonium sulfate, and phosphate fertilizers. The smelter complex has discharged liquid effluent and water-granulated fumed slag into the Columbia River, including a number of accidental spills and releases to the river (CSTAG, 2007).

Concentrations of organic compounds within the Upper Columbia River are generally low; however, where present, these compounds are typically above human health standards. No patterns of organic compound movement or areas of accumulation were identified in recent sediment sampling in the upper portions of the reservoir (EPA, 2006). Heavy metal contamination in areas downstream of about RM 710 generally occur in greater concentrations below 1,255 feet amsl (EPA, 2006). Upstream of RM 710 the heavy metal contaminated sediments are associated primarily with the main river channel and the historic river bed except in the very upper reaches where they occur in the side-bank beach and point bar areas.

In June 2006, the EPA published a draft report outlining the general results of sediment sampling at recreational beaches along Lake Roosevelt. Screening was conducted based on limited recreational use. Samples revealed that 12 of the 15 sites sampled were below detection limits for all contaminants tested, and were designated as safe for use. Three sites (Black Sand, Northport, and Dalles) had arsenic and/or lead concentrations slightly above screening levels; these beaches were designated as safe for seasonal recreation (EPA, 2006a).

Air quality around Lake Roosevelt has also been studied to determine concentrations of trace elements in airborne dust during ambient and dust-event conditions (Kahle and Majewski, 2004). Studies have been conducted by USGS, Teck Cominco Metals Limited and Ecology in cooperation with the Washington Department of Health (WDOH). The USGS study sampled airborne dust and also determined if exposed beach and bed sediments are the source of the airborne trace elements. That study was conducted at Kettle Falls, Marcus Flats, Inchelium, and Seven-Bays. Data was collected to coincide with significant lake drawdown events; from January through June, and in September. The study did not record concentrations of particulate matter with a diameter of less the 10 microns (PM10) at levels that exceeded either the short or

long term safety standards. It found that the air concentrations of trace elements related to contamination from the smelter at Trail, British Columbia were low and did not single out any trace element as being of concern.

The Ecology/WDOH study looked at airborne dust near Northport and Kettle Falls. The sampling was conducted in 4 phases beginning in 1992 and extending through 1998. As with the USGS study it did not find any violations of federal or state standards. Phase I of the study between December 1992 and February 1993. No violations of state or federal lead standards were found. Phase II of the study occurred between August and October of 1993. No violations of the PM10 standard were noted and there were no violations of the lead standard. No federal or state standards existed for 6 other metals monitored but maximum levels were compared to Ecology's acceptable source impact levels (ASIL). The ASILs were not exceeded for antimony, copper, manganese or zinc but the maximum arsenic and cadmium levels did exceed the ASIL. During Phase III of the study conducted between November 1993 and August 1994 quarterly airborne lead levels were found to be an order of magnitude below the quarterly standard. Average annual arsenic and cadmium levels did exceed the ASIL but, as EPA (2008) noted these exceedances are problematic as the ASIL standard is below detection limits and background concentrations typically exceed the ASIL values even in rural areas. The maximum PM10 value fell below the 24 hour National Air Quality Standard.

The TCML study focused on airborne dust at Northport and includes 10 years of data from years since improvements were made to the smelter in 1997. Results were similar to those from the Ecology/WDOH study for the same time periods. Beginning in 1997 though the concentrations of arsenic, cadmium, lead and zinc show a declining trend stabilizing in 2001.

Sanitation issues (e.g., human waste left on beaches) have been noted along Lake Roosevelt. The problems occur mainly in dispersed areas and other shoreline areas where restroom facilities are not provided. Bacteria in human waste present potential health risks for beach users.

The Washington State Department of Health (DOH) currently has an updated fish advisory in effect for walleye due to high mercury levels. DOH recommends that "women who might become pregnant, are pregnant, nursing, and young children should not eat more than 2 meals per month of walleye caught from Lake Roosevelt" (DOH, 2008). Also recommendations are in place to eat no more than four meals per month of burbot or sucker.

Mosquitoes are a concern due to risk of transmission of mosquito-borne pathogens such as West Nile Virus. Wind-swept shorelines lacking vegetation and pools, such as occur at Lake Roosevelt under normal operations, are not conducive to mosquito production (Pratt and Moore, 1993 in Reclamation, 2004).

Columbia River Downstream of Grand Coulee

Although specific data were not readily available, some transport of contaminants from Lake Roosevelt is likely present downstream in the Columbia River. Larger-scale studies of the entire Columbia River have noted contaminants (a variety of organic compounds and heavy metals) in fish tissues (EPA, 2002).

Odessa Subarea and Banks Lake

Sediment samples were analyzed for mercury concentrations at Banks Lake as part of an Ecology study reviewing statewide mercury levels in fish tissues. They were found to be well below the Threshold Effects Level (TEL) of 170 μg/kg dry weight. Largemouth bass tissues sampled as part of the 2003 Ecology study were found to have a mean mercury concentration of 114 μg/kg and 2 of the 10 fish sampled were above the DOH criteria of 150 μg/kg wet weight; however, all fish sampled in Banks Lake were below the EPA 2001 Revised Fish Tissue Residual Criterion of 300 μg/kg wet weight.

3.1.9.2 Environmental Consequences

Lake Roosevelt

Exposure of slightly more surface area in shallow waters at the end of August could mean more risk of exposure to contaminated sediments and an increase in swimming and boating hazards; however, the slight increase in the current level of impact is not considered to be significant. The sediments with the greatest heavy metal contamination are generally associated with the historic river channel or are found below elevation 1255 feet amsl. These areas would not be exposed by the proposed action any more than they are by current operations. Areas in the 1280 to 1279 feet amsl would be exposed in all years but the increase in exposed area is very slight relative to the exposed area under normal operations. During drought years the exposed area would be in the 1278 to 1276 feet amsl range but again the amount of area exposed would be slight relative to the total exposure. In embayment areas the expected exposure is expected to be about 35-45 acres in a normal year and 70 to 80 acres in a drought year. In a normal year, the number of additional acres exposed along the entire 151 mile reservoir would be approximately 400 acres, or a little over an acre for each mile of shoreline. The exposure would last for a few days to a few weeks. These areas are exposed under normal operations but usually not during the recreation season which would occur with the proposed action. As outlined above, EPA found all beaches sampled to be safe or safe for seasonal recreation under existing conditions (EPA, 2006a). The slight increase in exposure that would occur should not alter these conclusions given what is known about the distribution of contaminates in the sediments. Since the area to be exposed is small and the exposure time is limited any additional impacts will be slight.

Airborne contaminants from wind events during reservoir drawdowns were found to be well below standards (Kahle and Majewski, 2004). For example, data collected in 2002 and 2003 showed that concentrations for lead are at highest levels during December through June when the lake is at its lowest levels and far more of the reservoir bed is exposed than would occur under the proposed action. Even at the highest recorded levels the lead concentrations were still well below the National Ambient Air Quality Standard for lead. The USGS has concluded that for PM-10, the 24-hour average concentrations for all the monitoring stations did not exceed the short-term standard, and the annual average concentrations did not exceed the long-term standard. This was true under conditions when substantially more substrate was exposed than would occur with the proposed action.

Previous sampling in the mid-1990s by Ecology/WDOH found levels of arsenic and cadmium that exceeded the ASIL but, as noted above this is somewhat problematic as the ASIL is below detection limits and below levels seen in ambient air samples. Since the Ecology/WDOH sampling was done additional airborne contaminate samples have been collected at Northport. In

August, when the maximum drawdown of about 1 foot would occur under the proposed action, the median airborne arsenic and cadmium levels have been in the range of reported mean ambient air concentrations reported in EPA 2008 for rural areas (EPA 2008).

Additional human waste deposition would not be expected with increased beach area as the number of recreational users is not expected to increase.

Drawdowns during summer months will help control mosquito populations at Lake Roosevelt by limiting mosquito habitat near vegetated shores.

Columbia River Downstream of Grand Coulee

The proposed action would result in slight increases in stream flows downstream in the Columbia River at times. While increased flows downstream have the potential to transport contaminants, the increases are generally less than 1% so impacts, if any, would be slight.

Odessa Subarea and Banks Lake

Construction associated with the Weber siphons would generate dust during the construction period, but this would be temporary. Few people are located in the vicinity of the Weber siphons area, so no health impacts are anticipated from the temporary increase in dust.

Mitigation

Teck Cominco and the EPA are conducting a human health and ecological Remedial Investigation and Feasibility Study (RI/FS) to determine future hazardous substances remediation and mitigation needs. These documents are expected to guide mitigation of impacts from contaminated sediments upon their approval by EPA. If the new information indicates that the proposed action negatively impacts the environment by re-entraining pollutants into the air or water, the State will establish a working group with the CCT to develop mitigation measures and pursue funding for those measures (Washington State and the CCT, 2007).

At the Weber siphons BMPs to control dust will be implemented.

3.1.10 Recreation and Scenic Resources

3.1.10.1 Affected Environment

The Affected Environment of this issue is addressed in the SEIS Section 3.11

Lake Roosevelt

Lake Roosevelt provides recreation opportunities for 1.2 to 1.5 million visitors annually. Most visitors come from Washington and the immediate region, including Canada (NPS, 2000). The lake is popular because of its size, surrounding scenery, the quality of its water, and the fact that it is one of the few large lakes in the region that has an extensive amount of shoreline and adjacent lands that are publicly owned and available for public use.

Visitor use at Lake Roosevelt is unevenly distributed throughout the year, with peak activity and visitation occurring from June through September, which accounts for nearly 75 percent of visitor use. In general, visitor use dramatically increases in June, peaks in August, and falls off dramatically in September. The latest NPS visitation data (2007) show visitation at a high of 357,742 in August and a low of 23,265 in January.

The lake is characterized by seasonal fluctuations in the lake level as described in the Programmatic EIS. This affects boat launches and other waterfront facilities because they must be designed to be operable under variable water level conditions. In response to low lake levels rendering certain boat ramps inoperable, the NPS extended some ramps in 2000 to be operable under current lake management. Following these extensions, and under average conditions, the lake level is generally high enough to meet the needs of all ramps in the Lake Roosevelt National Recreation Area (LRNRA). Under below average water conditions when lake levels reach 1,278 feet, six of the 22 boat ramps within the LRNRA are inoperable during two of the highest use months on the reservoir. According to NPS, launching is reported to shift to other ramps when these become inoperable (Dashiell, pers. comm., 2008).

Columbia River Downstream of Grand Coulee

The Columbia River downstream areas include a variety of recreation and scenic resources. Recreation areas include parks, monuments and historic areas, wildlife refuges, wilderness areas, forest, and range areas. Recreation activities in the downstream areas include fishing, hunting, bird watching, boating, swimming, and other water-oriented activities.

Odessa Subarea and Banks Lake

Banks Lake is a popular recreational area due to its diverse recreational opportunities and scenic natural features. Activities on the reservoir include fishing, swimming, boating, water skiing, and wind surfing. The highest concentration of boating activity occurs in the Devil's Punch Bowl, Osborn Bay, Kruk's Bay/Airport Bay, and Jones Bay areas. Scenic natural features of the area include basalt outcroppings and coulee walls rising on the east and west sides of the reservoir. There are 19 developed recreation areas on the lake including Steamboat Rock State Park.

The reservoir fluctuates during the high-use recreation season from mid-May through September with an elevation of 1,565 reached in August, 5 feet below full pool. During drawdowns, certain boatramps may be more difficult to use or may become inoperable including Dry Falls, Million Dollar Mile North and South, Barker Flat, and Osborn Bay Southeast. Launching is reported to increase at the Steamboat Rock Rest Area and Boat Launch during low reservoir elevation periods. Swimming, which is the second most common activity on Banks Lake, can also be affected by low water elevations under current operations.

3.1.10.2 Environmental Consequences

Lake Roosevelt

The primary facilities that could be affected by additional drawdowns on the lake would be boat ramps, mooring docks, swimming beaches, and camping areas. Fluctuation in pool elevations is a normal aspect of reservoir operations, and facilities have been designed and operated to

accommodate these fluctuations. While the proposed drawdowns would not produce lake levels outside the range of historical seasonal fluctuations, the proposed action likely would cause the lake's surface to fall to levels that interfere with shore facilities earlier in the summer than currently occurs, and, for some years, expand the number of days in which some water-related recreational activities are restricted. These changes could result in changes in operation costs and temporary closures at some facilities.

The maximum drawdown of approximately 1 foot under non-drought conditions and 1.8 feet under drought conditions is anticipated to occur annually with the greatest potential for impacts for a few days or weeks at the end of August.

Columbia River Downstream of Grand Coulee

The project would result in slightly increased stream flows downstream in the Columbia River at times. These changes would be on the order of 1% or less. These changes in flow are not expected to be noticeable to the average recreational user.

As a consequence of the new water supplies, development in areas that would benefit from the new water supplies could increase. Additional development and population growth would also increase the demand for recreation areas. However, most of this development would be expected to occur in already developed areas and areas where growth has been planned, thus additional development would not likely have significant adverse impacts. Recreation facilities, such as playfields and parks, could benefit from more reliable municipal water supplies.

Odessa Subarea and Banks Lake

With the proposed action Banks Lake may be 1.5 inches lower in September. Since the lake is drawn down 5 feet in August this small change, which is within the range of normal weekly and daily fluctuations would not be noticeable to the recreational user.

Mitigation

The *Lake Roosevelt Shoreline Management Waterfront Facilities Drawdown Impact Study* (2008) recommends specific retrofit measures to address drought year impacts on NPS boat launch and swimming facilities. Mitigation measures for courtesy docks typically involve adding an additional dock section to the end of the existing dock system, Shifting docks to slightly deeper water where possible is recommended for maintaining usability at marina docks during August. Mitigation measures for swimming beaches typically involve lengthening log boom systems and extending the booms into deeper water. Recommended mitigation measures for specific facilities are included in Appendix G of the SEIS.

In addition, the State is funding a portion of the NPS shoreline management program to more specifically assess the impacts of the alternative release scenarios on NPS facilities and to address needed management actions for current and future conditions. The results of these studies will be incorporated into an adaptive management plan.

3.1.11 Socioeconomics

3.1.11.1 Affected Environment

The Affected Environment of this issue is addressed in the SEIS Section 3.12

Lake Roosevelt

The Lake Roosevelt area is predominantly used for purposes of the LRNRA and the STI and CCT Reservations. The NPS manages the LRNRA primarily for boating, camping, and fishing activities. The two tribes partake in these activities and conduct business activities that rely on the associated recreational uses.

The local economy with direct links to Lake Roosevelt includes the STI and CCT Reservations, and the adjacent portions of Ferry, Stevens, Lincoln, Grant, Douglas, and Okanogan Counties. In 2006, the six counties had a total population of 183,220 (U.S. Census Bureau 2008a,b,c). All counties with the exception of Grant County have been experiencing a slower population growth, have a higher concentration of persons 65 years and older, and have a higher concentration of American Indian and Alaska Native persons than the state as a whole.

Columbia River Downstream of Grand Coulee

The near downstream region of the Columbia River is contained in Okanogan County to the north and Douglas County to the south. These counties are demographically similar to the other counties surrounding Lake Roosevelt. Douglas County has a particularly high share of land in agriculture relative to the other counties and the state of Washington as a whole.

Odessa Subarea and Banks Lake

Banks Lake is within Grant and Douglas Counties. The city of Odessa and surrounding agricultural lands are within Lincoln County. Both counties are demographically similar to the other counties surrounding Lake Roosevelt.

3.1.11.2 Environmental Consequences

Lake Roosevelt

While literature suggests that the quality of the recreational experience might be reduced with lower lake levels, there is no evidence that decreases in lake level at the scale of the drawdowns associated with the proposed action would reduce the overall number of visitors for boating purposes. Instead, lower levels likely would reduce the usage of ramps that can be accessed only at high lake levels. Based on past responses to fluctuations in lake level, it appears that the overall impact of the proposed action on visitation would not be substantial. Localized impacts on activities associated with individual boating facilities seem likely to occur only when the proposed action causes the maximum drawdown for more than a few days at the end of August, especially in drought years.

Columbia River Downstream of Grand Coulee

The proposed action will increase flows downstream of Lake Roosevelt during some periods, and decrease them in others. Because the changes in flows will be minor, no impacts to socioeconomic are expected.

Odessa Subarea and Banks Lake

The proposed action will provide a surface water supply for irrigation in the Odessa Subarea. This water is expected to offset some demand for diminishing supplies of groundwater. The availability of surface water for irrigation in the receiving areas would likely enable continuation of current economic activities associated with irrigated agriculture. Irrigators' net earnings would increase or decrease proportionately with the change in costs of irrigating with new surface water supplies as opposed to the cost of using groundwater from increasing depths. The economic impacts of a change in irrigators' net earnings, if any, would depend on how it affects their decisions about which crops to grow on how many acres, how much water conservation to employ using which technology, how much money to spend within the local economy, and other economic concerns.

Mitigation

The State of Washington and the STI and CCT have signed Water Resource Management Agreements to mitigate effects of the storage releases by financing improved spawning habitat and lake access facilities. No additional mitigation is proposed.

3.1.12 Public Services and Utilities

3.1.12.1 Affected Environment

The Affected Environment of this issue is addressed in the SEIS Section 3.13

Lake Roosevelt and Columbia River Downstream of Grand Coulee

There are 11 hydroelectric facilities on the mainstem of the Columbia River including Grand Coulee Dam and the Grand Coulee pump-storage facility. For the facilities downstream of Lake Roosevelt, the dams operate primarily as run-of-river hydroelectric facilities which generate power according to the flow in the Columbia River. There is limited regulating capacity in the reservoirs upstream of each of the dams, but Reclamation and BPA coordinate water releases from Grand Coulee to gain the most benefit from all generations down to Priest Rapids Dam.

Odessa Subarea and Banks Lake

Banks Lake acts as a pump-storage facility. Water is pumped into Banks Lake and stored, and then released back to Lake Roosevelt to generate power from the elevation difference between the two lakes. There are also 2 hydroelectric plants on the CBP Main Canal, the Summer Falls plant near Summer Falls and the Main Canal Headworks at Banks Lake. These projects recover energy from water flowing from Banks Lake to irrigated lands in the CBP.

3.1.12.2 Environmental Consequences

All Areas

The proposed action would slightly increase hydropower production in spring and slightly reduce hydropower production in some Septembers and in October. The reduction is not expected to significantly affect regional power production. The agreement between the State of Washington and the CCT provides for compensation to mitigate the potential impact to CCT hydropower revenues.

Mitigation

Because no impacts are anticipated, no mitigation is proposed.

3.1.13 Transportation

3.1.13.1 Affected Environment

The Affected Environment of this issue is addressed in the SEIS Section 3.14

Lake Roosevelt

The CCT operates the Inchelium-Gifford Ferry, a small capacity car ferry on the upper lake, connecting Inchelium on the west shore to State Route 25 on the east shore. The Inchelium-Gifford Ferry becomes inoperable when Lake Roosevelt elevation falls below 1,228 feet, requiring passengers to drive approximately 30 miles north to the bridge at Kettle Falls or take a longer route to the south. This occurs only 4 percent of the time. Washington State Ferries operates the Keller Ferry, a 12-car capacity ferry from Ferry County and the CCT Reservation on the north bank of Lake Roosevelt to Lincoln County on the south bank, near the lake's confluence with the Sanpoil River. Approximately 60,000 vehicles travel on the ferry each year. During normal lake elevation of 1,290 feet above sea level to approximately 1,248 feet, ferry service is "on-demand" in order to avoid unnecessary empty runs. The ferry crew can observe both landings and remain at the north or south landing until a vehicle appears needing to cross in either direction. Occasionally, perhaps every two or three years, when lake elevations drop below 1,248 feet, the north landing is moved a short distance up the Sanpoil River, extending the normal 10 minute crossing to about 20 minutes. At this location, the ferry can operate normally with lake levels as low as 1,208 feet. With some special provisions in the ferry operations, it can be operated on a limited basis with levels as low as 1,180 feet (Washington State Ferries, 2008).

The primary east-west land transportation route serving Lake Roosevelt is U.S. 2, which connects Spokane, Davenport, and Coulee City to points east and west. State Route 20, which extends from U.S. 395 at Colville to U.S. 97 through Republic to Tonasket, is the primary east-west route for the northern portion of the National Recreation Area. Major south-north routes are U.S. 97, connecting Ellensburg, Wenatchee, Okanogan, and crossing the Canadian border north of Oroville; State Route 17, connecting Moses Lake to Okanogan; and U.S. 395, connecting Spokane to Colville and crossing into Canada.

Columbia River Downstream of Grand Coulee

The Columbia River has a number of large ports that are important hubs for trans-Pacific shipping. On the Columbia River, barge shipping extends from Astoria, Oregon, to Tri-Cities in Washington. Barge shipping is through the Ports of Pasco, Benton, Klickitat, Umatilla (Oregon), Vancouver, Portland (Oregon), and Kalama. Barge shipping also extends up the lower Snake River to the Port of Lewiston.

Odessa Subarea and Banks Lake

Transportation in the areas that would receive additional water supplies is primarily land-based road and rail. The Columbia Basin Railroad (CBRW) line crosses the Weber Siphon and is still in use to serve the grain storage facility at Schrag; however its use is sporadic.

3.1.13.2 Environmental Consequences

Lake Roosevelt

Since the drawdown is within the normal range of operations, the Keller Ferry on State Route 21 would not be affected. The ferry can operate normally with lake levels as low as 1,208 feet. With some special provisions in the ferry operations, it can be operated on a limited basis with levels as low as 1,180 feet (WSF, 2008).

The Inchelium-Gifford Ferry becomes inoperable when Lake Roosevelt elevation falls below 1,228 feet, requiring additional driving of approximately 30 miles to the Keller Ferry. The probability that the ferry would become inoperable is greatest in April when lake levels are drawn down for flood control under existing conditions. Under the proposed action, there would be no change in the end of April operations; therefore, no impacts to the operation of the Inchelium-Gifford are anticipated from the proposed action.

According to comments from the STI, low lake levels increases the need for removal of debris (e.g., logs) from the ferry ramps. The problems are worse when lake levels are lowest and only at certain times of the year (April). The proposed action will not extend the length of the April drawdown; therefore, no increase in debris at the ramps is anticipated.

Columbia River Downstream of Grand Coulee

The total additional volume of water discharged to the downstream areas would be small relative to the normal flows and would not affect barge or other vessel transportation on the Columbia River. Areas served by additional municipal water supplies from the proposed action could experience an increase demands on transportation systems. Any new development that occurs as a result of the new municipal water supplies is expected to be consistent with adopted land use plans and polices, which have incorporated transportation requirements to accompany growth projections.

Odessa Subarea and Banks Lake

Construction associated with the Weber Coulee Siphon is not expected to affect traffic I-90. The siphon barrel has already been installed under the roadway. Connecting the siphon barrel to the

East Canal would take place outside the I-90 right of way. Construction of the Weber Branch Siphon could cause temporary disruption of traffic when improvements are made under Road U Northeast. Construction of the siphon would require removal of the CBRW railroad for approximately two months.

No long term transportation impacts are expected, because no major infrastructure improvements are needed and no disruption to existing transportation systems would occur.

Mitigation

The State of Washington, the CCT, and the STI have signed agreements to mitigate effects of the drawdown. Included in the Water Resources Management Agreement with the CCT is the State's support for a federal appropriation for on-going maintenance of the ferry and of a study of locating a bridge at the ferry site.

A temporary detour of Road U will be provided as part of the construction of the Weber Branch Siphon.

During the two months of construction that the railroad will be impacted, alternate transportation will be provided if necessary.

3.2 Additional Resources

3.2.1 Environmental Justice

3.2.1.1 Affected Environment

All Areas

Executive Order 12898 requires each Federal agency to consider environmental justice as part of its decision making process by identifying and addressing disproportionately high adverse human health or environmental effects, including social and economic effects, of its programs and activities on minority populations and low-income populations of the United States.

Environmental justice requires Reclamation programs, policies, and activities affecting human health or the environment to not exclude minorities and low income groups from participation in or the benefits of programs or activities based on race or economic status. People are the primary resource for social assessment and the vast majority of the people that comprise the affected communities reside within Grant, Lincoln, Ferry, Okanogan, and Stevens Counties area.

Within the local area American Indians makeup a sizeable minority population as shown in Table 3-4 and represent a majority on the two Indian reservations in the project area. In the local area the percent of the county population made up of American Indians exceeds the state average in all counties except Grant. The percent of the total population living below the poverty level exceeds the state average in all of the nearby counties and is more than doubled on the two Indian reservations.

Table 3-4. Demographic Statistics for Counties and Reservations Surrounding Lake Roosevelt

	Ferry Co.	Grant Co.	Lincoln Co.	Okanogan Co.	Stevens Co.	Colville Reservation	Spokane Reservation	WA State
2006 Population estimate	7,560	82,612	10,376	40,040	42,632	7,587a	2,004a	6,395,798
White persons (2006)	78.5%	94.8%	94.9%	85.3%	90.9%	32.6% a	18.5% a	84.8%
American Indian and Alaska Native persons (2006	17.5%	1.4%	2.0%	11.0%	5.5%	59.7% a	76.5% a	1.6%
Per capita money income (1999)	$15,019	$15,037	$17,888	$14,900	$15,895	$12,185	$10,151	$22,973
Persons below poverty (2004)	17.80%	16.20%	11.80%	18.80%	15.10%	26.8% a	28.7% a	11.60%

a Reservation population data only available to 2000.
Sources: U.S. Census Bureau 2008a,b,c; U.S. Department of Agriculture 2008.

3.2.1.2 Environmental Consequences

<u>All Areas</u>

Previous sections of this chapter address impacts to natural resources that might affect minority or low income populations in the area. In particular potential impacts to American Indians as a result of impacts to fish, wildlife, vegetation, cultural resources and socio-economic conditions have been addressed. Only minor impacts to natural resources are expected as a result of the proposed action and the impacts would not fall disproportionately on minority or low income populations. To the extent that subsistence hunting, fishing or gather activities occur in the area these would not be affected. Socio-economics in the area would also not be affected. With respect to environmental health the prospect for the additional potential mobilization of contaminates is low. The drawdown will expose areas already exposed on an annual basis and the exposure involves a small amount of areas and would last for a very short duration. Individuals living in the area would not experience any additional risk beyond what is present on an annual basis.

With respect to the CCT and STI the state has entered into Water Resource Management Agreements with both tribes. The agreements authorize annual payments to the tribes. “The payments will be used to mitigate the damage on fish and wildlife, cultural resources, and recreational activities resulting from the release of water from Lake Roosevelt, and for economic development investments to benefit the local economy” (Office of Governor Christine Gregoire, 2005). To the extent that unforeseen impacts to members of the tribes do occur the agreements provide for mitigation of those impacts.

Mitigation

Beyond the Water Resource Management Agreements entered into by the State no additional mitigation is proposed.

3.2.2 Indian Trust Assets

3.2.2.1 Affected Environment

All Areas

Indian Trust Assets (ITAs) are defined in 25 Code of Federal Regulations Chapter 1, Part 115, Subsection 115.002 (2001) as "trust lands, natural resources, trust funds, or other assets held by the federal government in trust for Indian tribes and individual Indians. Trust land(s) means any tract or interest therein that the United States holds in trust status for the benefit of a tribe or an individual Indian" (United States 2001: 343).

Examples of ITAs include land, minerals, instream flows, water rights, and hunting and fishing rights. A defining characteristic of an ITA is that these assets cannot be alienated, sold, leased, or used for easements without approval from the United States.

The United States has a trust responsibility to protect and maintain rights reserved to Indian Tribes or individuals originating from treaties, statutes, and executive orders. This trust responsibility requires that federal agencies take reasonable actions to protect trust assets when administering programs under their control.

Historically, the government and the Tribes have offered varied opinions as to what constitutes an ITA, and which tribe holds title to those ITAs. This document neither judges the validity of, nor defines the rights claimed by any Tribal government or member.

While the majority of ITAs are located on-reservation, ITAs also occur off reservation. Consequently, several American Indian Tribes and bands have interests in the project area. Those include the Yakama Nation, the Spokane Tribe of Indians, Wanapum, the Nez Perce Tribe, the Confederated Tribes of the Colville Indians, the Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Warm Springs Reservation.

ITAs that may be present in the area include hunting and fishing privileges and rights, particularly in those areas where anadromous fish are present, instream flows and water rights. The CCT also has an interest in the power generated at Grand Coulee Dam.

3.2.2.2 Environmental Consequences

All Areas

The proposed action would not have an impact on legal interests in property or rights held in

trust by the federal government for federally recognized Indian tribes or individual Indians. No impacts would occur on such ITA resources as land, minerals, instream flows, water rights, and hunting and fishing rights held in trust by the federal government.

Mitigation

No mitigation is proposed.

3.2.3 Sacred Sites

3.2.3.1 Affected Environment

All Areas

Executive Order 13007, dated May 24, 1996, instructs federal agencies to promote accommodation of access and protect the physical integrity of American Indian sacred sites on Federal lands. Sacred site means any 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. A sacred site can only be identified if the Tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of a site.

No sacred sites have been identified in the project area but may be present.

3.2.3.2 Environmental Consequences

Lake Roosevelt and Columbia River Downstream of Grand Coulee

Actions in these areas that are part of the proposed action involve modifying, on a season basis, the operation of Grand Coulee which would affect reservoir elevations and downstream flows. The elevations that would occur are within the normal range of operations at Lake Roosevelt and the downstream flow modifications fall within the normal range of flows experienced. These actions would not limit access to or the physical integrity of any sacred sites on Federal lands beyond impacts which may be occurring under current operations which are part of the No Action alternative.

Odessa Subarea and Banks Lake

Impacts to sacred sites are not expected at Banks Lake as the maximum change in water surface elevation is 1.5 inches. This change would occur within the normal operating range of the reservoir and would not limit access to or the physical integrity of any sacred sites on Federal land beyond impacts which may be occurring under current operations which are part of the No Action alternative.

Access at the Weber Branch and Weber Coulee siphons would be affected during project construction but would return to pre-project conditions once the construction is finished. The area to be disturbed has been previously disturbed by construction of the existing facilities in the area. Reclamation holds easement for most of the right-of-way to be used with a small parcel of fee title land at the Weber Coulee siphon. No sacred sites have been identified in the vicinity of either siphon so the work is not expected to limit access to or the physical integrity of any sacred sites on Federal property.

Mitigation

No mitigation is proposed.

3.2.4 Essential Fish Habitat

The Magnuson-Stevens Act (MSA) of 1996 (PL 94-265) was established "to conserve and manage the fishery resources found off the coasts of the United States, and the anadromous species and Continental Shelf fishery resources of the United States" (Magnuson-Stevens Act). Federal agencies are required, under the MSA, to consult with the National Marine Fisheries Service regarding actions that are authorized, funded, or undertaken by that federal agency that may adversely affect Essential Fish Habitat (EFH).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3).

3.2.4.1 Affected Environment

Lake Roosevelt and Odessa Subarea and Banks Lake

EFH has not been designated on Lake Roosevelt, at Banks Lake or within the Odessa Subarea.

Columbia River Downstream

Essential Fish Habitat for the incremental storage releases has been identified downstream of Grand Coulee Dam in the Columbia River.

3.2.4.2 Environmental Consequences

Lake Roosevelt and Odessa Subarea and Banks Lake

The proposed action would not have any impact on EFH since EFH has not been designated on Lake Roosevelt, at Banks Lake, or in the Odessa Subarea.

Columbia River Downstream

The incremental storage releases would increase flows in the Columbia River by a minor amount

in most months. Although the flow increases will be small, they are expected to help meet stream flow targets in the Columbia River and provide benefits to fish. Columbia River flows will decrease in September with the biggest decreases in drought years in years. The decreases are small relative to Columbia River flows and are not expected to negatively impact fish habitat. No decrease in flows will occur during the April to August juvenile fish migration period. There would be no negative impact to EFH under the proposed action.

3.2.5 Invasive Species

Executive Order 13112, dated February 3, 1999, instructs Federal agencies to prevent the introduction of invasive species, provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause.

3.2.5.1 Affected Environment

The Affected Environment for this resource is covered in section 3.8.1.1 of the SEIS.

Lake Roosevelt and Columbia River Downstream

The most common invasive weed species in the Lake Roosevelt and Columbia River Downstream area are Canadian, star, and Russian thistle, diffuse and spotted knapweed, Dalmatian toadflax, cheatgrass, common mullein, wormwood, leafy spurge, hounds tongue, rush skeletonweed, goat weed, and baby's breath (NPS, 2000). In Lake Roosevelt, invasive aquatic species include Eurasian watermilfoil and Yellow flag iris. Eurasian watermilfoil is a submersed perennial plant that can thrive in a variety of aquatic environments. Yellow flag iris is found in temperate wetlands and along the margins of lakes and rivers.

Odessa Subarea and Banks Lake

Common invasive species are similar to those outlined in the Lake Roosevelt and Columbia River Downstream.

3.2.5.2 Environmental Consequences

Lake Roosevelt and Columbia River Downstream

Impacts associated with the change in operations at Lake Roosevelt would not have a discernable effect on invasive species. The additional drawdown could potentially increase the distribution and abundance of aquatic nuisance weeds such as Eurasian watermilfoil in shallow water areas or embayments. However, this drawdown is considered to be minimal because the period of maximum exposure would be a few days to a few weeks and would expose areas already exposed under current operations.

Odessa Subarea and Banks Lake

Construction associated with Weber siphon would take place within the existing canal right-of-way in an area surrounded by agricultural land and is adjacent to I-90. Native vegetation could be removed or disturbed by the project.

Mitigation

Mitigation for removal of native vegetation would consist of replanting the affected area with native plants. In some cases, the existing vegetation could be removed and saved for replanting.

3.2.6 Recreational Fishing

Executive Orders 12962 and 13474 require Federal agencies, where practical, to improve aquatic resources for increased recreational fishing opportunities.

3.2.6.1 Affected Environment

Lake Roosevelt

Lake Roosevelt provides an excellent recreational fishing opportunity that currently supports 32 species of fish (20 game and 12 non game). Rainbow trout, kokanee salmon, and walleye are the three primary fish caught in the reservoir, with smallmouth bass increasing in popularity over the past five years. White sturgeon and bull trout fishing are closed, and lesser fisheries exist for other species. The popular fishery found at Lake Roosevelt brings in an estimated $5.3 to 20.7 million annually to the local economy (Lake Roosevelt Forum).

Three fish hatcheries, two of them operated by the tribes and a third operated by the Washington Department of Fish and Wildlife, produce trout and kokanee for the popular sport fishery in the lake. The hatcheries release more than 500,000 rainbow trout and 500,000 kokanee into the lake each year. (Northwest Power and Conservation Council, 2008).

Columbia River Downstream

Downstream of Grand Coulee Dam is Lake Rufus Woods. Similar to Lake Roosevelt, Lake Rufus Woods supports resident fisheries primarily for rainbow trout, and kokanee salmon.

Further Downstream from Rufus Woods are Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids Dams. Anadromous fish species dominate the species composition in these areas, and recreational fishing occurs year-around. Only hatchery fish are allowed to be kept by anglers, all wild run fish are to be released after catching them (Willey, 2009).

Odessa Subarea and Banks Lake

Banks Lake covers 27,000 acres with a 91-mile shoreline. The water source for Banks Lake is pumping from Lake Roosevelt. There are 22 fish species in Banks Lake of which 11 are actively pursued by anglers. The reservoir supports a variety of non-game, warm water and cold water game fish species most notably walleye, bass, trout, and kokanee salmon. Planting of hatchery rainbow trout fingerlings has resulted in a successful non-seasonal boat and bank

fishery. This species is a prized gamefish in Banks Lake. Operation of the reservoir influences rainbow trout far less than kokanee. Lakeshore spawning of rainbow trout is not significant and annual hatchery fingerling plants must be made to sustain a viable fishery (Washington Department of Game, 1986).

3.2.6.2 Environmental Consequences

Lake Roosevelt

The incremental release of one additional foot of water would not have a negative impact on recreational fishing. Those factors that could have a negative impact on recreational fishing such as increased water temperature and additional sediments would not occur with the one foot incremental release of water.

Columbia River Downstream

The incremental release of one additional foot of water from Lake Roosevelt would not have a negative impact on recreational fishing downstream since no change of operations that would affect the river would occur.

Odessa Subarea and Banks Lake

The incremental release of one additional foot of water from Lake Roosevelt would not have a negative impact on recreational fishing in Crab Creek or Banks Lake. At most, Banks Lake would be drawn down an additional 1.5 inches in September in some years, but this is within the range of normal operations and would not affect the fish populations of angling opportunities.

Mitigation

Because no impacts are anticipated, no mitigation is proposed.

3.2.7 Endangered Species

The Endangered Species Act requires Federal agencies to consult with FWS and NMFS, as appropriate, to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of a listed species or result in the adverse modification or destruction of their critical habitat.

3.2.7.1 Affected Environment

The Affected Environment for this resource is covered in the SEIS in section 3.8 “Wildlife and Plants.” The following list contains those species listed by FWS and NMFS as threatened or endangered within the project area which includes the Columbia River downstream of Grand Coulee, lands in Ferry, Grant, Lincoln, Stevens, and Okanogan counties which border Lake Roosevelt and areas in Grant, Adams and Lincoln in the Odessa Subarea:

Species	Scientific Name	Status
Canada lynx	*Lynx canadensis*	Threatened
Gray wolf	*Canis lupus*	Endangered
Columbia Basin Pygmy rabbit	*Brachylagus idahoensis*	Endangered
Grizzly bear	*Ursus arctos horribilis*	Threatened
Ute ladies'-tresses	*Spiranthes diluvialis*	Threatened
Spalding's silene	*Silene spaldingii*	Threatened
Northern spotted owl	*Strix occidentalis caurina*	Threatened
Bull trout	*Salvelinus confluentus*	Threatened
Upper Columbia River Steelhead	*Oncorhynchus mykiss*	Endangered
Upper Columbia River chinook	*Oncorhynchus tshawytscha*	Endangered
Mid-Columbia River Steelhead	*Oncorhynchus mykiss*	Threatened
Snake River steelhead	*Oncorhynchus mykiss*	Threatened
Snake River sockeye	*Oncorhynchus nerka*	Endangered
Snake river fall chinook	*Oncorhynchus tshawytscha*	Threatened
Snake River spring/summer chinook	*Oncorhynchus tshawytscha*	Threatened
Lower Columbia River chum	*Oncorhynchus keta*	Threatened
Lower Columbia River chinook	*Oncorhynchus tshawytscha*	Threatened
Lower Columbia River coho	*Oncorhynchus kisutch*	Threatened
Lower Columbia River steelhead	*Oncorhynchus mykiss*	Threatened
Upper Willamette River chinook	*Oncorhynchus tshawytscha*	Threatened
Upper Willamette River steelhead	*Oncorhynchus mykiss*	Threatened

Critical Habitat

Critical habit has been designated for the following species within the project area counties: Northern spotted owl, bull trout, and Canada lynx.

3.2.7.2 Environmental Consequences

<u>Lake Roosevelt</u>

None of the listed anadromous species occur in Lake Roosevelt as passage is blocked downstream at Chief Joseph Dam and no critical habitat is present.

With the exception of bull trout, the other listed species present in or near Lake Roosevelt would occur in either upland areas or shallow wetland areas. Most, like lynx, wolf, grizzly bear, spotted owl, pygmy rabbit and Spalding's silene would be found in terrestrial habitats removed from the exposed reservoir substrate. None of these species are known to occur in the vicinity of Lake Roosevelt. Ute ladies'-tresses would be found in riparian or wetland habitats but again this would not occur in the drawdown area affected by the proposed action which is 10 to 12 feet below normal full pool.

Since the proposed action involves a 1 to 1.8 foot additional drawdown approximately 10 to 12 feet below the full pool level terrestrial or near-shore wetland habitat would not be affected in any way. With the exception of bull trout, the action would have no effect on the species listed above.

The draft bull trout recovery plan (USFWS 2002) reports that bull trout have been documented in Lake Roosevelt but the only core area identified for the Northeast Washington Recovery Unit, which includes Lake Roosevelt, is in the Pend Oreille basin. The 1997 stock status report for bull trout (WDFW 1997) reports that, while a few adults have been observed in the lake, there are no known bull trout spawning populations in tributaries to Lake Roosevelt. As discussed early the proposed action is not expected to effect physical conditions in the reservoir such as temperature or TDG. It also not expected to affect other fish species present in the lake. The additional drawdowns predicted to occur are well within the range of the annual drawdowns already occurring at Lake Roosevelt. Consequently the prey available to any adult bull trout that might be in the lake is not expected to change. Since there are no known spawning sites in tributaries to the lake, potential access to spawning tributaries is not a concern. As a result the proposed action would have no affect on bull trout in this area.

Columbia River Downstream

This proposed action would have no affect on endangered or threatened species using terrestrial habitats downstream of Grand Coulee Dam since the project would not alter terrestrial habitat in the area. This includes Canada lynx, gray wolf, pygmy rabbit, grizzly bear, northern spotted owl, Spalding's silene, and Ute ladies'-tresses.

The proposed action would affect flows in the Columbia River, increasing them during the period from April through August and reducing them in September and October. Affects from this proposed action on the listed anadromous fish species were addressed in the recently completed consultation on the FCRPS. NMFS issued a BiOp for the FCRPS on May 5th, 2008 which covers operations associated with this project. The BiOp determined that for each of the listed salmon and steelhead species this action will not jeopardize there continued existence as each will avoid extinction and have an adequate potential for recovery. The BiOp also concludes that the designated critical habitat for those species would not be adversely modified or destroyed by this proposed action.

Bull trout are known to utilize portions of the Columbia River mainstem for rearing below Grand Coulee Dam. As noted in Table 3-2 flows are expected to increase by less than 1 percent during

the April to August period with declines in flows by up to 3.5 percent in September. These changes in flows are not expected to affect the resident fish communities that occur in the reservoir pools below Grand Coulee and provide a prey base for rearing bull trout. Access for migrating bull trout to the basin where they spawn, such as the Methow, Entiat, and Wenatchee would not be affected by the flow changes either as access is a function of reservoir elevation and reservoir elevations in the reservoirs below Grand Coulee will not be affected. Consequently the proposed action will have no affect on bull trout in this area.

Odessa Subarea and Banks Lake

None of the listed anadromous fish species are present in this area so there are no affects.

Suitable habitat for Canada lynx, grizzly bears, northern spotted owls and bull trout is not present in this area. Consequently no affects to these species would occur in this area.

Pygmy rabbits, Spalding's silene and Ute ladies'-tresses may be present within the Subarea based on potential distribution and habitat availability. The last known Columbia Basin pygmy rabbit populations in Washington were located in Douglas County outside of the Odessa Subarea west of Banks Lake. These populations are now thought to be extirpated and there are no known populations in the wild (http://wdfw.wa.gov/wlm/diversty/soc/pygmy_rabbit/index.htm). Pygmy rabbits use shrub-steppe habitats with deep soils for burrowing. While potential habitat for Columbia Basin pygmy rabbits exists in this area it would not by impacted by the proposed action. Although, sagebrush habitat does exist within the subarea, that habitat would not be directly affected by the proposed action. In general this area, and subsequently the sagebrush habitat, has been heavily disturbed by agricultural development leaving what native habitats remain fragmented and degraded. Water to be provided for irrigation would only be used to irrigate lands already in agricultural production and being irrigated with groundwater. As such no conversion of shrub-steppe to agriculture would occur. The facilities to deliver the water from the East Low canal will be developed by private entities and are expected to make use of existing disturbed corridors such as county or farm roads, resulting in minimal, if any, impact to native habitats.

Spalding's silene, an herbaceous perennial, occurs primarily within open grasslands with a minor shrub component and sites with Idaho fescue and spare cover of snowberry. Ute ladies-tresses, an orchid, occur along riparian edges, gravel bars, old oxbows, high flow channels, and moist to wet meadows along perennial streams. As described above remaining native habitats would not be altered by the proposed action as water would be used to irrigate already irrigated lands and infrastructure would be located in areas previous disturbed and no longer provided habitat for these two species. As a result the proposed action would have no affect on Spalding's silene or Ute ladies' tresses in this area.

Mitigation

Because no impacts are anticipated, no mitigation is proposed.

3.3 Cumulative Impacts

Cumulative impacts are those effects on the environment resulting from the incremental consequences of a proposed action alternative when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes these actions.

The potential cumulative impacts of the Lake Roosevelt Incremental Storage Releases Project were evaluated in Sections 4.3 and 5.5 of the Programmatic EIS (Ecology, 2007: 4-58, 5-50). The Programmatic EIS acknowledged that the development of additional water projects in the Columbia River Basin could cause cumulative impacts that would exacerbate the impacts of existing facilities. Potential cumulative impacts include additional impediments to fish passage and increased migration times, increased total dissolved gas problems, water quality degradation, further reductions in shrub-steppe habitat and resulting impacts to wildlife, and potential social opportunity costs. The cumulative impacts could cause species already in decline to experience more severe impacts than if a single project were constructed in a less disturbed environment (Ecology, 2008: 4-84).

The SEIS has determined that the additional maximum drawdown of 1.8 feet for a few days at the end of August during drought years could incrementally increase the impacts described in the Programmatic EIS; however, because of the short duration of increased drawdown, the incremental impact would not be expected to be significant (Ecology, 2008: 4-84).

The proposed action would provide increased stream flows to benefit fish in the Columbia River downstream of Grand Coulee. These increased stream flows are expected to provide cumulative benefits to fish in most months. The adaptive management strategy developed for the preferred alternatives will allow Ecology to maximize benefits of the flow releases for fish (Ecology, 2008: 4-84).

Currently, Reclamation and Ecology are working on various projects in the Columbia Basin to continue development of the CBP.

The Potholes Feed Route project is currently underway. It involves developing two alternative feed routes so that water from the Columbia River and Banks Lake can be fed to Potholes Reservoir for irrigating portions of the CBP. The feed route project does not involve diverting any additional water from the Columbia River but rather moving the volume of water already being diverted along an alternate route rather than along the existing feed route. As a result that project does not affect flows in the Columbia River or storage in Lake Roosevelt.

The Odessa Subarea Special Study will investigate the possibility of continuing the development of the CBP to deliver project water to lands currently using groundwater in the Odessa Subarea. This study is currently on-going and the various alternatives have not been thoroughly analyzed to determine how much, if any, additional water will be taken from the Columbia River. This study is currently on-going and the various alternatives have not been thoroughly analyzed to determine how much additional water will be taken from the Columbia River and what impacts that withdrawal would have on Columbia River flows or Lake Roosevelt water surface elevations. None of the actions under study as part of the Odessa Subarea Special Study have been developed to the point where they can be “reasonably certain to occur”.

Ecology is working with the Columbia-Snake River Irrigators Association (CSRIA) on a Voluntary Regional Agreement (VRA) to undertake conservation and other measures to create new sources of conserved water that can be exchanged for new uninterruptible water rights on

the Columbia River and lower Snake River. The conserved water would be transferred to Ecology's Trust Water Rights Program. The VRA does not specify where the projects would be located. The conservation projects could be undertaken by municipal as well as agricultural users.

The proposed action analyzed in this EA identified few impacts to existing resources. The action involves any additional season drawdown of Lake Roosevelt but the drawdown is small, in most years around 1 foot and in the rare drought year about 1.8 feet., and is well within the normal annual drawdown at the reservoir. The action also results in some changes in Columbia River flows but in most months flows would increase by less than 1 percent and decrease would be limited to September and would be on the order of 3-4 percent at a maximum. Because impacts from this action are small to immeasurable, the cumulative impacts of this action, taking into account impacts from past, present and reasonably foreseeable future actions are also small.

Chapter 4

4.1 Coordination and Consultation

The following agencies, groups, or individuals were involved in the preparation of this EA:

- Washington State Department of Ecology
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- Quincy Irrigation District
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